THE

Psychological Bulletin

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Vol. X. No. 1. January 15, 1913

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

PSYCHOLOGICAL PROGRESS IN 1912

BY PROFESSOR EDWARD FRANKLIN BUCHNER
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In approaching our tenth consecutive survey of the annual achievements in psychology, the temptation to review the decade as a whole is strong. In a science so active as is ours at present, the ten years, however, could suffice to give only indications which might sound much as mere beginnings. And, in view of the timely readjustment of the plans of this journal to meet the task of disseminating and evaluating our new knowledge, we do not yield. We therefore limit ourselves to the year just closing. Nineteen hundred twelve has not been a twelve month which will stand out as conspicuous for a few single, great achievements. The flood of productivity has been kept to its high level, fed by the inpouring streams of the periodical and other material. The inner unity of the science, so notable towards the close of the last century, seems either to have been consciously neglected, or to have quietly disappeared amid the richer activities directed towards particular problems of methods and results. The reflective worker may well ponder the problem: Is the future of a science so young as psychology in any serious danger when it passes through movements which seem to affect a neglect of its historical continuity? The psychologist of today is actuated by a zeal for doing whatever his hands find to do, and the year has consequently shown its tendencies.

As though to overcome the loosening of its connections with the science's past, the year has given us a few interesting summaries and systematic treatises which should be mentioned first. If one may find progress by looking backward occasionally, then the most

interesting thing brought to hand is President Hall's (11) biographical chart which shows us the way by which our science has come to be. In selecting Zeller, "the scholar in his field," von Hartmann, "the philosopher of temperament," Lotze, "the harmonizer," Fechner, "the animist," von Helmholtz, "the ideal man of science," and Wundt, "a scientific philosopher," as the six founders, the author adds to the account of the fundamental advances and changes which psychology made in the nineteenth century, an intimate autobiography which illumines the source of his own permanent contributions. To the *cis*-Atlantic student, the book is of peculiar value and definite service, being filled with those rare tokens of progress that outlive the range of single years. Also through the medium of another lecture foundation, the Ichabod Spencer at Union College, Angell (1) has summed up more objectively and popularly "a just and comprehensive impression of the principal features of the psychology of today." The eight chapters become an inventory which reveals well-funded assets. Perhaps more striking and instructive is the sharp, and justly impatient criticism which Titchener (27) makes of the eleventh edition of the *Encyclopedia Britannica*. One is wholly right in regarding encyclopedic compilations as indexes of the advances made in knowledge. The sad limitations of this particular enterprise in psychology, as detailed, become a direct summary of the historical movements which have produced the facts and laws which constitute what should generously be called the currently accepted contents of our science. "There is no article ——" is the recurrent reply coming from his search for treatment of the expected topics. Rand's (20) compilation of representative selections from the writings of forty-three psychologists affords another opportunity to survey the historic background and the age-long interests of psychology. It is worth while noting that Aristotle, James, and Wundt are the three given most space, aggregating one sixth of the volume. Lotze, Fechner, von Helmholtz, and Wundt are the four in Hall's list of six "Founders" mentioned by Rand. Brett (3) presents an extended account of theories from primitive thought to St. Augustine. More technical and comprehensive systematic works showing present results and pointing the way for further activity are those by Lehmann (14) and by Wirth (31). The latter is especially notable, for its inclusion in a larger work on physiology, and its unusual attempt to extend the meaning of "psychophysics" over the whole field of "experimental" psychology. The rapid accumulation of new material in special fields of the

science is best indicated in the impressive revision and expansion of Meumann's *Vorlesungen* (15).

The particular interests of the year have been in the nature of critical reactions towards some of the work of former years. These have been most marked in the attacks on introspection, as a psychological method, the critical testing of tests, and the more secure establishment of the field of applied psychology. If the criticisms are not captious, all methodological questions are strictly fundamental (2). The recent efforts to secure an acceptable theory of introspection, whose issues confessedly involve seriously all analytic and experimental work, are a sign of growth. Dodge (5), for example, finds marked limitations of introspection, and believes it "is only one of the indicators of mental reality." Dunlap (7) is more decisive, and concludes that "there is, as a matter of fact, not the slightest evidence for the reality of 'introspection' as the observation of 'consciousness.' Hence, we must, in default of such evidence, cease the empty assumption of such a process. We might keep the word to apply to the . . . observation of feelings and of kinesthetic and cœnesthetic sensations. . . . It is probably better to banish it for the present from psychological usage." Dugas (6) goes to the other extreme, and upholds the positive, central value of introspection; because, without it not only psychology but all the other mental sciences would directly disappear. All proposed physical, physiological or social tests, with which to replace it in the science, are illegitimate. Meunier (16) appeals to the unique position of psychology among the sciences, from which it is able to oppose their conclusions with its own, and to deal with the very conditions of their methods and results. Titchener (28) admits that introspection does not furnish a psychological system. He also points out that the term is "highly equivocal"; but, he insists that "the introspection of the laboratory must be distinguished from that either of a moralizing common sense or of a rationalizing philosophy." Introspection is a scientific part of descriptive psychology; and although it shows "specific differences" in its procedure, all the forms present a generic likeness.

Two contributions looking towards the systematization and extension of methods may be mentioned. Stern's (26) renewed efforts to establish securely individual psychology as a definite branch of the science, appears in the place of a second edition of his earlier work. His main problem is that of the methods of studying individual differences or "characteristics," which are the data

usually neglected by the parent science. The results of the methods most applicable,—as the test, the questionnaire and the historical, to immediate experiences, acts and dispositions, in their four relations of the variation, the correlation, the psychography and the comparison of characteristics,—are to produce the true psychogram. The recent establishment of psychological laboratories in hospitals for the insane is the occasion for the appearance of Franz's manual (9), which by standardizing the diagnostic value of our science, will peradventure bring to a speedy end the individualizing procedure of clinicians, and also become a forerunner of further extension in the applications of psychology.

A year ago it was necessary to specify the intense interest in tests as one of the leading features of that survey. Again this interest has kept steadily alive, reaching the point of that sort of criticism which we have already indicated as a sign of progress. The test was one of the earliest forms of experimentation which was so concrete as to fill the psychologist's heart with great hopes that, by securing a performance testing some particular capacity, as discrimination, attention, etc., we should be in the fortunate position of indexing a mind with complete confidence. In those years we could not understand what is clear today, why the test should suffer taboo. The current revival of this interest may lead to the result of setting up the test as one of the distinctive achievements of present psychology. The newer tests are readily recognized, in comparison with the old, as simpler, more indefinite, unspecialized, and less discriminative. And today's confidence finds its basis in the collective readings of many tests. In surveying this field with the systematic intent of pointing the way for future activity, Stern (25) introduces a new term, "intelligence quotient," to designate the part of normal intelligence a given child possesses. Squire (24) also notes the importance of securing norms of "standard achievement for the unretarded," and suggests a method of correlating physical, pedagogical and chronological ages to arrive at this result. Hart and Spearman (12) make a methodological and an explanatory appeal to the various correlations observable among many intellectual achi vements in the recent type of tests to support their belief in the existence of a common factor which they term "general ability." Wallin (30), by selecting five tests, which "include a few of the mental functions which are basic to intellectual development," and using them in observing some conditions in oral hygiene favorable to mental development, opened up an interesting field, and discovered a variety

of indexes showing an unsuspected amount of average improvement. The value of the tendency to criticize methods, as well as the fact of the coöperative nature of our science, is shown in the second installment of the report of the special Committee of the American Psychological Association, which was prepared by Woodworth and Wells (21).

The third chief characteristic of our year is to be found in the increasing confidence in the scientific validity of "applied" psychology, and in the labors to perfect the procedures in seeking solution for many problems in other sciences and in the art of living. Sometimes this application means only a common-sense use of psychological insight; at other times a direct treatment of particular problems by the psychologist. At the twentieth meeting (1911) of the American Psychological Association, indication of this interest was notably shown in the presidential address, the symposium on psychology and medical education, and the section on educational psychology. The Fifth Congress for Experimental Psychology (Berlin, 1912) was characterized by a special manifestation of interest in the method and results of the applications of psychology, about one third of the forty papers presented being concerned with this field. This branch of the science was taken by Münsterberg as the theme for his Ichabod Spencer lectures early in the year. Meunier's (16) and Stern's (26) views belong no less to this field.

Among the many special interests of the year there are a few that stand out so interestingly as to deserve mention. After the appearance a few years ago of several studies on the psychology of drawing and art, chiefly in child development, interest in this topic seemed to wane. An awakening in this field has come, and we should now not be surprised to see ere long our technical methods applied to its problems (23, 32, 18). Drawing has very special psychological interest, inasmuch as it is an important form of mental expression, and offers a peculiarly constant means of understanding certain mental processes. In his special analysis of memory and ideation processes, Müller (17) promises a worthy achievement, when completed, and reports with unusual care the wonderful memory of a mathematical prodigy. The completion by Klemm of Vold's (29) prolonged study of experimentally stimulated dreams presents material which has permanent value, as contrasted with some results of the current attention paid to these phenomena. Ellwood's (8) critical review of the work of the last twenty years clears up many difficulties in studying social phenomena, and increases the fundamental value

of psychology in all efforts to understand the facts of society. The difficulty of the problems in evolutionary psychology appears no less in the cleverly selected types for study through which Holmes (13) traces the genesis of intelligence, than in the demand of Haggerty (10) that the "descriptive" terms of the past shall yield to the more useful experimental terms of the present, and in which there is an almost threatened divorce of the behaviorist from the psychologist, because the latter's concepts are too limited to exhibit the results of the "experimental analysis" of behavior, which has only begun.

The Psychological Index (19), which has been serviceable in aiding one to detect by numerical indications the ebb and flow of annual interest in the various phases of the science, has happily effected an arrangement with the *Bibliographie* of the *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, whereby a practically uniform system of classification of references came into adoption this year. This necessitated some radical changes in the distribution of the material, as shown by the following comparison, which also shows in a semi-logical fashion through the selection of rubrics certain progressive changes in the work of recent years. The old order was: general; anatomy and physiology of the nervous system; sensation, conditions and relations of consciousness; cognition; affection; conation and movement; philosophical implications of psychology; sleep, trance and pathology; and genetic, individual, and social psychology. The new order is: general; nervous system—structure and functions, sensation and perception; feeling and emotion; motor phenomena and volition; attention, memory, and thought; attitudes, and intellectual activities; special mental conditions; nervous and mental disorders; individual, racial and social phenomena; mental development in man; and organic evolution and behavior in other species. The former carried out the ten rubrics into sixty-three headings and thirty-seven sub-topics. The latter employs twelve rubrics, seventy-three headings and thirty-eight sub-topics. The *Index for 1911* contains 3,202 titles, only sixteen more than the number in 1910, representing the work of two thousand five hundred and eighty-seven authors. In view of the difficulties of comparing the relative strength of the main topics in the two years, owing to the changed distribution of the material (only three rubrics remain unchanged, a new one is added, and the tenth of the old order is divided into the tenth, eleventh and twelfth of the new) and also to the increase in the material in sense physiology and the tendency to eliminate philosophy, we refer the reader to the following table.

One cannot fail to notice a more equal distribution of material under the new classification.

1910		1911	
No. of Titles	Rubric	No. of Titles	Rubric
712	Genetic, individual and social psychology.	501	Nervous and mental disorders.
587	Sleep, trance and pathology.	440	Sensation and perception.
471	Sensation.	309	Mental development in man.
417	Philosophical implications of psychology.	297	Individual, racial and social phenomena.
292	Anatomy and physiology of the nervous system.	294	Organic evolution.
248	General.	284	Attitudes and intellectual activities.
171	Conation and movement.	270	General.
169	Cognition.	214	Nervous system—structure and functions.
86	Conditions and relations of consciousness.	191	Motor phenomena and volition.
33	Affection.	184	Special mental conditions.
		159	Attention, memory and thought.
		59	Feeling and emotion.
3,186		3,202	

The second year of the specially planned service of the PSYCHOLOGICAL BULLETIN to report the literature of psychology again illustrates the great range of activity. Its eleven issues devoted to general and special reviews selected material from 1911 and 1912 reaching an aggregate of over nine hundred references (not excluding duplicates), grouped under sixty-one topics. It is interesting to note, also, that this journal lists forty-four periodicals as regularly or occasionally containing papers on psychology, of which two are Italian, three British, six French, sixteen American, and seventeen German.

The annual record of the doctorates conferred by American universities being kept by *Science* (4) gives indication of a steady gain in the amount of worthy student research in psychology. This year twenty-nine degrees were conferred upon candidates presenting dissertations, twenty-five by these six universities: Columbia (eight), Clark (six), Pennsylvania (four), Cornell (three), Chicago (two), and Johns Hopkins (two). In the fifteen-year period, 1898 to 1912, during which this record has been kept, two hundred and fifty-one degrees have been conferred for work done in psychology. It ranks fourth in the list of twenty sciences aggregating two thousand three hundred and ten degrees, and is preceded by chemistry, physics and

zoölogy. Chemistry is credited with over one fourth, psychology with nearly one ninth of these doctorates. The average number of degrees in psychology conferred annually during the first ten years of the period is 13.5, during the last five years 23, and during the whole period 16.6. Over against this showing of consistent advancement in the scientific welfare of psychology are to be placed the special findings of Ruckmich and Titchener (**22**). Judging by financial support, by student registration, and by the number of university "hours," they conclude "that psychology, after twenty-five years of growth, does not stand very high on the honor roll among academic subjects" in American colleges and universities. It always "foots the lists." It has also been outdistanced in the academic race with its rivals of equal, or less, age, as political science, education and zoölogy. Indeed, it is not faring as well as its foster mother, philosophy.

A few additions to the list of psychological and allied periodicals have been made during the year. The *Fortschritte der Psychologie und ihrer Anwendungen*, edited by K. Marbe with the assistance of W. Peter, "aims to serve science and practice equally," the program of applications including medicine, natural science, philology, literature, æsthetics, history, pedagogy, jurisprudence, political economy, and philosophy. The *Psische: Rivista di studi psicologici*, edited by R. Assagioli, of Florence, assisted by three directors, having plans more monographic than journalistic, is to appear six times a year, each issue being devoted to a special topic. The *Zeitschrift für pädagogische Psychologie* has begun a series of monographs. The intimate relations of education to psychology give interest to the appearance of the *Archiv für Pädagogik*, edited by Brahn and Döring, the *L'année pédagogique*, edited by Dugas and Cellérier, of Paris, and the *Svenskst Archiv för Pedagogik*, edited by Hammer, of Upsala. The intention of extending psychoanalysis to the whole territory of the mental sciences has led to the new publication, *Imago*, edited by S. Freud. The *Schriften des Vereins für freie psychoanalytische Forschung*, under the direction of A. Adler, of Munich, as the journal of a new organization, indicates that dissensions among the psychoanalysts are making their appearance. The *Studies in Linguistic Psychology*, by R. J. Kellogg, of Decatur, Illinois, hopes to be interesting enough to grow into a journal.

The associational and personal interests of the science have brought it special credit, or shown a widening extension of its influences. The exhibit of apparatus and other material by the German In-

stitute of Applied Psychology at the Fifth Congress of Experimental Psychology was a distinct service. The psychophysical *Sammlung*, founded by Ebbinghaus at Halle a. S., has during the year become a greatly enlarged and equipped Institute for experimental psychology under the direction of F. Krueger, now the German Exchange Professor at Columbia University. The first Conference of the Texas teachers of philosophy and psychology was held at Waco at the very close of last year. The Institute J. J. Rousseau, under the direction of P. Bovet, has been opened at Geneva to meet the demand of teachers for instruction in psychology and pedology, and to further the scientific study of education. Renewed applications of our science are a part of the plans for the three-year course of the new École Supérieure des Sciences Pédologiques et Psychologiques, privately inaugurated at Brussels, under the direction of Mlle. Ioteyko. The creation of the office of consulting psychologist to the Nutrition Laboratory of the Carnegie Institution, filled by the appointment of R. Dodge, is a tribute to the science as well as an opportunity for approaching new problems and formulating new technique. T. Ziehen has withdrawn from teaching and the direction of the psychiatric and neurological clinic at Berlin to devote his full energy to psychological research in his private laboratory at Wiesbaden. W. Wundt, the "*Altmeister der Psychologie*," attained his eightieth birthday and retired from teaching, surrounded with such grateful honors as to make the joint event one of specific interest to the entire German people. The Wilhelm Wundt Stiftung of seven thousand marks, the material token of the occasion, is devoted by his designation to research in phonetics and acoustics, to aid in the fields of linguistics, music and social psychology.

The year's necrology includes the death of Alfred Fouillée and Hermann Munk. Psychology, as well as ethics and the history of philosophy, has been enriched by the works of the former, who was a prolific writer. His *Psychologie des idées-forces* aided in ushering in the functional point of view, and social psychology received the contributions of his studies on the people of France and of Europe. The death of Munk reminds us of our obligations to his work a generation ago on the functions of nerves and muscles and particularly on the localization of functions in the cerebral cortex.

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GENERAL PROBLEMS; MIND AND BODY

BY PROFESSOR WALTER T. MARVIN

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Prominent among current discussions of the relation of psychology to the other sciences are articles concerning the place of applied psychology among the world's learned professions and concerning the importance of our present stock of psychological information to almost all scientific investigators. Seashore (18) points out the very great demand for applied psychology and describes four fields where the consulting psychologist is especially needed: mental pathology, education, technical crafts and professions, eugenics. The profession of consulting psychologist is then defined. He is a trained expert and his profession is like that of other consulting experts. "He will be a university product in the best sense, and the universities must rise to the recognition of this opportunity for usefulness." Marbe (13) has written a long introductory article for his new periodical showing in much detail the importance of present-day psychology to natural science, medicine, philology, literature, esthetics, history, pedagogy, jurisprudence, economics and philosophy. He closes his article by criticizing the little recognition psychology now receives in the curricula and examinations of German universities and by urging its recognition as a distinct subject, and as a subject essential at least as a minor for candidates in education, law and medicine.

In current philosophical discussion the special metaphysics of psychology continues to be prominent. By the special metaphysics of psychology I mean, in the first place, the following subjects: the definition of psychological fact, the rigorous formulation and limitation of the psychologist's problem and the explicit recognition of the propositions presupposed in psychological research. Though much of this discussion is carried on by philosophers, prompted by the growing revolt against phenomenalism and against all types of idealism, still much of it is carried on also by psychologists, prompted by purely psychological interests, especially by the endeavor to formulate general psychological theory. Concerning psychological facts there is the question: Do these facts include the content experienced or is that content non-mental, that is to say, are the facts under study in psychology solely processes, functions, systems of relations, including the content only in so far as the content is a term in a psychological relation? In short, is the mental fact a quality, a stuff, or is it merely a relation? In papers read in recent years at the meetings of the Aristotelian Society different positions have been taken regarding the answer to this question. At one extreme stands Moore (17). He begins by claiming that "there is always a distinction between *what* I am conscious of and *my consciousness* of it." It is highly doubtful if the content of sensation or of mental imagery, "sense-data," can be properly called mental. They are not acts of consciousness, nor "qualities" of such acts, nor are they "mine" in the sense in which my mental acts are mine. Hicks (6) takes issue with Moore on several points. The threefold distinction of act, content and object should be retained as the basis of psychology. "Neither contents taken in abstraction nor acts taken in abstraction are the real components of the actual mental life." The psychologist therefore has rightly regarded the contents of consciousness as falling within his province. "Even though they be not mental entities, yet they are factors in the development of mind, no less essential than those entities about whose character there can be no doubt." Finally, Dumville (4) goes quite to the other extreme, maintaining that the psychologist, in psychology, should adopt the position of subjective idealism. If he takes this position as a general basis for his metaphysics and constructs a general theory of reality out of pure psychology, insuperable difficulties are at once met; but within psychology we must regard "sense-data" as purely mental, the object of consciousness must be regarded as the product of mental process. A position similar to that of the two latter writers is taken

by Strong (19). Not only must we distinguish between the object of cognition and the content or "image" through whose agency our cognition is made possible, but we must admit that this content or "image" is psychical, is in the brain. It is not objective, it is subjective. Apart from its mental being it has no existential status. But Strong goes further and gives us a theory of "awareness" which denies that awareness is either elemental or unanalyzable or again self-transcendent in the traditional sense. By means of the image and the practical function of the image we are aware of the object. The image as such is a non-cognitive feeling. Through its function, its accompanying and connected images and especially through the reactive tendencies which it has, it gains a purely logical self-transcendence. As will has been, so now awareness should be, rejected as a psychological fact or "conscious element." In order to show how great is the confusion to-day regarding the foundations of psychology, it is interesting to compare with the statements of Strong those of Dodge (3) in an article whose general conclusions seem markedly in harmony with those of Strong. "The stuff of consciousness cannot be sensations, feelings, memory images or any of the other direct products of introspective analysis. As far as these facts are not pure abstractions, they obviously serve as building material for the complex organizations within consciousness. . . . It never seemed to me that the hypothesis of a special soul stuff helped matters much when we are forever forced to deal with that stuff and its combinations under the category of causation." "The stuff of consciousness is a logical accident. Whatever it were, the right kind of integration would constitute a kind of consciousness. I can see no reason why any stuff in the universe may not enter into a similar kind of organization, if the proper conditions are given."

Closely allied to the foregoing discussion regarding what is and is not mental fact, are attempts to limit more narrowly the problem of psychology. On the one hand, there is the attempt to exclude from psychology, *e. g.*, Husserl, what has been called "phenomenology." On the other hand, there is the attempt to formulate positively the problem of psychology as the study solely of a process. Husserl's views have called forth a defence of the older point of view from Messer (15) in which he endeavors to show that phenomenology, or the study of the immediately given (Moore's "sense-data") is a fundamental and necessary part of psychology. But the more interesting and important work is the positive attempt to formulate anew the results of psychology as the study of a process. One of

these attempts is made by Alexander (1) and is without question allied most closely to his neo-realistic tendencies in metaphysics. With Moore he would deny that the contents, images or sense data are mental. The mental is the act of experiencing, and psychology is "the science of the act of experiencing and deals with the whole system of such acts as they make up the mental life." As a name for this act of experiencing he prefers the word "enjoy." Without any reference to pleasure, this name is taken to cover any experience undergone. Alexander proceeds to show that an ultimate analysis of experiencing reduces the bipartite (Stout) classification of mental elements to one ultimate process, namely conation or attention, precisely as the bipartite classification claimed to reduce the older tripartite. Presentation is really non-mental, the difference in perceiving a star and a tree is but "the variation in some intrinsic character which belongs to *conation* as such," that is, "to enjoyment." So-called presentation belongs to psychology only as an indirect means of discovering these intrinsic characters of enjoyment. Regarding feeling he says: "I am content as at present advised to regard it as not independent of conation but as a qualification of conation. The attempt to treat it as sensory does not appear to me successful." In short, conation is consciousness and consciousness is the general form of "enjoyment." This doctrine does not require us to abandon a large part of present psychology. On the contrary it requires nothing more than the rearrangement of existing material. A similar attempt to formulate anew the problem of psychology, though governed by a different motive and point of view, is that of Joteyko (9). May we not carry over from biology to psychology the general notion of a struggle for existence and a natural selection of the fittest and see in each mental life the outcome of a survival of competing psychic elements? The belief that we can leads the author to give an elaborate reinterpretation of psychological fact and reformulation of psychological theory in these biological terms.

Besides the foregoing attempts to define and limit the psychologist's problem is that of MacDougall (11), who points out the danger of the psychologist losing a clear sight of his field of research by merging it on the one hand with the physiological processes of the afferent system and on the other hand with the reaction system. The mind is a middle term. It is not "a mere point where stimulus and reaction meet." It is "an interposed system," and "it is the existence of this mediating system which constitutes both the ground and limitation of the science."

In addition to the foregoing problems I mean by the special metaphysics of psychology the problems grouped under the heading, the mind-body relation. Both among philosophers and psychologists interest in these problems continues to be prominent. If I mistake not, two influences especially are at work in raising a new opposition to the widely held and now almost traditional doctrine, parallelism. On the one hand, there is the influence of neo-vitalism, and on the other hand, there is the influence of the functional versus the stuff theory of consciousness.

Before proceeding then, a few words should be said regarding the current discussion of vitalism. Among prominent recent articles are two, one by Jenkinson (7) defending mechanism and the other by Thomson (20) upholding vitalism. A chief point made by the former is that the psychoid of the vitalist "must be psychically at least as complex as the phenomena" it explains, and must therefore be "as much in need of explanation as they." "In fact it is only a 'photograph' of the problem, and no solution at all." Thomson on the other hand draws the conclusion: We must recognize "three orders of fact: the physical order, where mechanism reigns supreme; the animate order, where mechanism is transcended; and the psychical order, where mechanism is irrelevant." In other words, the physiological is to be explained in part, but only in part, in chemico-physical terms, and the psychical in part, but only in part, in physiological terms. Besides these two articles the discussion of the nature of vitalism begun by Lovejoy[1] has been continued by him (10) and by Jennings (8). Jennings finds Lovejoy's interpretation of vitalism too conservative. Driesch's kind of vitalism does affect fundamentally scientific work. If Driesch is correct "then the biologist cannot from a knowledge of the total physical configuration predict what will happen, even after he has observed it"; whereas the usual working hypothesis of the biologist is that every biological fact has its sufficient and necessary condition. To which Lovejoy replies: Driesch's position "does not imply that different effects have the same antecedents; it implies only that, in an individual organism, the *same* type of effect (*i. e.*, the typical form of the species) may follow from *different* antecedents—the relation between the two sets of antecedents being such as to reveal the non-mechanical character of the action of both." In short, indeterminism is foreign to Driesch's conception of a "harmonious equipotential system."

By far the most prominent publication of the past year on the

[1] Noticed in the January, 1912, number of the BULLETIN, p. 16.

subject of the mind-body relation is a book by McDougall (12). After giving a comprehensive survey of the history of the development of animism from the earliest ghost theories to modern times and of the modern rejection of all animistic hypotheses, the author subjects these modern theories to a searching criticism. In general "in spite of the efforts of many philosophers to provide alternate solutions, we are still confronted by the dilemma, materialism or animism." The issue "between the rival doctrines cannot be solved by metaphysical reasoning, but only by appeal to empirically established facts." These facts not only support the animistic hypothesis but are explicable in no other way. Hence the author frankly adopts the soul-hypothesis. The influence of neo-vitalism and in part also of Bergson is explicitly admitted. In Carr's article (2) the influence of Bergson is complete. The problem of the mind-body relation has arisen from the impossibility of measuring psychical facts. They are purely qualitative. The solution of the problem offered in parallelism "involves an ineradicable dualism and this dualism involves a radical contradiction," the fundamental contradiction, as Bergson has shown, of asserting "that the part is the whole." Moreover, "it obscures the true distinction between the immediate data of consciousness and our knowledge of the real world of practical activity."

Meyer's (16) argument is directed especially against McDougall. Why do psychologists such as McDougall appeal in despair to the ghost theory for help? "The answer is simple. They attempt in vain to conceive of a nervous process as being capable of forcing another nervous process from its own path into a new path." But we do not need a ghost to explain this. "When a *nervous process* is forced to stream over a path other than that of least resistance, it is forced most probably by *another nervous process*." Hence the conclusion: "We must try to establish *definite nervous correlates for all the specific mental states and mental functions* which are used in and seemingly cannot be spared from our descriptions of human life in the mental and social sciences." Marshall (14) distinguishes between the concept of efficiency and the concept of causation "in the sense of unconditional invariableness of succession." To the behavior of animals the latter and not the former concept may be held to apply, provided we study them quite objectively; but when we study consciousness, efficiency and not causation appears to apply. When we carry over either concept, as we often do, into the opposite field where it may not apply, the question arises at once whether we have

the right to do so. In the mind-body relation the succession of changes is not unconditional or causal. Hence we should not attribute "a direct causal relation," but postulate "a causal influence beyond both." Dodge (3) finds "the principle of psychophysical parallelism inhibiting rather than stimulating" to the psychologist. Moreover, this theory certainly needs to be limited and modified before it fits the phenomena of inner psychophysics. "Our consciousness is obviously not correlated with the subthreshold intensity of action of the nervous system, but only with a nervous activity of definite, *i. e.*, of supra-threshold intensity." Again this theory breaks down when we really use it. "We are utterly unable to reason successfully either from known nervous facts to consciousness, or from consciousness to its nervous correlates." Finally, parallelism is "at least a confession of scientific impotence." We cannot set aside the problem "what characteristics of the nervous processes are essential to our normal consciousness." Against Yerkes' "psychical causation" Dunlap (5) maintains that unless it means mere description it does not seem to mean anything intelligible or verifiable. To explain anything we have to get beyond description, we have to bring in logical symbols as, for example, in explaining the connection between the flash and roar of a cannon by means of the notion *matter*. But even if we could explain anything purely in terms which we observe, the question would still remain whether such an explanation should be called "physical" or "psychical."

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TERMINOLOGY

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The fourteenth installment of the French "Vocabulaire Philosophique" (2) extends from *Métaphysique* to *Nous*. Among the definitions which pertain to psychology are Méthode, Mimétisme, Mnème, Moi, Moteur (type), Mouvement, Musculaire, Névrose, Notion. The discussion of the term "Nature" is particularly exhaustive; as many as eleven meanings are differentiated. In a report to the International Congress of Pedology held at Brussels in 1911, Dr. Ioteyko (1) summarizes the progress toward uniform terminology in the sciences of pedology and psychology. She repeats in outline the reports of Claparède and Baldwin to the last International Congress of Psychology (see Psychological Bulletin, 1911, 8, 20). An original feature in Dr. Ioteyko's report is her modification of Aliota's classification of the quantitative branches for pedology. She proposes six divisions, educational anthropometry (anthropométrie pédagogique), psychophysics, psychochronometry, psychodynamics, psychometry, and psychostatistics, of which all but the first belong to psychology. Stern's notation for the age of children is approved; *e. g.*, 2; 10 (15) would denote 2 years, 10 months, and 15 days.

Psychologists will be interested in the attempts made by the American Philosophical Association to define *consciousness* and *per-*

ception (4). Thirteen different uses of the term consciousness are mentioned, including consciousness as response, as an external relation between objects, as conation, and as psychic existence. The Committee makes no attempt to suggest different words for these radically different meanings. Professor Royce (3) expresses considerable dissatisfaction with the Committee's attitude toward perception.

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BIBLIOGRAPHICAL

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The new Italian review *Psiche* has started a new psychological bibliography in its first number (1). The new bibliography aims to select the literature for the use of students who are not specialists; titles of doubtful value are excluded, and each citation is followed by a few words about the contents of the work. The first installment, which deals with the most general topics, contains 41 useful references. The French philosophers have also inaugurated a bibliography of French philosophy. The bibliography for 1910 (4) contains 2,058 titles, all in the French language. Of these 479 belong to psychology and form a very useful reference list. The only criticism to be suggested is the inconvenience of referring to a bibliography confined to a single language. The Committee appointed by the Bibliographical Society of America to survey the field reports (2) the results of a circular letter sent to representatives in every field of science. Psychology appears to fare as well as any science, but there is a call for wider coöperation, especially in the less familiar languages.

We have already quoted the compilation of the complete writings of Wundt. Professor Titchener (3) follows this up with a list of the publications of Professor James Ward, which includes book reviews as well as books and articles.

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CONSCIOUSNESS AND THE UNCONSCIOUS

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The Committee on Definitions of the American Philosophical Association has attempted to compile some of the recent definitions of consciousness as a factor in a perceptual situation (15). Thirteen types of definitions are distinguished, and a bibliography is appended. Pikler (13) states that in assuming opposition as condition of consciousness he means, not polar antithesis, but mutual exclusion, "what other psychological theories call difference of stimuli." Other psychologists, however, have not worked out the implications of the resulting conflicts in the subject.

Strong, in a series of articles (18) reminds us that the term consciousness as used by the psychologist means "our feelings, emotions, desires and sensations, or rather the whole which these at any moment form," while to the logician the term means "the bare cognizing or being aware." Images (sensible data) are essentially psychic existences. Color and variety, considered as existences, are in the image or subject, and are projected into the outer world "much as the beams of a search-light are projected upon a distant ship." This psychology of awareness is that of "projectionism." Image plus motor promptings to response explains what we perceive.

Perry (12), in his chapter on A Realistic Theory of Mind, holds that mental action is a property of the physical organism, that mind "consists primarily in interested behavior," that mind is "behavior or conduct together with the objects which those employ and isolate." Dewey (3) regards consciousness as "an adjective of behavior," a quality attaching to it under certain conditions. Thilly (19) tells

us that "the mind has something to do with the way in which the object figures in the perceptual situation. We may say that in the perceptual situation an object is revealed, . . . and that this is the work of consciousness. But we must also say that much that appears belongs to the mental realm, is read into the object, sometimes truly, sometimes not."

McGilvary (10) develops the view that consciousness is a relation, a "unique and not further analyzable relation of togetherness"; like every other relation it will then "constitute objects into a unitary group or complex" (experience), each experience seeming to have a unique center of reference, the material body concerned plus organic sensations, emotion, etc. Like any other relation, again, consciousness "exists in individualized instances, and yet each instance is an instance of a kind." When objects enter into experience, something of "the complexity of the temporal and spatial relations" in which the real objects stand is left out, a fact explicable only on the relation-theory of consciousness.

Woodbridge (21) argues first, that "the distinction between an object and consciousness" can be defined "only in a situation where that distinction exists," second, "that the characteristic behavior and laws of objects, if distinguished from consciousness, are not consciousness or determined by consciousness" except in so far as empirical investigation may show them to be so determined. Consciousness is not directly efficient in a situation, but is a relation. The efficiency imputed to consciousness belongs rather to the being who is conscious. Singer's two articles (16, 17) reiterate his position that the meaning of consciousness is to be sought in the behavior of conscious beings. He denies that the mechanical description of experience alone, without parallel teleological interpretation, can explain conscious behavior. To find just what behavior is characteristic of mind is a problem for the psychologist. Bode (2) agrees with McGilvary that consciousness is selective and a "peculiar togetherness of things," and finds it hopeful that realist and pragmatist may so far agree. Nevertheless, the realist has not yet given sufficient consideration to the "unique kind of centrality" which objects possess when they enter into the relational experience. Experience and knowledge are events or processes in which things undergo a change; our standpoint must be "internal" rather than "external" to experience.

Frost (6) thinks that the reason for the rejection of the notion of consciousness by the more mechanistically inclined biologists and

physiologists is to be found in the fact that psychologists have not defined consciousness with sufficient clearness; it has been regarded both as a state and a process. The notion of consciousness as a state "should be relegated to the realm of pure concept," while for consciousness as a process, the term "consciousizing" is suggested. Behavior may then be "preconsciousizing" (as in infusoria), "consciousizing" (wherever development occurs), and "consciousized" (hymenoptera). In man, all forms probably exist. Consciousizing is to be regarded as a remedial process, which attends change and growth, and disappears when adjustment has been made.

Kohlhofer (8) sees in "apprehension by the ego" the essential nature of the conscious act. Unconscious psychic acts are those which cannot later be recalled, as those of early childhood, and yet leave an impression behind. Martin (11) defines consciousness as "individual awareness in a protoplasmic organism of self and not-self." It is identical with the "complex sensations of stress accompanying cell adjustment to lines of force."

The main point of McDougall's argument (9) falls outside the field of this review. Some aspects of his treatment, however, are of interest here. The author regards the unity of consciousness as "a fundamental and primary fact," though we learn later that he is willing to admit the possibility of several psychic beings in the same individual. The ground of this unity is to be found in a permanent soul, "a sum of enduring capacities for thoughts, feelings, and efforts of determinate kinds," consciousness arising apparently only when the permanent substrate interacts with some bodily organism. It may be that "the soul that thinks in us is but the chief of a hierarchy of similar beings, . . . and that, if the subordinated beings exercise in any degree their psychic capacities, the chief soul is able, by a direct or telepathic action, to utilize and in some measure control their activities." This is suggested as an explanation of cases of apparently co-conscious personalities. All impressions made on the soul are not necessarily united in the stream of personal consciousness; this, the author agrees with Janet, may be only possible at the expenditure of a certain amount of psychic energy which produces a conscious synthesis. In the early stages of bodily development the soul may control actions in all parts of the body, and perhaps only gradually does it become restricted to the central nervous system. It built up the vegetative functions of the organism, and is perhaps the bearer of heredity.

The most complete recent treatment of the subconscious is that

by Weingartner (20). Conceptions of the unconscious and of the subconscious are quite different. The unconscious is used to include (*a*) physiological dispositions, (*b*) psychic activities (the soul as carrier of consciousness, unconscious normal activities, psychic dispositions), (*c*) unconscious sensations, (*d*) the notion of Lipps that ideas, themselves unconscious, may affect consciousness. Conceptions of the subconscious include (*a*) that of a hierarchy of higher and lower spheres of consciousness (Fechner), (*b*) the obscure content of normal consciousness, (*c*) the idea of a separate consciousness in the individual, either normal (Dessoir, Hartmann, James) or abnormal (Janet, Binet), (*d*) mental functions connected with lower brain centers. Against these conceptions, so far as they include any unconscious or subconscious psychic activities, Weingartner brings the indictment that they are so ambiguous and variable that they are of little value in scientific work. Partially weakened memory, changes in psychophysic basis, margins and fringes are better explanatory concepts. To explain by calling a process subconscious is, as Wundt holds, merely to explain by giving a name to a phenomenon. The author then runs over the evidence for the existence of a subconscious element in religious conversion, belief, prayer, ecstacy, and refuses from the evidence at hand to accept any solution of the problems of the psychology of religion based on the activities of the subconscious.

Prince (14) presents the thesis that the setting which determines the meaning of ideas "may be, and usually is, partly conscious and partly unconscious." Evidence for the unconscious determination of meaning is found in the analysis of pathological cases, and, synthetically, in the building up of new settings in hypnosis, which, though themselves remaining unconscious, determine the meaning of conscious ideas.

Dunlap (4) argues against conceiving the subconscious as the guardian of automatic and reflex movements, or the repository of forgotten ideas. Recall of previously unnoticed percepts is based on marginal consciousness. Furthermore, "we are justified in concluding that the assumption of a detached subconsciousness or co-consciousness to explain the phenomena of alternating personality is not at present defensible since the identical problems involved in these phenomena are quite like those involved in all mental life, and the problems of neural disposition and modification are not affected in any way by the hypothesis of co-consciousness."

Gardner (7) would recognize both a subconscious and a super-

conscious mental life, and stresses the importance of these concepts for religion. Paganism stressed the subconscious, the Stoics, Confucius, etc., consciousness, and Christianity, the superconscious. Arréat (1) holds that while the rôle played by the unconscious is important, and may furnish us with the secret of instinct, we must not exaggerate its importance as do many of the "anti-intellectualists" or blind ourselves to the importance of voluntary effort.

Ferrari (5) propounds a most ingenious theory for the basis of our emotional and subconscious life. It is impossible to give in brief compass any adequate conception of the working out of his hypothesis, except to say that emotion and subconscious acts, tendencies, interests, possibly habit, are based on the activities of the "autonomic" nervous system as described by Langley. The reader is referred to an extended review of the article by Dr. T. L. Smith (*Amer. J. of Psychol.*, 1912, 23, 464–468).

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TEXT-BOOKS AND GENERAL TREATISES

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The most useful and thorough text-book of the year, which unfortunately is in German, is that of Elsenhans (6). There are 434 large octavo pages of text including a large bibliography at the end of each section, beside countless references to classical and modern authors throughout the text, an author as well as a subject index, and a minute table of contents of 15 pages.

The aim of the author is to present the fundamental principles of a psychological system, principles gained both from systematic observation under the artifical conditions of experimentation and under the natural ones of general observation, in such completeness, thoroughness and interconnection as to give to the student, who may wish to do further work in the discipline or may desire to use psychology as a help in other sciences, a firm and trustworthy foundation. Emphasis is not laid upon experimentation and for an intimate knowledge of methods and tabulated results the reader is referred to Ebbinghaus, Külpe and Wundt. Although the system is a well-rounded one the author states that the subjects of association, feeling, will, memory, imagination, character, forms of expression and social psychology have been given more minute and systematic treatment. Elsenhans acknowledges his deepest indebtedness to the influence of Sigwart, Lotze and Wundt.

The book opens with the concept of psychology, then follows a short history of classical and modern psychology, the latter being divided into schools such as the metaphysical psychology of Drobisch, Lazarus and Volkmann, and empirical psychology, which is subdivided into the psychopathology of Kraepelin, Möbius, and Binet,

the psychology with a physiological trend of Exner, James and Münsterberg, the psychology of the Würzburg school, etc. The *American Journal* and the PSYCHOLOGICAL REVIEW are mentioned among the publications, the latter being, according to Elsenhans, still edited by Baldwin, Warren and Judd. The author shows a decided lack of knowledge of American literature. At least he has sadly neglected it. Of approximately six hundred authors mentioned only fourteen are Americans and most of these have written in German.

A chapter upon methods, including a discussion of the difficulties of introspection and how they can in part be overcome, precedes a long chapter upon the relation of mind to body, which shows a strong preference for the theory of interaction. The sensations are introduced by a chapter upon the nervous system, illustrated by cuts of the brain, nerves and spinal column, and by a section upon the measurement of sensations, and Weber's law, together with its meaning and its limitations. There is not much space devoted to the sensations, yet the chapter on vision, for example, contains a good cut of the eye and of a cross-section of the retina, beside sections upon the fundamental colors, the laws of color mixture, intensity as related to quality, adaptation, after-images, contrast, color blindness and five different theories of color vision, of which Elsenhans thinks Wundt's has the advantage from a psychological point of view.

The most general concept of idea (*Vorstellung*) which includes sensation, is adopted by the author and used with specializing prefixes such as sensation, memory, imaginal, etc. The association of ideas and the factors which produce reproduction, such as the unconscious and the middle links, are described. The chapter on the thought processes includes the theories of the Würzburg School and the section on concept, judgment, etc., which makes several references to Sigwart's Logik, points out the fact that introspection finds that the act of reasoning is almost invariably in the form of the enthymeme.

The portion devoted to space includes tactual as well as visual space. It gives several pages to illusions and ends with a discussion of the nativistic and empirical theories. Wundt's theory of localization as developed from the theories of local sign of Lotze and Helmholtz is accepted. A short section on time, dealing principally with filled and unfilled time intervals, is followed by a section on the idea of a connected outer world. In the extensive chapter upon feelings one finds, among many others, sections upon sensation, esthetic, intellectual, ethical and religious feelings.

Among the points of interest of the last hundred pages might be mentioned the following: Of the theories of the will the autogenetic, which assumes an elementary will quality, is selected. In a discussion of the freedom of the will the most important fact for the psychologist is that of the consciousness of freedom. The subconscious is not to be interpreted in physiological terms, but enjoys an individual existence. The section on sleep and dreams contains a long quotation from Freud illustrating his method. Under speech and thought is given the physiological basis of speech and aphasia and a paragraph on graphology. The theory of attention follows closely that of Wundt. The chapter upon memory and imagination includes data from numerous experimental studies. The subject of the development of mental life includes the question of natural disposition and inheritance, child psychology, bodily expressions, and social psychology. Concepts of suggestion and hypnotism and a section on mental disorders are given. The book closes with a discussion of the fundamental principles, *i. e.*, the relation of the soul to time and space, the concept of a soul substance, and psychic causality.

For the experimental psychologist the most important book is the *Grundzüge der Psychophysiologie* of Lehmann (8). The guiding principle is Lehmann's energy theory, which he propounded in the second part of his *Körperliche Äusserungen psychischer Zustände* and which states that "the psychic phenomena are dependent upon a peculiar form of energy, which is caused by a transformation of the chemical energy of the central nervous system and which obeys the general laws of energy."

The book is arranged to show how the facts drawn from physics, physiology, and the different manifestations of consciousness elucidate and substantiate this theory. These facts are taken for the most part from experiments which the author himself has conducted and from his own numerous self-observations, and are published here for the first time. The more important results of others are described and for the rest one is referred, as far as possible, to books containing general summaries.

The volume is divided into four books. The first, called Body and Soul, treats of the phenomena of consciousness in general and their physical and physiological relations. The second book, called Psychophysics, bears upon the simple psychological phenomena and their relations to external stimuli. The third book, termed Psychodynamics, considers the relations of the psychological phenomena

among themselves, and the fourth book treats of the psychological complexes resulting from these relations. Anatomical sketches, formulæ, tabulated numerical results and curves and schematic diagrams abound. The laws deduced from the data given are printed in italics.

After a discussion of the relation of body and soul, which includes a tabulation of the weight of the brains of various animals, a chapter is devoted to the laws of energy and its transformation. Muscular work in general in its relation to dissimilation and assimilation is also discussed. Then follows the physiology of the nervous system and the latest facts in nerve conduction and inhibition. The part upon the sensations reminds one in treatment of Nagel's *Handbuch*. The anatomy, physics, physiology and psychology of the several senses are given in clear detail. This section of the volume ends with a description of the feelings, especially as regards their relation to the kind, strength and duration of the stimulus, and to the general bodily and mental conditions.

The first part of the psychodynamics is upon inhibition and facilitation. The phenomena of color and brightness contrasts are treated as inhibitions and come, therefore, under this head. We also find here associations and reproductions. In the second part, upon psychic activity, attention is treated at length, the description including the conditions of attention, the effects of concentration and distribution, and the attitudes (*Einstellungen*). In this part we also find the subject of the limen and the measurement of sensation, memory and imagination, and thought.

The last book includes time and space, a short chapter on the ego and its activities and a section on the emotions. The last few pages are devoted to the will, temperament and character. It will be seen from the subjects just mentioned that the book is not as restricted in scope as the title might imply.

The only American text-book that has appeared this year is that by Dunlap (5). We read in the preface that the author's "greatest effort has been to present as consistent and systematic a sketch as possible of the general field of normal human psychology, elaborating the details only where they are essential to the general survey" and that "the book is not designed to be made the sole basis of a course in elementary psychology," but should be supplemented by explanatory lectures. There is very little physiology and no detailed account of experimental methods or results. The author has shown originality both in the arrangement of the subjects and in some of the fundamental concepts.

As has been the case in other recent text-books, so here also the sensations have not been arranged according to the different senses, but in reference to the different attributes. For example, one chapter is devoted to quality, another to protensity and extensity and another to local significance. Relations are considered elementary forms of consciousness. Pitch is included under the attribute of extensity. Throughout the book there is a great effort to define carefully the different concepts used. Many technical terms not usually found in text-books are introduced. The book closes with chapters upon the subconscious, the ego and the occult.[1]

In the third edition of her *First Book in Psychology* Calkins (3) states that the "revision . . . has been made with three main ends in view: to emphasize the essentially social nature of the conscious self, to accentuate the fact that the study of the self, as thus conceived, involves a study of behavior and finally to prune the book of expressions which lend themselves to interpretations in terms of an atomistic psychology." The three important changes in concepts, those of attention, of will and of time, seem to have been caused by a reaction against the strictly sensational-descriptive psychology of the Cornell school. "Attention is, in truth, an unique attitude, a basal relation of self to object." "This conception may, but need not, be combined with the teaching that there is a structural element of clearness, or attended-to-ness." In the concept of will more emphasis is laid upon the inadequacy of a structural analysis to explain entirely the will consciousness. "The awareness of dependence-on-me is itself irreducible to impersonal terms." In the conception of time there is a certain elemental experience; " . . . structurally analyzed it probably includes an unsensational and distinctive element."

Natorp's book (9) is, as the author says, a philosophy of psychology. He has been actuated by a desire for clarity in the logical problems of psychology and for strict, well-defined concepts as a foundation for the science. The method is that of a logical investigation of the fundamentals, which, since Kant, has been called the critical method. The book is a revision and enlargement of his *Einleitung*. Only a small part, however, consists of the former thoughts and then seldom are they strictly in the old form. This first volume is merely a foundation of a foundation of psychology. The second volume, soon to appear, will consider general phenomenology. A third volume, dealing with the genetic side, may follow.

[1] See special review below, p. 35.

Natorp, in view of his monism in psychology, holds that a discipline which desires to proceed as an objective science, as a system of explanatory laws, cannot be called psychology. How is it with so-called descriptive psychology? This is a study of consciousness and here subject and object are identical, for the object X is determined by the consciousness A and thus ceases to exist as X in opposition to A. It would seem from this that description is psychology, but description deals with facts and as facts are objective, we cannot apply the term psychology to it any more than to explanation. Furthermore description involves abstraction and abstraction halts the stream of consciousness. Psychology must take cognizance of this eternal onward movement. This brings us to Natorp's main theme: The method of psychology must be one of reconstruction, a reconstruction closely following the Kantian principles, but with the distinguishing characteristic of emphasising the ever active process, as it was first expounded by Natorp twenty-five years ago. Description, or as it is most frequently spoken of, descriptive psychology has, however, a very important function to fulfill. According to Natorp the problem of the psychic as subjective, which for him is psychology, only appears after the far-reaching search for an object knowledge has long been in progress. That is, the reconstruction is a system which has grown out of the facts as supplied by descriptive and genetic psychology.

The last chapter discusses the principles fundamental to and characteristic of the theories of Wundt, Lipps, Husserl, Dilthey, Münsterberg and Bergson.

Smooth and intelligent translations have made two German books more accessible to English readers. Wundt's (11) short introduction, consisting of five chapters on consciousness and attention, the elements of consciousness, association, apperception and the laws of psychic life, will be welcomed by the student who wishes a comprehensive idea of the author's theory of apperception and his tridimensional theory of feeling and the manner in which he uses them to explain the thought processes. Dessoir's *Outlines* (4) is not a mere abridgment of his longer history. As the author states, "it offers a less detailed account than does the *History*, but on the other hand it covers broader fields." The history brings us as far as William James. No living psychologists are mentioned.

Rand (10) has given the psychologist, who is interested in the history of his problems, a very excellent and inclusive book. It was the idea of the compiler to select those psychologists and from

each the theories which have meant most for the development of the science. The book includes forty-three authors from Anaxagoras to Wundt and about twenty pages are devoted to each. We find represented the important Greek philosophers and those of the Middle Ages, the English Associationists and the Scotch School. From the French Descartes, Bonnet, Condillac, and Maine de Biran have been selected. The Germans are very well represented. Of the living psychologists Hering, Mach, Stumpf and Wundt are included. As examples of the manner of selection we might add that James is represented by his chapters on the Stream of Consciousness, and on the Emotions; Stumpf by his Degrees of Tonal Fusion and Cause of Tonal Fusion; Mach by his Sensations as Elements and his Space Sensations; and Helmholtz by his Theory of Color Vision. A number of the translations are published for the first time.

The lectures which Angell (1) delivered at Union College have recently been published. They are in semi-popular form and give a sketch of the entire field of psychology, including abnormal, applied and animal psychology.

Hall's (7) lectures upon *The Founders of Modern Psychology* which were "designed to give a general idea of the personality, standpoint and achievement" of Zeller, Lotze, Fechner, Hartmann, Helmholtz and Wundt will no doubt be of interest to many.

The translation into German of Aristotle's (2) psychology will, apart from the fact of the cheap form in which it is published, hardly interest the English student, who already has several excellent translations in his own language.

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4. Dessoir, M. *Outlines of the History of Psychology.* Translated by Donald Fisher. New York: Macmillan, 1912. Pp. xxix + 278.
5. Dunlap, K. *A System of Psychology.* New York: Charles Scribner's Sons, 1912. Pp. xiv + 368.
6. Elsenhans, T. *Lehrbuch der Psychologie.* Tübingen: Mohr (Paul Siebeck). 1912. Pp. xxiii + 434.
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8. Lehmann, A. *Grundzüge der Psychophysiologie.* Leipzig: O. R. Reisland, 1912, Pp. x + 742.

9. NATORP, P. *Allgemeine Psychologie nach kritischer Methode.* Erstes Buch, Objekt und Methode der Psychologie. Tübingen: Mohr (Paul Siebeck), 1912. Pp. xii + 352.
10. RAND, B. *The Classical Psychologists.* Boston: Houghton Mifflin Company, 1912. Pp. xxi + 734.
11. WUNDT, W. *An Introduction to Psychology.* Translated from the second German Edition by Rudolph Pintner. New York: Macmillan, 1912. Pp. xi + 198.

APPARATUS

BY PROFESSOR C. E. SEASHORE

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The Cornell Laboratory (1) has set a good example in reporting detailed specifications for the following five pieces of apparatus. It is very desirable that the various laboratories should adopt the plan of describing fairly permanent pieces of apparatus apart from the report of the research.

Sound Localization Apparatus.—This apparatus consists essentially of a well-mounted and graduated curved arm which may carry a sounding apparatus such as a telephone receiver or a tuning fork, in any direction from the center of the head, under controlled conditions. It is built on excellent lines, but its use is limited. On the basis of years of experience with a perimeter (see PSYCHOL. REV., 10, 64 ff.) the reviewer would suggest the following modifications to make the Cornell apparatus of more general use: (*a*) For the production of sound fusions, or phantom sounds, mount another arm to move in the same way and in the same plane as the present arm. (*b*) To facilitate measurement in the vertical direction, mount a third arm at the side moving at right angles to the line of the other two arms. (*c*) Take off the head rest which is a serious distraction and substitute a system of sighting for the alignment of the head. (*d*) Make the apparatus portable. (*e*) Convert it at will into a first-class color perimeter by mounting a Helpach lantern for color stimulus in place of the sound stimulus.

Rhythm Interruptor.—This provides for all the necessary control in the ordinary rhythm experiment, and would seem to be very serviceable. An electric phonograph motor is used to drive the apparatus. This is reported as having an error of ± .9 per cent., which is not accurate enough for the finest measurements, as some persons can perceive deviations of that amount. For the finest work in rhythm, the best available source of power and speed control

is a synchronous motor, which may have an error of less than ± .0008 of a second. Such a motor can of course be attached to this apparatus in place of the phonograph motor.

Rhythm-box Controller.—This consists of a Stoelting rhythm-box equipped with a device for starting and stopping the metronome in the box noiselessly and with precision.

Rhythm Hammer.—This hammer may be used in setting up any desired pattern of rhythm. It is well adapted for demonstration purposes, and may be used for fine work if driven by a constant speed motor.

Automatic Tuning-fork Hammer.—This hammer is designed to produce an accurate and controlled stroke and to dampen the fork with precision.

Brown (2) describes a method of measuring short intervals which could very easily be used in reaction time experiments in psychology. His measurement depends upon the principle that the time interval varies directly as the throw of a ballistic galvanometer which has been connected in a particular way through a Wheatstone bridge circuit during the interval. The method is capable of a sufficiently high degree of accuracy for ordinary reaction time experiments, and the apparatus could be built at a very reasonable cost.

Dunlap (3) gives an account of what seems to be a very serviceable laboratory pendulum that will swing for more than an hour with a high degree of accuracy. Full specifications for construction are given.

In the article in the *British Journal* (4) he discusses the advantage of working without the springs on the Hipp chronoscope, and reports the results of tests under these conditions.

Ferree (5) states that "the object of this apparatus is to add to the vertical campimeter the rotary features of the perimeter, and thus to allow investigation of every possible meridian of the retina with as much ease and precision as was possible with the old form of campimeter in the nasal meridian only, or at most, in the nasal and temporal meridians." For full description one must consult the original. To the reviewer it seems unfortunate that the apparatus was not built for operation on the surface of a hemisphere rather than on a plane surface.

Martin (6) has given us a useful manual for the quantitative use of faradic stimuli, from the point of view of the needs of the physiological laboratory.

Michotte (7) describes what seems to be a very excellent form of

a tachistoscope which is capable of accurate and very wide range of use. It may be employed as an ordinary shutter; two exposures may be made upon the same point of the retina under controllable conditions of time, space, and intensity; the exposed objects may be magnified; and the conditions of adaptation may be varied. It seems probable that all the important sources of error in apparatus for tachistoscopic experiments have here been eliminated. The instrument is made by Zimmerman in Leipzig.

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SPECIAL REVIEWS

DUNLAP'S SYSTEM OF PSYCHOLOGY

A System of Psychology. KNIGHT DUNLAP. New York: Charles Scribner's Sons, 1912. Pp. xiv+368.

Professor Dunlap has designed his book for semi-advanced students. He has desired to present a sketch, as systematic as possible, of the general field of psychology. It does not, however, seem that he has succeeded as well in presenting a connected series of facts as he might have done had he written a conventional text-book. It would perhaps describe the book better if one called it an introduction to a system of psychology, for the impression one receives is that of a collection of definitions. One finds very few references to experimental data. It was undoubtedly Dunlap's idea that such references would be out of place in a "system," but in consideration of the manner in which the book has actually been planned and the fact that the author ranks among the leading experimentalists, it is a question whether it would not have gained greatly in value if they had been more generally included.

The author believes that psychology should not at present be divorced from philosophic theories. This is undoubtedly true, but in introducing philosophy into a psychological treatise one must have constantly in mind the danger of wandering into fields no longer psychological. This is an error Dunlap has at times made, for example, when under perception he gives us a section upon the determination of perceptual truth and falsity, a subject which is only in place in a logical or epistemological treatise.

The definition of psychology adopted by the author reads as follows: "psychology is the study of experience: of the reference of experience to its content: of any direct reference it may have to a subject of experience: and of the content of experience in so far as it is directly related to experience." It will be seen from this that the author separates function from content. Whether or not in Dunlap's opinion this separation is justified by an analysis of consciousness is not clear.

Of the three elements of consciousness usually accepted, namely sensations, feelings and images, Dunlap rejects images as specific

contents. As far as we can gather from the text, it seems that Dunlap places the specific character of imagination in the act of imagining, in the "way of being conscious" and not in the content, which may be a "revived or false sensation" or "actual normal sensations from the various organs." On the other hand he adds relations as elements of consciousness.

Sensations are treated in general and then the qualities of sensations. We learn that there is only one elementary quality in audition. From this statement the reader will probably expect differences of pitch to be classed as differences of intensity. He will find, however, that Dunlap identifies differences of pitch with differences of extensity. He says that "on purely psychological grounds pitch is analogous to extensity of visual and tactual sensation." Now it seems to the reviewer that there are very reliable psychological data which refute this theory, for in the middle register there is little or no variation in the extensive attribute and there should, therefore, be a correspondingly slight change in pitch, which is contrary to the facts. Dunlap admits that "extensity itself can be estimated only approximately by direct observation" and therefore to help out his theory he brings in local signs, which he believes attach themselves to the notes according to "the group of end-organs at which the excitation on the basilar membrane ends," and aid in the more accurate estimation of the correct pitch. In fact, according to Dunlap it is the musical ear especially which arranges the tones in their proper places in the scale by means of the local sign. Now local sign, if it means anything, is a qualitative attribute of tone and there is no doubt that it is this attribute that most psychologists call pitch. There does not seem, indeed, any reason why this term should be transferred to the attribute of extensity.

There are chapters upon threshold, intensity, protensity, extensity and local significance. It is unfortunate that the chapter upon the relational elements is so short. In the next chapter, which includes a description of the difference between concrete and abstract ideas, Dunlap retains the term image, although, as pointed out above, he does not consider that it covers an unique content of consciousness. Problems of memory and recall, retention and association follow. Perception includes time and space perception as well as the perception of things.

In his chapter upon feeling the author indicates his attitude toward the subject in his statement "that any analysis of the emotions which attempts to reduce them to sensations alone, or to sensations and affective elements is inadequate."

After a description of action and a short chapter upon the empirical ego, in which it is stated that "the body . . . is fundamentally the self," there follows a chapter upon the degrees of consciousness, which includes vividness, attention and judgment. The last is placed here for the reason that concept and judgment differ solely in the "matter of relative vividness among the factors of these complexes." But may not all manner of change occur in the relative amount of vividness of the parts of a concept without that concept going over into a judgment? Rhythm, fluctuation of vividness, etc., are treated under the time relation of consciousness.

The book closes with short chapters upon the subconscious; upon the ego, which, in contradistinction to the empirical ego, is considered transcendent and therefore assumed; and upon the occult. It is surprising that there is no chapter upon thought and its determining tendencies.

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GENETIC PSYCHOLOGY

Psicología Genética. JOSÉ INGEGNIEROS. *Arch. de psiquiat. y crimin.*, 1911, 10, 1–354.

North American psychologists should not overlook the recent progress of psychology in South America. In the Argentine Republic especially a number of investigators have recently made original contributions which deserve to be noticed. At the University of Buenos Aires, J. Ingegnieros, F. de Veyga, and C. Rodriguez-Etchart are working in social and criminal psychology and kindred lines. The BULLETIN has received a number of brochures by these writers printed under the auspices of the Argentine National Penitentiary. The Psychological Society of Buenos Aires issued in 1910 the first volume of *Anales de psicología* containing their original contributions to psychology for the year 1909. We are not advised whether this is to appear annually. Another Argentine periodical, *Archivos de psiquiatría y criminología*, is now in its eleventh year.

Dr. Ingegnieros's article on Genetic Psychology fills a double number of the latter magazine. It is an elaborate treatise of 350 pages, which aims to establish the claims of psychology to be regarded as a natural science by applying to it the data and methods

of biology, and to refute the scholastic system of psychology which still holds sway in many Latin countries. The author is clear and logical in his arguments, though his explanations are often too diffuse and he tends to over-elaborate the analysis. He shows encyclopedic familiarity with the history of psychology, biology, and philosophy, citing countless authors of all lands and ages, from Plato and Democritus in ancient Greece to James and Baldwin in modern America.

In discussing the biological foundations of psychology Ingegnieros proposes a theory of organic life, based on the radioactivity of matter; his world-view is a form of evolutionary monism.

Consciousness is regarded as a specific character of certain psychological processes (p. 275; cf. 136, 311), but it is not a character of all mental states, since the term *psychological* is applicable to many biological phenomena which are unconscious (p. 105). "For biological psychology, the conscious functions are a useful variation of the mental functions in the course of organic evolution" (p. 311). The author defines the relation of excitation to sensation and personality as follows: "(1) An *excitation* is a disequilibration caused by an external or internal force; when the excitation is known or felt by the subject we say that it is conscious and call it *sensation.* (2) The continuous and systematized memory of conscious excitations, or sensations, constitutes the conscious experience which results in the gradual formation of *conscious personality.* (3) An excitation is conscious (*i. e.*, sensation) when it determines reactions *related to previous experience, i. e.*, to conscious personality" (p. 298).

The foundations of comparative psychology are discussed at considerable length, with special reference to the contributions of Darwin, Romanes, and recent writers; but the results of experimental investigations by Thorndike and others are only briefly mentioned. The same lack is to be noticed in the author's study of mental development in the child, although here the names of 42 investigators are given. A long section is devoted to the thought process viewed as an evolutionary product; the author follows rather closely Baldwin's view, as elaborated in his *Genetic Logic.*

Space will not allow us to present an analysis of the work. The titles of the sections will indicate the subjects treated: Scientific psychology, Genetic psychology, The origin of living matter, Biological energetics and mental function, Comparative psychology, Social psychology, Individual psychology, The thought function, The conscious mental functions, and The methods of psychology.

It is to be noticed that the author lays special emphasis on external observation as a psychological method, and is inclined to minimize the importance not only of introspection but even of experimental research. The work lacks the finer details of analysis and does not give the data concerning the growth of particular functions that one would expect to find in so extensive a work. As a study of the groundwork and history of genetic psychology it is quite exhaustive; but it does not meet the requirements of a systematic treatise or text-book.

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BOOKS RECEIVED DURING DECEMBER

RAAB, F. *Die Philosophie von Richard Avenarius.* Leipzig: Felix Meiner, 1912. Pp. iv + 164. M. 5.

BERKELEY. *Theorie der Gesichtswahrnehmung.* Leipzig: Felix Meiner, 1912. Pp. xii + 152. M. 3.80.

NATORP, P. *Allgemeine Psychologie nach kritischer Methode.* Bd. I. Tübingen: J. C. B. Mohr (Paul Siebeck), 1912. Pp. xii + 352. M. 9.

PAULHAN, FR. *L'activité mentale et les éléments de l'esprit.* 2e éd. Paris: Alcan, 1913. Pp. 586. 10 fr.

CELLÉRIER, L., & DUGAS, L. *L'Année Pédagogique.* 1ere année, 1911. Paris: Alcan, 1912. Pp. viii + 487. 7 fr. 50.

JAMES, W. *Psychologie und Erziehung.* 3. Aufl. (Trans. by KIESOW, F.) Leipzig: Engelmann, 1912. Pp. x + 134. M. 1.

RENOUVIER, C. *Traité de Psychologie Rationnelle d'après les principes du criticisme.* 2 vols. Paris: Colin, 1912. Pp. 398, 386. 16 fr.

NOTES AND NEWS

DR. W. S. HUNTER (Chicago) has been appointed instructor in psychology in the University of Texas. DR. F. A. C. PERRIN (Chicago) has been appointed to a similar position in the University of Pittsburgh.

DR. C. E. FERREE, associate professor of experimental psychology at Bryn Mawr College, has been appointed director of the psychological laboratory.

At the recent meeting of the American Psychological Association at Cleveland, Professor H. C. Warren (Princeton) was elected president for the coming year. Professor W. V. Bingham (Dartmouth) continues as secretary-treasurer.

The American Philosophical Association has elected Professor E. B. McGilvary (Wisconsin) president and Professor H. A. Overstreet (College of the City of New York) vice-president for the ensuing year. Professor E. G. Spaulding (Princeton) continues as secretary.

The following items are taken from the press:

The psychological laboratory at the Sorbonne, founded and for many years directed by the late Alfred Binet, will be conducted by Professor H. Piéron. The *Année Psychologique*, the current number of which has been prepared by Simon and Larguier des Bancels, will be continued under Professor Piéron's editorship.

Dr. Edward L. Thorndike, professor of educational psychology in Teachers College, Columbia University, will give a course of lectures on the Ichabod Spencer Lecture Foundation at Union College in February and March.

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THE

PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-FIRST ANNUAL MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, CLEVELAND, OHIO, DECEMBER 30 AND 31, 1912, AND JANUARY 1, 1913

REPORT OF THE SECRETARY, PROFESSOR W. V. BINGHAM, DARTMOUTH COLLEGE

The twenty-first annual meeting of the American Psychological Association was held at the Western Reserve University, Cleveland, on Monday, Tuesday and Wednesday, December 30 and 31, 1912, and January 1, 1913, in affiliation with the American Association for the Advancement of Science.

The attendance at the meetings was excellent. It included, naturally, more than the usual number of members from the central West.

The sessions, with one exception, were held in the Physics building of Adelbert College. In spite of the fact that this location was several miles from the hotel headquarters, it proved to be very satisfactory. Local plans had been made with unusual foresight, and everything was done that could be done by the hosts of the Association to add to the convenience of the arrangements, and the comfort of the members.

On New Year's Eve, a psychologists' dinner was shared by seventy of the members and their friends. Following the dinner, the Association listened to the address of the President, Professor Edward L. Thorndike, on "Ideo-motor Action." The speaker vigorously attacked the widely current doctrine. He reported the results of a study of American psychologists which showed that although a majority of them hold to the doctrine that an idea of a movement tends to produce the movement it resembles, nevertheless these same psychologists believe that the less the idea resembles a desired

movement, the more efficient it will be in producing it! The doctrine of ideo-motor action was declared to be a lineal descendant of the belief of primitive man in magic, a vestigial survival in scientific thought of an ancient superstition. The animated discussion which this address provoked at the smoker which followed later in the evening, served to dispel any apprehension that American psychologists have lost interest in analytical and theoretical questions, and today care only for the problems of experimental and applied psychology.

It is true that more than three fourths of the forty-one papers read at the meetings were reports of experimental investigations. Of this number eight were in comparative psychology, fifteen in applied psychology, and ten in experimental psychology. In addition there were six papers upon various topics in general and analytical psychology and psychopathology, and three papers upon themes of common interest to psychologists and anthropologists, read at the joint meeting with the American Anthropological Association and Section H. At this session, which was the most largely attended of any, an address was given by Professor Felix Krueger, of Halle, Kaiser Wilhelm Exchange Professor of Psychology at Columbia University; and Professor George Trumbull Ladd delivered the address of the retiring Vice-president of Section H.

The display of new apparatus included a keyboard problem box for studying types of learning in human subjects, and two voice recorders, by Professor Shepard; a simple and convenient graduated brake for electric motor, by Dr. Frost; and new forms of chronoscopes by Dr. Dunlap and Dr. E. E. Jones. Still another new form of measuring association reaction was demonstrated at the Tuesday afternoon meeting by Dr. Brown, of the Physical Laboratory of the University of Iowa.[1] At the Friday afternoon session, a representative of Bausch and Lomb demonstrated a new stereopticon attachment for the projection of monochromatic light, complementary colors, and color mixtures. The display of standard apparatus by the Stoelting Co. was again a prominent feature of the exhibit.

Professor Kirkpatrick had on exhibition a sample of the series of photographs of psychologists which he has prepared. The interest shown in the project was sufficiently keen to warrant him in going forward with the plans.

Ten of the members who had expected to read papers were un-

[1] Brown, F. C., "An Electrical Method of Measuring Small Intervals of Time," *Physical Review*, 34, 452–458.

avoidably detained; but even so, there was no lack of program material. Rather, the program, in spite of arrangements for two simultaneous sessions, proved to be quite compact. An inordinately large number of contributors failed to compress their reports into the time limits they had requested, with the result that all too little time was available for informal discussion. The large audiences, too, tended somewhat to check spontaneous debate. It is evident that the Association will be compelled in the future to choose between some of these alternatives: lengthening the period of meeting to four or five days; cutting down the maximum time limit assigned to papers and holding readers strictly to the period specified; refusing a place on the program to a fraction of the members with reports to present; accepting only those titles which bear on certain specified groups of topics; increasing the number of simultaneous sessions and group meetings; *or*, making no allowance of time whatever for informal discussion.

This last alternative would, without doubt, be most unsatisfactory. The plan of parallel sessions has many advantages and some disadvantages. There will inevitably be those at each meeting who will protest because papers in which they are interested are being read in different meetings at the same time. On the other hand, the audiences will be smaller and more homogeneous, and this will conduce to greater freedom of comment and criticism.

In this connection it may be announced that the newly elected executive committee proposes, in making plans for the next meeting, to use every means in its power to encourage members to prepare their reports in such a manner that they may be presented to the Association without transgressing the usual limits of time. This will involve in many instances the abandonment of any efforts to present orally either elaborate accounts of methods used or detailed statements of results,—details which can in any case be much more easily grasped when they appear in printed form.

Another plan which may be adopted in the effort to encourage free discussion and interchange of ideas is that of holding round tables. Relatively small groups, made up, for example, of psychologists actively engaged in perfecting tests of mental development, or of psychological workers in reformatory institutions, or of investigators of the "imageless thought" problem, may meet to confer at length regarding questions peculiar to their work.

Authors' abstracts of the papers read will be found following the report of the business meeting. In conformity with a vote of the

council at the Washington meeting, no papers were listed to be read by title.

Transactions at the Annual Business Meeting

A brief preliminary business meeting was held on Tuesday at a time when the attendance was at a maximum, to hear the report of the special committee on methods of nomination and election of officers. This report, presented by Professor Aikins, had been formulated in the light of a wide inquiry into the methods of election used by the many learned societies of America. The committee recommended:

I. That those portions of the constitution dealing with the election of officers be suspended for three years.

II. That during that period the President and two members of the Council be nominated by a nominating committee elected at the annual meeting one year before that at which they are expected to report.

III. That this nominating committee consist of three members elected by ballot (without previous nomination) at the annual meeting, the persons receiving the largest number of votes to be declared elected to this nominating committee, the President casting the deciding vote or votes in case of a tie.

IV. That it shall be the duty of the nominating committee to communicate with every member of the Association, asking for nominations or suggestions, before making its nominations to the Association. The nominating committee shall also file with the Secretary a memorandum as to the number of members who send in replies, and other similar data, for the future guidance of the Association.

V. That the Secretary of the Association be nominated by the Council as at present.

VI. That at the end of three years a new committee shall be appointed to consider and report upon the working of the above plan.

The recommendations of the committee were adopted and Professor Angell, Professor Watson and Professor Thorndike were elected to act as a nominating committee for the coming year.

At the regular business meeting, the following officers, nominated by the Council, were elected: *President:* Professor Howard C. Warren, of Princeton. Members of the Council to serve three years (Professors Lindley and Yerkes retiring): Professor J. W. Baird, of Clark University, and Professor Madison Bentley, of the University of

Illinois. Member of the Council to serve one year, filling the vacancy caused by the election of Professor Warren as President: Dr. Shepherd Ivory Franz, of Washington, D. C. Representative on the Council of the A. A. A. S.: Professor Robert M. Ogden, of the University of Tennessee.

On recommendation by the Council, the following persons were elected to membership in the Association: Henry Foster Adams, Ph.D., University of Michigan; Charles Macfie Campbell, M.A., Bloomingdale Hospital, White Plains, New York; Walter Bradford Cannon, Ph.D., Harvard Medical School; Wallace Craig, Ph.D., University of Maine; Ludwig Reinhold Geissler, Ph.D., University of Georgia; William Healy, A.B., M.D., Juvenile Psychopathic Institute of Chicago; Thomas Verner Moore, Ph.D., Catholic University, Washington, D. C.; Jared Sparks Moore, Ph.D., Western Reserve University; Rudolf Pintner, M.A., Ph.D., Toledo University; Albert T. Poffenberger, Jr., Ph.D., Columbia University; B. R. Simpson, Ph.D., Brooklyn Training School for Teachers; Clara Harrison Town, Ph.D., Lincoln State School and Colony, Lincoln, Illinois.

The report of the treasurer was read, as printed below, and accepted.

The Council reported the following statement of policy, formulated after considering the urgent wishes of members who prefer sometimes to meet apart from the large group of societies affiliated with the A. A. A. S.: It is the opinion of the Council that in determining the place of the annual meeting, consideration should be given to the desirability of meeting in alternate years apart from other organizations, or in affiliation with some other small association with kindred interests.

Invitations had been received to meet next year at Yale University, Johns Hopkins University, and also at Atlanta, where the A. A. A. S. and the Southern Society for Philosophy and Psychology are to meet. An invitation had also come from the executive committee of the American Philosophical Association, suggesting a joint meeting. It was voted to hold the next meeting at New Haven, subject to later action by the Council.[1]

Professor Martin brought to the Association an invitation to hold a meeting in California in the summer of 1915. She also outlined a fascinating project for an excursion of psychologists to San Francisco by way of Panama.

[1] The place of meeting of the American Philosophical Association has not been fixed, but it is hoped that it, too, will arrange to meet in New Haven.

Professor Warren presented the following report of the committee on the relations of the Association to American periodicals concerned with psychological research: "During the past year we have discussed several projects for coöperation among the periodicals for the benefit of their contributors and readers. Besides the question of a psychological *Centralblatt*, which was before us last year, we have considered propositions for coöperation in subscriptions, for the better support of scientific publications by scientists, for the regulation of exchanges, and for systematic information of contributors as to requirements and etiquette in offering contributions. We cheerfully recognize the obligations of scientific periodicals to their contributors and readers as represented in this Association. Nevertheless each topic brought forward has revealed considerable divergence of standpoint and interest among the periodicals represented on the committee.

"After two years of friendly discussion we have reached the conclusion that no useful end would be served by continuing this Committee. The present committee has been successful in bringing the magazines together and promoting good feeling among them as never before. We believe that any further coöperation would best be accomplished in a more informal manner, on the initiative of the editors themselves. We therefore ask that this committee be discharged."

The report was accepted and the committee discharged.

The report of the committee on the relations of psychology and medical education outlined the scope of an inquiry it has under way. The Association voted to accept the report, to continue the committee, to continue the appropriation set aside last year for its expenses, and to authorize the publication of the finished report of the committee immediately upon the conclusion of the investigation. The expenditure of $20 to cover the cost of publication was authorized.

The following expenditures were also authorized: A sum not to exceed $25 for expenses incurred by the special committee on methods of nomination, in gathering data for their report; a like sum to cover expenses of the nominating committee for the current year; and a like sum to cover express charges and other expenses which may be incurred in arranging an apparatus exhibit at the next annual meeting.

At the annual meeting in 1911 the following resolution had been introduced by Professor Cattell and, on his motion, referred to the Council for consideration and report: "*Resolved*, that the American Psychological Association regards it as inadvisable for any of its members to accept a position in a summer school in which the rate

of payment per week is less than he receives during the academic year, or to take an extension or similar course for which the payment *pro rata* is less than for his regular work."

Upon recommendation of the Council, the Association, after full discussion, voted unanimously to adopt this resolution, and to instruct the secretary to transmit copies to the directors of summer schools.

The Association also adopted the following resolutions, upon recommendation of the Council: "*Resolved*, that the American Psychological Association lends its support in any efforts which the A. A. A. S. may make to secure action by the United States Government permitting duty-free importation of scientific books in English. *Resolved*, that the secretary be directed to transmit a copy of these resolutions to the Council of the A. A. A. S."

The following resolution, presented by Professor Pierce, was unanimously adopted by a rising vote: "*Resolved*, that the Association extend a very cordial vote of thanks to Professor Aikins for the various courtesies and hospitalities which the members have so thoroughly enjoyed at his hands; and also that there be expressed to the Western Reserve University and especially to Professor Whitman the Association's appreciation of the adequate arrangements and accommodations provided in connection with the place of meeting."

On motion, the meeting adjourned.

Report of the Treasurer for the Year 1912

Dr.

To Balance from previous year	$2,913.87	
Dues received from members	247.40	
Interest from July 1, 1911, to July 1, 1912	97.88	
Receipts from sales of Psychological Monographs No. 51 and No. 53	30.09	
		$3,289.24

Cr.

By Printing and supplies	$ 107.36	
Postage	55.04	
Express and telegrams	7.58	
Reprints of Proceedings	25.44	
Reprints of Symposium on Psychology and Medical Education	12.00	
Clerical and stenographic aid	39.08	
Expenses of the Secretary (1911 meeting)	51.74	
Expenses of apparatus exhibit (1911 meeting)	14.35	
Appropriation for report of Committee on Mental Tests (Woodworth and Wells' Monograph)	50.00	
Expenses of Committee on Teaching Experiments	6.25	
Exchange on checks	.40	
		$ 369.24

Cash on hand	.05
Balance in Fifth Avenue Bank	49.08
Balance in Union Dime Savings Institution	2,870.87
	$2,920.00
	$3,289.24

W. V. BINGHAM,
Treasurer

HANOVER, N. H.,
December 23, 1912.

Audited by the Council

ABSTRACTS OF PAPERS

GENERAL STUDIES

Ideo-Motor Action. Address of the President. EDWARD L. THORNDIKE, Columbia University.

The speaker described the various forms in which the doctrine of ideo-motor action is now held true, and argued against the truth of the doctrine that an idea tends in and of itself to produce the act which it resembles. His argument was, that the facts alleged in support of this doctrine are all better accounted for by the laws of habit, pure and simple; that, experimentally, ideas of acts do not *per se* produce them; and that, in judgments of the potency of particular ideas, even the defenders of the doctrine abandon it. This last point was illustrated from the records of an experiment in measuring the belief of the Association as a group on certain significant issues. It was then shown that the doctrine of ideo-motor action, even in its present most approved forms, is the descendant and h mologue of primitive man's general belief in sympathetic magic—one of the relics of teleological thinking which psychology still cherishes.

(This paper will appear in full in the March number of the PSYCHOLOGICAL REVIEW.)

Behavior as a Psychological Category. JAMES R. ANGELL, University of Chicago.

Consciousness has been attacked from two directions. The philosophers have exhibited its metaphysical limitations while certain psychologists, especially the comparative psychologists, have urged the desirability of substituting for it some term like behavior.

Two main motives are to be noted in the psychological attack. First, the ambition to describe all conscious process in terms of objective behavior. Second, the distrust of introspection and the desire to replace it with other and more reliable scientific methods. Theoretically, it should be possible to state differences of mental conditions in terms of overt behavior. Practically, this is in some instances easy to do, in other instances extremely difficult. The frailties of introspection are real but hardly different in kind from those of other scientific methods — popular prejudice to the contrary notwithstanding. The criticisms of the psychoanalytic school are in part irrelevant, because they tend to confuse introspection as a method affording descriptions of conscious experience, with introspection as a method adequate to *explain* the presence of a given state of consciousness.

The tendency to enlarge objective modes of describing behavior ought to be encouraged inasmuch as it falls in line with the most substantial forms of scientific progress. The tendency to discount introspection, while wholesome in so far as it looks toward the betterment of methodological procedure, is premature, if not unjustifiable, in so far as it proposes to do away wholly with resort to introspection.

Structure versus Function in Psychopathology. E. E. Southard, Massachusetts Psychopathic Hospital.

Demonstration of a Case of Amnesia. H. Austin Aikins, Western Reserve University.

This case, discovered by Dr. Carlyle Pope, was studied in conjunction with Dr. Chas. W. Stone, Dr. J. S. Moore and others. H., present at meeting, is an attractive and gifted boy of 19, who was found unconscious on sidewalk at 2 A.M., November 8, 1912. Coming to 18 hours later, he said he had just been at his mother's funeral. Funeral actually took place sixteen months earlier, and H. had fallen unconscious when about to enter church. Examinations showed hysterical hypæsthesias, unstable emotions, deficient moral discipline and bad early associations.

Hypnoidal visions, easily induced at first and startlingly clear, all proved to come from important scenes in the lost period, though they seemed quite new and inexplicable to patient at the time. Association experiments with Jung's 100 words produced no perceptible fluctuations in galvanometer and very little variation in reaction time. The first 60 reactions in first experiment seemed to

indicate blocked associations (*e. g.*, cold—very, ask—anything, pity—much) and proved later to be highly significant. Subsequent reactions were usually visualizations, some of them at least from the lost period. Other glimpses of the lost period were had in dreams, natural or induced, and in two or three spontaneous day-dreams.

Starting with such clues as these and others supplied by his friends we resorted to hypnotism and gradually pushed towards both ends of the lost period, though it was weeks before we could get him to approach very near to either end of it. Even now in hypnosis H. is practically an alternating personality; he can tell about the lost period if started in it, but gets confused and wakens up if urged to pass either into it or out of it.

H.'s life during this period contained strong conflicting passions and interests, not very well controlled, in spite of an idealized sentimental friendship with another boy. It culminated in a dramatic struggle between friendship and moral indignation and in an open conflict with desperate degenerates that left him terror-stricken, exhausted and probably fainting where he was found.

In H.'s attitude towards mother, father, brothers and sisters Freudians would find a well-worked-out Œdipus complex, and in the image-content of adolescent night terrors attributed at first to a dog bite they would find strikingly significant symbolic substitutions.

H. is gradually getting hold of more and more of the lost period, but only as recollections of scenes in visions, dreams and hypnoses. Many of the events so far revealed are such as one might naturally wish to repress.

[The following note from Professor Aikins was received by the Secretary under date of January 17: "H's memory come back this morning. Last night we cleared away a bad set of buried memories at the beginning of the lost period. The others, you remember, were at the end."]

Demonstration and Design of Apparatus to Simulate the Working of Nervous Discharges. S. Bent Russell, St. Louis.

First is given a theory for the working of nervous discharges and development of nervous channels. It does not consider definite molecular or chemical changes but rather advances "a mechanism of associative memory."

The second topic for discussion is based on the first and is a brief illustrated description of a practical mechanical device which will

represent the essential elements of a nervous system and which will react in the same way. Superficially the likeness of the device to a nervous system is not obvious but there are certain principles of action common to both.

Thirdly is given a demonstration of operations performed by the apparatus simulating inhibition, learning, habit-forming, etc.

The argument shows that a comparatively weak nervous channel may become a comparatively strong one if it be provided with two sensory endings and provided that outside occurrences shall cause the two endings to be excited in succession from time to time. In due course the originally weak channel will prevail over the originally strong channel and will control the muscular response. It is shown that converging channels will account for inhibition and diverging channels for association of ideas. The importance of counter signals or nervous impulses brought about by certain movements is pointed out. A form of satisfaction which is the antithesis of inhibition is explained by the effect of counter signals upon channel development.

The apparatus described is a hydraulic regulating system. The important parts are (1) a transmitter or triple slide valve with a timing attachment; (2) a measuring or balancing device governing a hydraulic cylinder or motor; (3) a system of key rods connected so that each key rod controls one or more transmitters and on the other hand each transmitter is controlled by one or more key rods.

What a Student of Elementary Psychology Should be Taught Concerning the Functions of the Nervous System. G. V. N. DEARBORN, Tufts College Medical School.

By request, the writer ventures the following suggestions as to the aspect of the nervous system essential at first to a student of psychology. *He should be taught:*

(1) Systematically and carefully the enormous *complexity* of the neuro-musculo-glandular mechanism and process, homologous to the indescribably complex mental procedure.

(2) The utter and misleading inadequacy of known central and axial localization to explain the actually experienced certainties of complexity, mental or bodily.

(3) That the sole function of the nervous system is to conduct influences as the means of coördination and integration.

(4) That the nervous system functionally viewed is a fabric, with separate pathways only in an anatomic sense.

(5) That, every moment of the mental process being "will,"

"feeling," and "intelligence" mixed, there is to be sought a more or less closely corresponding breadth in the nervous coördinations.

(6) The unified duality in the nervous system of the vegetative (phylenic, nutritional, habitual, actuating, spino-sympathetic, subconscious) and the personal (ontogenic, new, inhibitory, cortical, conscious).

(7) The hierarchy of nervous circuits (arbitrarily six, for example), each including more or less those beneath or within it, and influencing more or less those above it.

(8) The universality, both in time and space, of the cenesthetic influences coming into the central nervous system from the universally tonic or moving body, these waves of exciting energy constituting the reservoir from which the effective nervous energy is drawn, actuating and inhibitory.

(9) That the greater part of the neural fabric is continually determining and serving the subconscious personality as an unique set of purposes.

(10) That the nature of the nervous energy is still unknown, but that, whatever its variety, it (and not "traces" supposed to be "graven" in the material of the great cortex, 85 per cent. water) constitutes, in the form of *kinetic strains*, the chief immediate "physical basis" of memory, habit, meaning, and the rest.

(11) All possible really known details concerning the structure and the functions of the nervous system, and perhaps much more of the physiology of the receptors and the effectors than the majority of students ever learn.

(12) Psychologic students should be taught that it is better to be reasonably sure of a few of the basal general principles of the action of the neuro-musculo-glandular mechanism than to pretend an understanding in no way to be had from a relatively few isolated and uncertain facts of neural structure.

Left-handedness and Right-handedness in Infancy. MAX MEYER, University of Missouri.

The thesis of this paper is that left-handedness in infancy is a necessary accompaniment, in individual endowment, of right-handedness in adult life. The left-handedness of infancy is commonly enough observed, but it is nevertheless quite generally disbelieved. If a person who in adult life is known beyond doubt to be right-handed is reported by observers of his infancy to have been left-handed, then—so we reason—those observers must necessarily

have been in error, must have been unreliable; or the prevailing activity of the left hand, if accurately observed, must have been due to fortuitous circumstances forcing its use. This reasoning is not justifiable.

Here is an example of this erroneous interpretation. A classical example, it might be called. "In taking her out to her cab," Mrs. Helen Thompson Woolley says in the PSYCHOL. REV., 1910, "the nurse always carried her on the left arm, leaving the child's left hand free, and *as a result, she learned* to wave Bye-Bye with *the left hand.* . . . By fifteen months, she had ceased using the left hand." If our ancestral inheritance could be so easily modified as Mrs. Woolley supposes, what an incentive this would be to enthusiastic educators!

I stated the fact of general left-handedness in infancy in my book on *Human Behavior* in 1911. So far as I know it has never been clearly recognized before. I have also indicated there a possible explanation. If the left cerebral hemisphere, which serves such complex functions as speech, reaches maturity, so to speak, only during the second year, it appears plausible to assume that during the first months of life hand movements are predominantly controlled by the right hemisphere which serves simpler functions and probably matures at an earlier time. General left-handedness in infancy would be the consequence as naturally as general right-handedness in adult life.

If the thesis is true, such attempts as that of Mr. H. C. Stevens (PSYCHOL. REV., 1908) to explain right-handedness by regarding it as determined by an hypothetical superiority of histological equipment of the left halves of the retinæ must fail, unless the histological equipment of the halves of the retinæ is supposed to change places from the first to the second year. The superiority of the sense of sight on the right half of the field of vision, which Mr. Stevens has proved, is not the cause, but rather the effect of right-handedness, unless both are to be regarded as the effects of a common cause.

Families of American Men of Science. J. MCKEEN CATTELL, Columbia University.

Statistics were presented in regard to the families of about a thousand of the leading men of science of the United States. Twelve per cent. are foreign born, 12 per cent. are native born of foreign parents and 7 per cent. have one foreign parent. Forty-three per cent. of the fathers belong to the professional classes, 21 per cent. to the agricultural classes, and 36 per cent. to the manufacturing and

business classes. Clergymen have the best record. The fathers were married at the average age of 26.6 years, they were on the average 35 years old at the time of the birth of their sons, and died at the average age of 70.6 years. Families of the class from which scientific men come had about 3.25 children; married scientific men whose families are complete have on the average 2.2 children. The percentage of deaths of children under five years is for the parents 14.8 and for the scientific men 7.5. The figures show a slight inheritance of fertility and a slight selective death rate against the larger families, but the correlations are very low. Mothers of large families live longer than mothers of small families. Scientific men coming from large or small families and those having relatively large or small families are in rank of about average standing, as are those unmarried. The first-born child has the best chance to become a scientific man. There are many cases in which scientific men are interrelated, and a large percentage of scientific men have relatives of distinction. A large mass of data concerning these and other factors was presented on tables. The discussion of the paper is concerned largely with the causes and effects of decreasing birth rates and death rates and on the extent to which scientific performance is determined by heredity or opportunity.

The Separate Origins of Magic and of Religion. JAMES H. LEUBA, Bryn Mawr College.

Three types of behavior have been developed by man:

1. *The Mechanical Behavior* is the method of dealing with things. It implies a quantitative relation between cause and effect.

2. *The Anthropopathic Behavior* includes (*a*) the common relations of men and animals with each other, and (*b*) those of men with unseen beings. When these beings are gods, we have religion.

The desired results depend upon an agent endowed with intelligence, and feeling.

3. *The Magical or Coercitive Mode of Behavior*, in which neither quantitative nor anthropopathic relations are involved. But magic may be used upon a personal agent. In that case the agent is neither prayed to, nor conciliated by offerings, but coerced.

Most of the varieties of magic may be accounted for by the following principles of explanation:

(*a*) Playful prohibitions. "If you do *this*," say our children, "*that* will happen to you." The "this" and "that" have usually no logical connection. Playful prohibitions may be taken in earnest and acquire a magical significance.

(*b*) Threats of untoward happenings made for the purpose of preserving things vital to the life and prosperity of the tribe.

(*c*) The deliberate treatment of certain situations according to magical principles, for instance, that like produces like. This source of magic is, of course, relatively a late one, since it presupposes that a principle of magical procedure has been disengaged from magical practices.

With regard to the *origin* of science, the author maintains, against Frazer, that the ancestor of science is not the magical but the mechanical behavior. The essential presupposition of science is that definite and constant *quantitative* relations exist. The clear recognition of that proposition means, whenever it appears, the death of magic and the birth of science. This fact indicates the opposition of the magical to the scientific attitude.[1]

Magical and Religious Factors in the Development of the Human Will. FELIX KRUEGER, University of Halle.

Regarding *labor* as a continuous, purposive and organized activity, comparatively independent of accidental stimuli, primitive tribes work or labor far less than we. There are many facts, proving primitive man's *volitional inability* to work.

Under certain "irrational" conditions, and in magical or religious forms, we see him performing extensive and accurately regulated work. He tries to influence the weather, birth, sickness, prepares ritually for war or hunting. Primitive man's waking life is largely filled with dancing, singing and music,—not as mere amusement, but as expressions of emotional tension and as conventional, magically effective procedures. In human development, the beginnings of labor, in the psychological sense, are closely related to magical and religious ceremonies.

These are the first temporally, spatially and qualitatively regulated forms of social activity. The magical and religious performances are believed to be most effective and at the same time very dangerous. Such irrational regulations first teach self-restraint and sacrifice, independence from momentary stimuli—essential conditions to the will's development.

The procedures of the magician or medicine-man represent the first profession, of a single individual. From magico-religious qualities and taboo arise all primitive social privilege and every institution of group or personal property.

[1] See for developments Parts I. and II. of the author's book, *A Psychological Study of Religion; its Origin, Function and Future*, Macmillan, 1912.

All of these irrational relations are of utmost importance for the strengthening and deepening, for the individual as well as the social differentiation and integration of voluntary activity. Originally disconnected magical stirrings organize themselves into social conventions, political institutions and economic practices, into moral and æsthetic feelings, into religious forms of reaction, in the proper sense of this word.[1]

The Study of Man. Vice-presidential address before Section H. GEO. TRUMBULL LADD, New Haven.

The discussion is introduced by reference to the conversation between Socrates and Theætetus as to the meaning of the celebrated maxim of Protagoras: "Man is the measure of all things; of that which is, how it is; and of that which is not, how it is not." The meaning and truth of the maxim can be determined only by the study of the "measurer,"—that is, the study of man. The cordial coöperation of the two sciences of psychology and anthropology—as represented by this section—is indispensable for the successful prosecution of this study. Psychology cannot study the individual man, on his mental as well as on his physical side, without studying him as a member of the race. But anthropology is, in its turn, confessedly dependent upon psychology as one of the most important, if not the most important, of its contributory sciences. From both points of view we see that no doctrine of the relativity of knowledge can be maintained which regards knowledge itself as a process, largely or mainly receptive on a basis of sensations. Instinctive and intuitional elements, emotional factors, and the activity of intellect, according to its constitutional and, so far as we know, unalterable laws, enters into all science, as well as so-called practical knowledge. But having, at least in a preliminary way, determined the meaning and the truth of any of the current doctrines as to the relativity of knowledge, we are ready to see what are some of the more fundamental relations in which psychology and anthropology, as cooperative in the study of man, stand to all the positive sciences. Such relations are, chiefly, these three: (1) The determining, in a general way, the method of science; (2) the fixing of the limitations of science; (3) the setting-forth and defence of the ideals of science. Each of these topics is then made the subject of a brief discussion, and the paper closes with one or two practical remarks as to the

[1] This paper will appear in full in one of the first numbers of the *Arbeiten zur Entwicklunsg-Psychologie*, Leipzig, Engelmann, 1913 ff.

spirit in which the two sciences, in conducting the study of man, should coöperate.

Studies in Experimental Psychology

The Relative Value of the Eye and of the Arm in Spatial Relocalization. H. F. Adams, the University of Michigan.

The purpose of the experiment was to test, if possible, the accuracy of the theory held by Wundt, Dodge, and many others, that the kinæsthetic sensations from the external eye muscles are of no use in giving us awareness of position. If this theory is true, how is it possible to relocate a position more accurately with the eyes than with the arm, for no one denies that the kinæsthetic sensations from the arm muscles are of considerable importance in giving us spatial data.

The fixation throughout lasted 5 seconds. The intervals between fixation and refixation varied from 5 to 30 seconds. During the interfixation period the members were sometimes moving and sometimes stationary.

With the members stationary during the interfixation period of 5 seconds, the average error of the eye and of the arm refixations was about equal, there being but 0.1 degree in favor of the arm. There is, however, a considerable variation between subjects. With the members moving at random during a 5 second interfixation period, the eye is almost twice as accurate as the hand, the average error of the former being 1.206 degrees, and of the latter, 2.086 degrees.

The duration of the interfixation period with the members stationary exerts a considerable influence, much more marked with the hand than with the eye. The same thing is true when the member is moving during the interfixation interval, though the error is much more marked, being in some cases more than double what it is when the member is stationary.

The direction in which the members move also exerts some influence upon the accuracy of the refixation. When the members move freely, the average error is least of all of the refixations after movement. The error after a movement to the right is less than after a movement to the left; and the error after a movement upward is less than after a movement downward.

The error after a movement to a definite mark is greater than an unregulated movement in the same direction.

The error of the eye-hand coördination is greater than either the

hand-hand or the eye-eye coördination, and increases rather regularly with increasing duration of the interfixation pauses. Oddly enough, the eye-hand coördination in indirect vision is less than it is in direct vision. In indirect vision, the error varies directly with the eccentricity of the stimulus.

In general, two sorts of cues are used in the refixations, the first being kinæsthetic, the second, visual imagery of one sort or another.

Studies in Association and Inhibition. JOHN F. SHEPARD, University of Michigan.

Introspection indicates that in the preparation of the subject for the simple reaction experiment both stimulus and action are present together in consciousness and they are parts of a whole. This wholeness consists in the fact that the stimulus or representation of the stimulus tends to arouse the act by association and yet that an incompleteness or variation of the stimulus inhibits the act. We seem to have a form of inhibition here which could not be brought under the concept of drainage or division of energy. No connection or path has been formed which could rival that already "sub-excited" between the representation of the stimulus and the reaction. An attempt was therefore made to investigate the possibility and laws of inhibitions where there is no division of established connections or where the connections established work toward the same end.

Nonsense syllables were used. Associations learned between the syllables were combined in several ways such that the rearousal effects should reinforce each other if association were a mere path of lowered resistance. Instead of reinforcement, inhibitions were found. The results indicate that an association involves other processes besides certain lowered resistances. These processes prevent any other stimulus from using the same neurones at the same time, check the response if there is any variation or incompleteness in the recalling stimulus, and block any other associations that are tending to operate at the same time even though both lead to the same end result. The introspections seem to show that we may identify attention and this association-inhibition process; the unit of attention is not a simple sensory or simple motor process, but is an association process.

Further experiments in association by similarity suggested that the excitation and inhibition sides of association force the distinction of likenesses and differences in the reasoning process.

The Varying Forms of Attention in Tachistoscopic Reading and in the Reaction Experiment. RUDOLF PINTNER, University of Toledo.

The object of the experiments was to investigate the individual differences in the attention process during reading and to compare these with the individual differences in reaction. It was found in the reading experiments that observers could be classified according as they tended to fixate sharply or to allow their attention to fluctuate. Characteristic differences in the manner of reading resulted from these different forms of attention. No hard and fast line can be drawn between fixating and fluctuating readers. Children tend on the whole to belong to the fluctuating class, but even among very young children fixating readers are occasionally found.

In the reaction experiments three types of reactors were distinguished—sensorial, muscular, and natural. A common characteristic of the first two types is that the mean variation of the reaction times is comparatively small, whereas the mean variation of the natural reactor is comparatively large. Represented graphically the first two types show curves with one summit; the natural type shows curves with two or more summits. It was found that the fluctuating reader approximated to the type of natural reactor. The fixating reader on the other hand was either sensorial or muscular in his reaction. This would be explained by the fact that he fixated sharply either the stimulus or the action to be carried out. The fluctuating reader or natural reactor would seem to let his attention wander between the stimulus and the action. The correlation between fluctuating reading and natural reaction and conversely between fixating reading and muscular or sensorial reaction was found to be very high with adults, but not so high with children.

The experiments seemed to show that individual differences in the attention process are fundamental to the character of the individual and that they will show themselves in all psychological processes and influence the response of the individual to any stimulus.

Experimental Criteria for Differentiating Memory and Imagination in Projected Visual Images. R. M. OGDEN, University of Tennessee.

These results are based upon introspective analyses obtained from 6 observers in 250 experiments. They comprise 138 memory images (*M*'s), and 74 images of imagination (*I*'s). The instruction called for the fixation of a circular disk of "granite" paper 2 cm. in diameter, exposed in a card-changer at approximately 30 cm. distance

from the observer's eyes. When the card appeared the observer was to try to get a visual image suggested by a word printed below the disk, and to react as soon as the image became clear and definite.

(1) An attempt to study the eye movements involved, by means of distraction marks placed upon the cards outside the disk, failed to bring results.

(2) The projection of images was found to be a simple task. But one observer reported images (5) located "in his head," and only 22 images were reported without definite location. The principal types of location were: I. Location upon the disk; II. Location in space near the observer; III. Location at a distance. *M*'s tend generally toward Location III., and *I*'s more strongly towards Location I.; although both may be projected in all three locations. This seems to agree with Perky, rather than with Koffka and Martin.

(3) The presence and absence of color did not reveal any marked correlation with either *M*'s or *I*'s.

(4) Feelings were very infrequent; when present they attached to *M*'s.

(5) *M*'s were reported as distinct in a larger proportion of cases than *I*'s, in opposition to Perky's results, and agreeing with Martin.

(6) The images of both categories were more often mediated by an introductory thought, than spontaneous. *M*'s were more often spontaneous than *I*'s, agreeing with Martin.

(7) The above is also attested by a shorter average reaction-time for *M*'s than for *I*'s, which opposes Perky's results.

(8) Associations were not found to be more frequent accompaniments of *M*'s than of *I*'s as Martin and Perky report.

Quantitative Investigation of the Relation between the Anschaulich and Unanschaulich Contents of Consciousness. Lillien J. Martin, Stanford University.

The following experiments grew out of a desire to test certain conclusions drawn from introspections given to protocol during a recent investigation of the projection method and the location of visual images. The experiments fall into two series.

Material and Method.—Simple figures cut from a school drawing-book and mounted on cards. Each card was shown to the *Vp* from 5–20 seconds. He was then asked to draw his visual image, if he had one, (*B*), and to state how it arose. Immediately after completing this drawing (*B*), the *Vp* was asked to draw the figure on the card as he remembered it (*U*). *U* represents then what is regarded

as correct in the corresponding image (*B*) and anything additional that the *Vp* knew in regard to the figure on the card. The *Vp* was questioned as to the presence of other than visual images. The results are given in tables. The tables give the number of divisions in the lines of the cards which had been counted, and their lengths which had been measured in cm. Similar data are given for the *Vpn's* drawings for *B* and *U* for the cards.

Discussion of the Tables.—If we exclude all cases where there were other images than visual the results of the tables show (1) That often *U* is more correct than *B*. (2) That sometimes *U* is as correct as *B*. (3) That for every card and every *Vp* except one, *U* is more correct than *B* at some time. (4) That $B = 0$ 5 times but that *U* does not = 0 at any time. (5) $U > B$ occurs 3 times out of 164.

Discussion of the Drawings.—Plates in which the drawings made for *B* are reproduced furnish still further proof of an unanschaulich memory. One sees (1) That in different individuals *B* may differ greatly where the *U*'s do not differ materially. (2) The same thing is seen in the case of the same individual. (3) In some cases *B* is but a fragment and yet *U* is more complete than in other cases where *B* is a fairly complete image. (4) *B*'s of like completeness but of different spatial arrangement give the same *U*. (5) In two cases the parts of the image as shown on the plate arose successively, and yet it was not supposed by the *Vp* that the parts of the figure on the card had a relation of succession to each other. (6) On the plate are shown irrelevant images, that is, images that were not those of the card. *U*, however, was not affected by *B*. (7) The plate gives a case where an after-image arose and where it was the only image that arose for this card. *U* in this case was approximately correct. (8) Of the correcting power of *U* the plates also give evidence.

Discussion of the Introspections.—The introspections furnish additional proof not alone for the existence of an unanschaulich memory but of the fact that it actually gives rise to the visual image which is so often supposed to be that to which the memory is traceable.

Concerning the Function of a Visual Image in Memory and Imagination.

LILLIEN J. MARTIN, Stanford University.

The relation of the image to the imageless memory of a particular card can be shown by a diagram in which *C* the outer circle includes the content of a particular card to be remembered, *U* the inner circle, the unanschaulich memory of the card and *B* the inmost circle, the image arising in connection with the remembrance of the card. It is

evident from the results of the experiments just discussed that in case of some other cards or some other *Vp*, *U* could = *C* in area, or *B* could = *C* in area or both could = *C* or *U* could include more of *C* (*U* > *B*) than *B* or just as much of *C* (*U* = *B*) as *B* or less of *C* than *B* (*U* < *B*). It would seem from the previous experiments that where *B* contains more of *C* than *U*, *B* could be considered an (1) information bringer; where it contains the same amount of *C* as *U* (2) that it acts as an emphasizer of what is remembered; that where *B* is very fragmentary (3) it acts as an aid to the attention, serving the same purpose as does a fixation point in darkroom experiments; and where *B* came after or grew out of *U*, as the introspections of the experiments just described sometimes show to have been the case, that (4) the arising of *B* was proof to the *Vp* remembering that the assigned task had been fulfilled.

Certain characteristics of *U* support the idea that *B* acts as an attention holder. (1) *U* is in general marked by a certain quickness, vividness, flash-like character. (2) Again *U* has a massive and undifferentiated character. It gives an impression of richness of content. *B*, through offering a fixation point, serves as a speed reducer and delayer of *U*.—Through *B*'s aid *U* is given an opportunity to develop, to become more differentiated.

A series of experiments recently made to obtain further information regarding the effect of questioning the *Vp*, furnishes valuable proof of the function of *B* as, (1) an aid to the attention, and (2) as a proof to the *Vp* that the task set has been completed. The method was to direct the *Vp* to get an image, for example, of a lady in evening dress, and such questions were put to him as, Is the dress yellow, red, etc.? The *Vp* reported the effect of the question upon the image and its background. The introspections show that while *B* was affected in various ways by the questions *U* remained unaltered. It is evident from the results that in discussing the suggestive effect of questioning one must state whether he is referring to the unanschaulich or anschaulich memory.

The Mental Imagery of Two Blind Subjects. Mabel Ruth Fernald, Chicago Normal School.

The mental imagery of two blind subjects (university students) was studied by methods used by the author with normal subjects, with translation from visual to Braille symbols when necessary. The attempt was made to determine (1) whether visual imagery was used, (2) whether tactual imagery appeared, and (3) what differences xisted between the two subjects.

One subject (*A*) has been almost blind from birth and completely so since her seventh year, while the other (*B*) has partial, though very slight, vision—a condition which has existed since her second year. The main differences to be noted, therefore, in general training are: (1) Though both have to depend entirely on touch and tactual symbols for their present reading, *B* learned first by visual symbols and used these slightly until her twelfth year, while *A* never knew any but the tactual symbols. (2) *B* has had a more extensive, though crude, visual acquaintance with objects in general and still depends upon this field of sensory material. Such visual experiences as *A* had before her seventh year were quite inadequate, and she has had none since then.

Non-verbal Imagery.—The results indicate that *B* uses an abundance of visual imagery, as well as auditory, with some olfactory, gustatory, kinæsthetic, etc. Tactual was mentioned only twice. *A* never uses visual imagery spontaneously and is uncertain about the visual suggested in a questionnaire. She is dubious as to whether she ever gets imagery of colors. Tactual and kinæsthetic imagery are plentiful, as well as auditory, temperature and olfactory.

Verbal Imagery.—Both subjects make much use of auditory-vocal-motor imagery. Where these are inadequate *B* uses visual imagery, usually of the Braille forms. Tactual images of the Braille symbols did not appear to be stimulated. On the other hand, *A* showed no use of visual imagery but relied upon tactual-kinæsthetic to make the discrimination when necessary.

So far as these two subjects were concerned, therefore, it appears that a decided positive emphasis on tactual sensory experiences during adult life was not effective in stimulating tactual imagery for the subject who was able to translate these into visual terms, while the subject who had no such resource used tactual imagery with readiness and success.

Consonance and Dissonance. FELIX KRUEGER, University of Halle.

(A summary of this paper will appear in the *Journal of Philosophy, Psychology and Scientific Methods* for February 27, 1913.)

The Place of Stimulation in the Cochlea vs. the Frequency of Vibration as a Direct Determiner of Pitch. JOSEPH PETERSON, University of Utah.

This paper reviews critically various theories of hearing with respect to their bearing upon the specific energy of the cochlear

branch of the auditory nerve. Besides failing to account for certain secondary phenomena of hearing, most of the theories reviewed do not adequately explain such pathological phenomena as tonal islands. Ebbinghaus's modified resonance theory rests upon mutually contradictory assumptions. It is noted that resonance theories do not necessarily assume specific energy of nerves, while on the other hand some non-resonance theories do assume specific energy.

There seems to be a need for a specific energy interpretation. The basic assumptions of the Helmholtzian theory seem to answer the need best. Some of the early objections to Helmholtz's theory have been removed by advance in experimental methods. Of difficulties still in the way of this theory this paper considers (1) its unsatisfactory explanation of intensity relations of combination tones, (2) the easy drowning out or obliteration of a weak high tone by a lower tone, (3) the experiencing by the ear of phase-difference in tones. It has been shown that we can locate tones below a certain pitch largely or entirely on the basis of phase differences of the vibrations in the two ears. Lord Rayleigh regards this fact as sufficient to discredit the whole resonance hypothesis.

This paper attempts theoretically to meet the first objection, and refutes the second on experimental evidence. It has heretofore been shown that a low tone easily obliterates a high weak one when the two vibration-series operate in the same ear through the ossicles, and that it cannot drown out the high tone when the vibration series fall one upon each ear, so that the two cannot operate on the same tympanum. These facts are verified, but this additional point is discovered: when two sounding forks are placed in contact with the skull or the teeth so that both vibration-series, by means of bone conduction, operate together in either ear, the low tone cannot easily obliterate the high weak one. A low-frequency vibration evidently dampens or destroys a more rapid weak one in the transmission through the ossicles. The facts alleged in objection (3) are apparently correct in the main. Reasons are given why these facts are not fatal to the resonance hypothesis. A high degree of resonance is out of the question. Somehow the cortical center seems to register in consciousness any lack of simultaneity in the impulses from the two ears reaching this center.

Foveal Vision as Influenced by Bright Surroundings. Percy W. Cobb and L. R. Geissler, National Electric Lamp Association, Cleveland.

A uniformly bright field 6 × 8 cm. was prepared, trans-illuminated from a second room and observed with one eye at 2 meters' distance. The brightness could be accurately controlled and measured. This was arranged so as to give place for a definite observation period to a test-field (*a*) in which one half was a small and measurable amount brighter or darker than the other half (*b*) in which a system of parallel lines of variable width appeared. The test-field was always equally bright to the blank field and both were constant for any particular set of experiments.

A set of bright surroundings for this field was obtained by observing through a hole in the further side of a box, the face of the observer being held in an opening in the near side. The interior of the box (a 26-sided polyhedron, approaching a spherical shape) was whitened and illuminated in such a way that the whole visual field was filled with a nearly uniformly bright surface.

The following sets of determinations were made by two observers, *G* and *C*: (*a*) with dark surroundings, parallel brightness-difference and visual acuity observations at seven points, the test object varying in brightness from 0.00437 to 68.3 candle-power per square meter. (*b*) with surroundings at 42 c.p. per sq. meter, a similar set at five points in which the test-object varied from 1.51 to 64.3 c.p. per sq. meter.

Results.—A constant individual difference was that toward the lower limit of vision observer *C* uniformly required a greater brightness of test-object for equal distinctness of vision than *G*, namely, from 1.6 to 4.25 times as great under the different sets of conditions.

Two results were noted as due to the bright surroundings: (*a*) The lower limit of vision came about at much higher brightness of test-object in the case of bright surroundings, *i. e.*, these latter were here *unfavorable* to the eye. (*b*) With the highest brightness of test-object the results showed a difference *favorable* to the eye in the case of the bright surroundings.

Experiments on Color Saturation. L. R. Geissler, University of Georgia.

This study was made in the physical laboratory of the National Electric Lamp Association, in Cleveland.

In the first group of experiments a deep red on the inner disc of a Lummer-Brodhun color-mixer was gradually reduced in saturation by adding small amounts of gray of the same tint as the color until it looked just noticeably less saturated than the pure red on the out-

side ring. Then the latter was made equal to the inside, which was then again reduced until it was just different from the outside. This was continued between 360° and 300°, 240° and 220°, and 115° and 105°. The corresponding stimulus differences decreased from 11° at 360° to 4° at 330° and from here remained practically constant. On this experimental basis and by the aid of interpolation the total number of just noticeable differences between the color limen and the maximally saturated pigment-color red was determined to be about 100. For still more saturated colors the number would probably be greater, and conversely.

The purpose of the second group of experiments was to determine the color-limen for red, green, yellow, and blue with a large number and variety of observers and for both eyes as well as for each eye separately. The method was similar to the first. The combined results of binocular and monocular vision for all nine observers showed that the more saturated the original color, the lower or smaller is its visibility limen, that is, of the most saturated color, red, 2.12° + 357.88° gray of equal tint in the inside looked just barely colored as compared with 360° gray on the outside. Expressing the results in percentage, we get for red .60 per cent. ± .24, for blue .82 per cent. ±.36, for yellow 1.60 per cent. ±.58, and for green 1.95 per cent. ±.49. These figures afford us therefore a fairly accurate and simple means of determining the saturation-ratios of different colors, and if a certain color could be agreed upon for a standard, our method could furnish also an absolute measurement of color-saturation. Our experiments are also suited to bring out individual peculiarities, of color-weakness, for example, as the three observers to whom blue looked either equally much or more saturated than red gave also a lower limen for blue. Neither age nor long experience with colors seems to influence the color-limen, but the two women observers gave, if anything, slightly larger values than the seven men. The binocular averages were considerably smaller than the monocular, and the right eye gave lower averages than the left eye. For binocular as well as for monocular vision the order of the colors remained the same.[1]

Keyboard Puzzle Box and Apparatus for Experimental Phonetics. JOHN F. SHEPARD, University of Michigan.

The keyboard is composed of two rows of keys, eighteen in all, arranged similarly to the keys of a typewriter. The door of the

[1] This paper will appear in full in the April number of the *American Journal of Psychology*.

problem box is held shut by a sliding bar which runs lengthwise of the keyboard under the arms of the keys. A series of triangular clips can be set at any desired positions on the bar. The under edges of the key arms are beveled. When one of the clips comes under a key arm, depression of the key will then move the bar one notch. The clips can be so arranged that a certain number of keys pressed in a certain order will open the door.

The apparatus for experimental phonetics consists of several pieces. The first is a speech receiving instrument. In it are two chambers packed with cotton to prevent resonance, and having an opening which fits airtight around the mouth and nose of the subject. The receiving chambers for the mouth and nose are separate. The escape from each chamber is regulated by a graduated opening. The changes of pressure in each chamber are recorded by tambours with tightly stretched rubbers. With constant escape the records are, then, a function of the outflow with speech.

Tubes also run from in front of the mouth and nose out of the chambers to tone recorders. Two new designs of tone recorders are used. One of these forms is an adaptation of the piston recorder. The other records the vibrations of a circular piece of mica placed over a shallow receiving chamber and attached to a ring of rubber around the edge. In both forms a new recording vibrator is used. It is made of two pieces of quill about a millimeter wide, scraped thin, and glued end to end with the cross diameters at right angles to each other. With this arrangement the bending will be confined to the piece fastened in the holder, and the needle will move as a whole and not vibrate in sections.

The larynx movements are recorded by a new laryngograph which fastens to the head and neck and does not rest upon the chest. It also prevents the head from moving with reference to the throat and larynx.

Experimental Studies in Animal Psychology

Some Sensory Factors in the Maze. Stella B. Vincent, University of Chicago.

This paper reports some experimental work on the maze problem in which the method used was the opposite of that employed by Professor Watson in "Kinæsthetic and Organic Sensations," namely, the addition instead of the subtraction of stimuli. In the one group of experiments the true path and the false were made to differ so far

as possible in brightness. In the other group an olfactory trail was laid alternately in the true and false pathways.

The results showed a lessening of initial time and errors and a decrease of total errors. As a whole, though, the final speed and accuracy was less than that found in the normal maze. The learning curves were very different.

The conclusions are that if animals are given two contrasting sensory paths side by side, the one path may prove more dominant and favor speed and accuracy in the early trails prior to any effects of learning. After the problem is learned, in the slow turning over to kinæsthesis, when attention is freed, these sensory factors may still retain their potency in times of momentary distraction. The result is a less perfect automatism and a slower speed.

The Delayed Reaction in Animals and Children. WALTER S. HUNTER, University of Texas.

The reagents used were white rats, dogs, raccoons and children. Associations were set up between getting food (or candy) and a light which might appear in any one of three directive positions. Tests were then made in which the light was turned off before the reagents were permitted to react. During the interval of delay, the subjects were confined in a release box from which all three light boxes could be seen. The interval of delay between turning off the light and releasing the subject was gradually increased until the maximal limit of delay was obtained. In addition data were secured on the method used in solving the problem.

The maximal delays of the various reagents varied as follows: rats, no learning—10 secs.; dogs, 2 secs.–5 mins.; raccoons, 3 secs.–25 secs.; children, 50 secs.–25 mins.

There were no two or three objective stimuli which were presented simultaneously at each trial (such as the three spatial locations of the boxes) that could serve to determine the reactions. Such stimuli could not indicate where the light had been most recently. Differential responses must have alternating and not simultaneous cues.

A series of controls demonstrated that in the absence of the light there was nothing in the external environment that alternated from trial to trial which could serve as a guiding cue for the reactions. It follows from this that in successful responses some representative substitutes for the three positions of the light must be developed from within the subjects' bodies and used.

The rats and dogs solved the problem by maintaining gross motor

attitudes of the whole or part of the body. If this attitude were lost, the reaction failed. The raccoons depended upon such cues for the majority of their reactions; but of those responses made from wrong body orientations, too large a number succeeded to be attributed solely to chance. This and the following reasons force one to attribute to the raccoons the use of some internal cue other than gross motor attitude. (1) Correct reactions might be made in direct opposition to orientation. (2) Different correct reactions might be made from the same orientation. (3) The same correct reactions might be made from different orientations. And (4) wrong reactions often resulted from correct orientations.

The children were never dependent upon gross motor attitudes.

The behavior of the rats and dogs can be stated in terms of habit; but that of the raccoons and children requires the assumption of an ideational function whose content may be regarded either as sensory or as imaginal, depending largely upon the interpreter's psychological prejudices.

Some Reactions of Raccoons to a Temporal Series of Stimuli. F. M. Gregg and C. A. McPheeters, University of Chicago.

Professor Cole, of the University of Oklahoma, in experimenting with raccoons, taught them to discriminate between two series of color cards, each series consisting of three cards, presented to the animal in succession.[1] It was assumed that the animals reacted to all three cards, the first and second being present as memory images and the third actually present when the reaction occurred.

This experiment was repeated and the assumptions tested. First. The animals were taught to discriminate between the two series of color cards, white blue red, and red red red (Professor Cole's series). Second. Controls were employed to discover if there were other factors than color influencing the reactions of the animals, and if so what they were.

Controls.—(1) Cards were shown in the customary order, but were attached to different levers. (2) Cards were shown in various orders, being changed from one lever to another, but the order of the levers remained the same as that which the animal had learned. (3) The positions of the levers were changed, levers were washed, and fresh color cards were used. The cards and levers were presented in the customary order. (4) Entirely different colors were used, but the levers were operated in the customary order. (5) The levers were

[1] *J. Comp. Neurol.*, Vol. XVII., pp. 255 ff.

operated by another person than the one usually operating them. (6) Glass was placed immediately in front of levers and color cards. (7) The levers were operated without any cards attached.

Conclusion.—The animal was not reacting to color but to the position of the levers.

Further tests were made to determine if the animal was reacting to all of the levers or to only a part of them.

Conclusion.—The animal was reacting mainly to the first of the series, was possibly influenced by the second, but not at all by the third.

On Sound Discrimination by Cats. W. T. SHEPHERD, Washington, D. C.

The paper is a report of experiments made on cats, to ascertain their ability to discriminate musical pitch and to discriminate "noise." The tests include: Experiments on (1) discrimination of notes of a difference of two octaves of pitch on a harmonica; (2) discrimination of notes of a difference of one octave of pitch on a harmonica; (3) discrimination of notes of a difference of two octaves of pitch on a piano; (4) discrimination of different intensities in noise.

One individual employed was eighteen months old. It had received previous training only in some experiments on discrimination of articulate sounds, completed nine months previously. The other animal was about four years old. It had received similar training at the same time as the first cat. Both were gray house cats. Both were of medium intelligence.

The experimenter sounded a certain note, or made a noise of a certain intensity (approximate), waited ten seconds for a response, then fed the animal. In conjunction with the "feed" note, or the "feed" noise, other notes were sounded, or a noise of a different intensity was made, whereat the animal was not fed. The cat was to show its discrimination of the pitch of the notes, or of the different intensities of the noises, by reacting in a definite manner to the feed note, such as rearing up and looking through the top of the cage for food to be given it, and by not so reacting to the other notes or to the other noise.

In Experiment 1, the younger animal showed indications of forming the association in the first day's trials. On the second day, or in 45 trials in all, it had perfected the association. The older cat first showed indications of forming the association on the third day. The latter perfected the association the seventh day, in 90 trials in all.

In Experiment 2, the younger animal learned to discriminate a difference of one octave of pitch on a harmonica in two days, or in 30 trials in all.

In Experiment 3, the younger cat formed the association in two days, or in 40 trials.

In Experiment 4, the same cat discriminated noises in two days, or in 40 trials.

The writer concludes that cats are able to discriminate pitch and also noise.

Raccoons, in tests similar to Exp. 1, took 100 and 150 trials. Two *Rhesus* monkeys, in similar tests, required, respectively, 30 and 40 trials to perfect the association.

Experiments upon the Chick's Spectrum. JOHN B. WATSON, Johns Hopkins University.

The chick's spectrum ends in the red region at about $\lambda = 7{,}150$; in the violet, at about $\lambda = 4{,}000$.

The reaction thresholds were taken throughout the spectrum with stimuli of known energy. Thresholds of two human subjects were taken under conditions approximately the same as those maintained for the chicks. The sensitivity curves of the chicks and of the human beings thus obtained are almost identical in form. No justification was found for Hess's statements to the effect that the chick is blind to blue and violet rays.

In carrying out this work, it was found that no single spectrometer system gave monochromatic bands of sufficient purity (freedom from admixture with white light) for making threshold tests. In order to eliminate white light, it was found necessary to pass the band issuing from the selecting slit of the first spectrometer through a second spectrometer (purified spectrum of Helmholtz). The intensity of the light was cut to threshold values by means of the Brodhun sector. With this instrument, the intensity of the light can be changed while the sector is in operation.

The experiment box employed was similar to that devised by Yerkes. It was fitted with automatic signalling devices which enabled the experimenter to obtain records of the time elapsing between the exit from the home box and the right or wrong choice.

The work was done under the auspices of the Marine Biological Laboratory of the Carnegie Institution, under the direction of Dr. Alfred G. Mayer.

Brightness Vision in the English Sparrow. EUPHA FOLEY TUGMAN, University of Indiana.

A Comparative Study of the Intelligence of Normal and Inbred White Rats. GARDNER C. BASSET, Johns Hopkins University.

The Relation of Accuracy and Speed in Practice: a Study in Conscious Attitudes. M. E. HAGGERTY and H. L. SMITH, Indiana University.

The Relative Effects of Maturation and Use on the Development of an Instinct. J. F. SHEPARD and F. S. BREED, University of Michigan.

In a previous study of the pecking instinct of barred Plymouth Rock chicks data were gathered from which a curve of development of the instinct was plotted. This curve represents the improvement in accuracy of the pecking coördination from the second to the twenty-fifth day. With this curve as a standard an attempt was now made to determine the relative amounts contributed by maturation and use to this improvement. Two lots of chicks, divided into five groups, in all twenty-three in number, were tested. By confinement in a dark-room prior to the first tests practice was prevented for a definite time in each group—three, four, or five days from date of hatching. Meanwhile the animals were fed and watered artificially. The most interesting features of the results are (1) the equally poor initial records, and (2) the rapidity with which normal accuracy was attained. Regardless of the duration of the period of confinement, within the limits specified, the chicks began below an efficiency of 18 per cent. and with from one to two days' practice reached normal efficiency. In the first two days of the curves the necessary practice component, it seems, is represented, and in the remainder a record mainly of maturation. This inherited disposition is apparently not comparable throughout to a partially developed habit.

STUDIES IN EDUCATIONAL AND APPLIED PSYCHOLOGY

The Need of a Dual Standard in Testing Handwriting. FRANK N. FREEMAN, University of Chicago.

It is necessary to include in an adequate test of handwriting a measure of speed as well as of quality or legibility, first, because both characteristics are indispensable from the point of view of practical importance. Furthermore, neither alone is an adequate basis for test because their relation is not a constant one, but varies in different ways. This variation is manifested whether we compare different school grades in the same school, the same grade at different times of

the year, different schools, or individuals with one another. In order to determine whether the writing of an individual, a grade, or a school is good, or whether the teaching of a teacher is efficient, it is therefore necessary to measure both the quality and the speed of writing.

Economical Learning. W. H. PYLE, University of Missouri.

The object of this investigation was to determine the proper length of period and the proper distribution of periods in drill or habit-formation. The experiments were begun in February, 1910, and have been continued to the present time; the subjects—at all times as many as eight or ten—were mostly seniors in the University of Missouri, and the practice has been in typewriting, shorthand, memory work and in learning to write in arbitrary characters instead of with the ordinary alphabet. The method was to give the subjects practice for a certain length of time, requiring all to use the same procedure, then the subjects were divided into two groups. One group was then given practice using the same procedure as before, while the other group used the method then being tested. The first or control served to give a measure of ability of the subjects when using the same method. After this method was perfected, the only material used was the arbitrary alphabets which seemed best to serve the purposes of the experiment.

The results, in brief, are as follows: On the whole, 30 minutes seems to be the best length of practice period. In some cases, shorter periods seem a trifle more advantageous, especially in the early stage of practice or habituation. But, generally speaking, one gets ample returns in habituation for practicing up to the point of fatigue, which, in our experiments proves to be 30 or 40 minutes for most subjects. Eighty minutes, the longest period used, proved decidedly disadvantageous, especially in the early stage of habituation. Generally speaking, daily practice seems to give better returns than the same number of periods distributed on alternate days or in twice-a-day periods. However, there is some evidence that in the early stage of habituation, the second practice on the same day gives good returns and that, later on, alternate days may be the best distribution. While practicing twice a day does not give, on the average, as good returns as once a day, if we count the same number of periods, it gives much better returns if we count the number of days, the subjects, of course, having twice as much practice as those working once a day. That is to say, if one does not count the time, it pays to practice twice a day, at least till we gain considerable efficiency.

Reliability and Distribution of Grades. DANIEL STARCH, University of Wisconsin.

Considering grades as a scale of measurement, two problems arise: How small steps are distinguishable and what proportion of persons should ordinarily receive the various grades? The fineness of the scale depends upon the reliability of the assignment of grades. This latter was determined by having two papers in English work graded by 142 teachers of English and one paper in geometry graded by 118 teachers of geometry. The grades of one English paper ranged from 64 to 98 with a probable error of 4.0. The grades of the other ranged from 50 to 98 with a probable error of 4.8. The grades of the geometry paper ranged from 28 to 92 with a probable error of 7.5. To discover whether this wide variation might be due to the difference in standard among the schools, ten freshman English papers were graded by ten instructors of freshman English in the same institution. The mean variation of all these grades was 5.3 which is not materially different from the above variations. In order to eliminate the variation due to differences in standards among individual instructors, all the marks were weighted by the amount that each individual differed from the general average. The mean variation of these weighted grades was 4.2.

In order to compare the accuracy of measurement by means of a mental scale in an entirely different field, five rods ranging from 10 inches to 23 inches were judged in terms of inches by eleven experienced carpenters. The mean variation of these estimates is identical with the variation of the grades, which indicates that the deviation of the marks is not due to the nature of the examination paper but it implies that measurements by means of a mental scale simply cannot be made any more accurately.

The steps on a scale should be at least twice the size of the mean variation or probable error of the measurements in order to be distinguishable steps. Hence the steps on a marking scale should be at least two times 4.2 or approximately 8 points. And hence, on a scale of passing grades of 70 to 100 only four steps can be used with any degree of objective reliability.

Intelligence of 600 Young Children. WILL S. MONROE, State Normal School, Montclair, New Jersey.

Three hundred boys and the same number of girls between the ages of three and six years were tested in matching and naming the six standard colors. In the color perception test, the girls were 8 per

cent. ahead of the boys at the age of 3; 7 per cent. at the age of 4, and 4 per cent. at the age of 6; but at the age of 5 the boys were 2 per cent. ahead of the girls. In the color name test, the girls led the boys at all ages—3 per cent. at the age of 3, 18 per cent. at the age of 4, 4 per cent. at the age of 5, and 13 per cent. at the age of 6.

The same children were given the Binet intelligence tests for the third, fourth, fifth, and sixth years. In the third year tests, the girls led the boys in four out of the five tests; in the fourth year tests, sex differences were very slight; the boys led the girls in all of the fifth year tests, and in the sixth year, the girls led the boys in five of seven tests.

The results of the tests suggest that they are reasonably well placed with regard to the mental ages of children from 3 to 6 years. In the third year tests, the boys made an average of 90 per cent. and the girls 91 per cent. Boys of 4 years passed the fourth year tests with an average of 96 per cent. and girls 95 per cent. The fifth year tests stood for boys 89 per cent. and for girls 87 per cent. In the sixth year tests, six year old boys made an average of 88 per cent. and girls of the same age 90 per cent. Sex differences were less pronounced in the Binet tests than in the color tests.

Three Annual Testings of 400 Feeble-Minded Children and 500 Normal Children. H. H. GODDARD, Vineland Training School, N. J.

The entire population of the Vineland Training School for Mental Defectives has now had three annual testings by the Binet scale. Their mentality as measured by this scale agrees with that which experience has taught us after dealing with them for numbers of years.

Of the 352 last tested, 109 have remained absolutely the same, while 232 or 65.9 per cent. have not varied more than two points in the two years, some losing and some gaining; 22 individuals, that is, 6.25 per cent., have gained more than 5 points, that is, more than one year in two years. These are all the younger cases who perhaps have not yet entirely stopped their mental development and some of them are special cases who have been receiving special treatment, such as pineal gland extract or other treatment; 19 have lost either 3, 4 or 5 points. These are all the older children, averaging in the neighborhood of 27 years of age. These testings were made by different individuals, but always by trained persons. It would seem to be strong evidence for the accuracy of the tests, agreeing as they do at every point with observation and experience with these children.

Public School Cases.—As reported previously, 2,000 public school children, an entire school system, were tested two years ago. One year ago, the children in half of these schools were retested, giving us approximately 800 cases. This year, all those who had been previously tested twice were again tested, giving us three testings on a group of 464 children. The study of the result of these retestings shows that 227 or 49 per cent. of the whole made normal or more than normal progress, that is, an average of 5 points per year, while 219 cases or 47.2 per cent. of the whole made approximately one half of normal progress. Six cases or 1.25 per cent. made no progress, while 12 cases or 2.5 per cent. retrograded one or more points. This is again a remarkable testimony of the reliability of the Binet Scale, especially when we consider that these testings were made by different people, some of whom were not highly trained and the personal equation comes in to affect the results here to a large extent. Nevertheless, a careful analysis of the results, much more than can be presented here, shows that the variations are very largely accounted for by the personal equation and that the scale itself in the hands of a trained person is thoroughly reliable.

A Study of the Personal Equation as Shown in the above Testings.—Unfortunately there is no considerable number of children that were tested by the same individual on the three successive years, but one person, and that a highly trained one, tested 71 children the second and third year. A similar group were twice tested by other examiners. By a comparison of the results by the trained observers and those of less training, we have been able to show very definitely that some of the examiners have been too easy, and others too severe. The distribution curve of these individual examiners brings this out very clearly.

The same thing is repeatedly shown from the study of the records of individual children. Where, for instance, a child was examined a year ago by a person who is known to have been too easy and given too much encouragement in the tests, such a child, tested this year by a person more highly trained, is found to have made only one or two or perhaps no points of improvement, showing that the person a year ago had marked too high. In short the various combinations of examiners of different personal equations almost invariably agree with the progress or otherwise of the individual children when it is taken into account.

Conclusion.—In all cases where a child tests four or more years behind his age, there is little danger of error in considering him

feeble-minded, even though the test was made by a person who was not highly expert, provided such person is able to use the test with reasonable intelligence. With the border-line cases, those who are two or three years backward, the best expert should be employed in the testing.

Other factors, such as progress in school, environment, heredity, or anything that makes the child suspicious or otherwise as to his mentality, should be taken into account. With proper regard to these points, the Binet scale is the most useful means for school-men to understand their children that has ever been devised.

Eighty-two Children Retested by the Binet Tests of Intelligence. CHARLES SCOTT BERRY, University of Michigan.

The subjects were first tested in September and October, 1911, and retested in September and October, 1912. In making the tests the 1911 revision of the Binet scale was used. All the tests were made by the writer and under favorable conditions. Of the eighty-two subjects retested forty-two were school children of Ann Arbor, Michigan, and the rest were defectives from the Michigan Home for Feeble-minded and Epileptic at Lapeer, Michigan.

The school children when retested ranged in physical age from seven to twelve, more than half being either eight or nine. Their total gain as measured by the Binet scale was forty-three years, an average of a year. The average deviation was .26 of a year. The individual gain ranged from .4 of a year to 1.8 years. Sixteen gained less than one year, nine gained exactly one year, and seventeen gained more than one year. In 1911 nineteen tested below age, sixteen at age and seven above age. In 1912 twenty tested below age, thirteen at age, and nine above age. The average gain for those who tested below age in 1911 was .96 of a year, for those at age in 1911 the average gain was 1.02 years, and for those who were above age in 1911 the average gain was 1.17 years.

The forty defectives when retested ranged in physical age from nine to twenty-four, and in mental age from four to eleven years. Their total gain was twenty-one years, an average of a little over .5 of a year. The average deviation was .31 of a year. The individual variation ranged from a loss of .6 of a year to a gain of 1.2 years. Four gained one year or more and three lost ground. The four who gained a year or more were all under fifteen, while the three who lost were all above that age.

These results show: (1) A close correlation with the results of

the original tests. (2) That the average gain of the normal children who tested above age in 1911 was twenty per cent. greater than that of the children who tested below age in 1911. (3) That the average gain for the defectives fifteen and under was fifty per cent. greater than for those above that age, although there were marked individual variations.

A Report of a Series of Tests Administered to 800 Fourteen-year-old Children. HELEN T. WOOLLEY and CHARLOTTE RUST FISCHER, Cincinnati.

The investigation of which this series of tests is a part is planned as a study of working children. The 800 children were tested upon leaving school to go to work. About 500 of these same children have been retested after being at work for a year. The tests are also being given to a corresponding series of children who remain in school. Only the first series of tests with working children is included in this report. The report states for each test the norm, the comparison of the sexes, the comparison of types of school, and the correlation with grade. It is impossible to state norms in a brief summary. With regard to sex the following generalizations can be made. In physical development the girls are superior to the boys in height, weight, and perfection of coördination. The boys are superior to the girls in strength, rapidity of motion, and vital capacity. The girls are somewhat superior to the boys in all of the mental tests at this age. Some of these children had completed the fifth grade, some the sixth, some the seventh, and some the eighth. The tests of physical development show a slight, though fairly consistent, correlation with grade. The tests of mental ability show a very marked correlation with grade.

Psychological Tests Applied to Criminal Women. JEAN WEIDENSALL, State Reformatory, Bedford Hills, New York.

Some Results of Association Tests Among Delinquent Girls. ELMER E. JONES, University of Indiana.

Five series of association tests were given to 210 delinquent girls in the Indiana Girls School for the purpose of determining their educability. Previous tests had revealed the fact that their retardation was not due to defective sense organs, as had been suspected, and it seemed probable that careful tests might show that the deficiency is due to the lack of the proper coördination and association of the sense material. Accordingly, five series of tests were arranged,

each representing a distinct type of association. They are as follows: Controlled association, form board, naming colors, crossing out A's, and rapid naming of words.

These tests were carefully applied to the whole group, with the result that it was possible to make classifications of the subjects which seemed fully as accurate as the results obtained by applying the Binet scale. So satisfactory was this method of determining normals, morons, and feeble-minded, that it was used almost exclusively instead of the Binet scale. It is far more easily applied, because three out of the five tests can be given with equal satisfaction to groups. One can apply such a scale possibly ten times as rapidly as the Binet scale, and it seems with just as good results.

This suggests the use of some such scale in determining such classifications in the public schools. The Binet scale is so slow in application as to practically preclude its use in measuring all children in a large system; for it has been conclusively proven that the regular teacher cannot apply the scale fairly to her own pupils. If the scale is applied it must be done by some one trained for the work, and some one who is a stranger to the pupils tested. At least this is preferable. But if a scale can be developed which can be applied to a whole room or grade at one time, all working under precisely the same conditions and for the same length of time, it seems highly probable that it will meet with immediate success.

The Process of Learning of Delinquent Adolescent Girls as Shown by a Substitution Test. Bird T. Baldwin, Swarthmore College.

This investigation was pursued at the girls' division of the Pennsylvania Reformatory School and is based on a study of forty-one delinquent white girls and fifty-four delinquent negroes, who have been committed by the courts of the State for various offences, including incorrigibility, immorality, dependency, malicious mischief, manslaughter, lewdness, fornication, vicious conduct and vagrancy. The girls are of average standard in height and weight when compared with the Bowditch norms, but have a high percentage of sense defects, hypertrophied tonsils, bad teeth and venereal diseases.

A substitution test, which consists of a transliteration of a portion of Franklin's Autobiography into a wig-wag code comprising two, three or four short marks to the right or left of vertical lines for respective letters, was given for sixteen days to the subjects in five groups. The conditions for limiting the practice to the desired five-minute periods were unusually good because no paper or pencils are permitted except in certain class exercises.

The curves show a wide range of individual differences. Among the white girls the best accomplished, on the average, 111 substitutions for the sixteen practice periods; the least efficient white girl accomplished, on the average, 26 substitutions. The composite learning curve for the group of forty-one white girls is based on 44,179 substitutions, and shows distinct periods of acceleration and retrogression with an increase from 23 for the first trial to 109 for the last trial. The average for all white subjects, including all trials, is 71 substitutions.

The subsequent acquisitions in efficiency are, in the main, a distinction between right and left; the location of the symbols in the code; a knowledge of the numerical equivalents of the letters; a change in reading from letters to syllables, words, phrases or clauses; and in the motor reactions of making symbols. The errors consist primarily in the wrong symbols, and in the omission of letters, syllables or words and occasionally in the repetition of a letter.

The negro girls accomplish less work; they are also less accurate, less easily enthused and are more controlled by moods than the white girls. Fourteen of the negroes were too feeble in mind to learn how to carry out the test, but the other forty, with ten exceptions, were the best negroes in the school. The best negro girl completed, on the average, 91 substitutions and the poorest 32. These forty negro girls accomplished in all 33,488 substitutions. The composite learning curve for the group starts with 22 substitutions and ends with an average of 93. The composite average for all individuals and for all trials is 55 substitutions, which shows the negroes in this test accomplish 77.9 per cent. as much work as the white girls, disregarding errors. The negroes make more than twice as many errors as the white girls.

A Pictorial Completion Test. WILLIAM HEALY, Chicago Juvenile Psychopathic Institute.

The result of our own prolonged clinical experience with following up work on cases leads us to be very skeptical about a snap-shot diagnosis for any given individual despite sharp correlations with general ability for a certain few tests. More good tests are still needed to aid diagnosis in difficult cases. The Ebbinghaus test is unquestionably of great value, but in our work we found it impossible to adopt this test because of language difficulties, *viz.*, inequalities of training in language and the prevalent use of foreign languages.

A pictorial completion test was devised and gradually evolved to its present shape. It is an open air scene with children's various activities depicted by an experienced illustrator for children. This has been lithographed and mounted on scroll-saw wood. Ten groups or activities are represented and from each group activity is cut a piece one inch square containing an object necessary to the meaning of the group activity. Besides these pieces there are 40 other similarly sized squares which have depicted on them other objects or bits of the indifferent background, which when placed in position either make meaningless combinations or else are only vaguely related to the group. The 50 pieces are placed at the side when the test is offered and they represent, as it were, the store of ideas. One space is deliberately shown to the examinee and it is at once ascertained whether or not the meaning of the test is clear. It is a real completion test analogous in many ways to the Ebbinghaus verbal method, and like his test could be readily varied in simplicity or difficulty and adapted to individuals with varied types of experience. To this end other pictures could, with some trouble, be devised.

We have established norms on the basis of several hundred observations where the test was given in connection with a whole series of observations which enabled us to mentally classify the individual. Above the age of 9 years there seems to be very little difference between the performance of individuals who are to be ranged in the same grade of mental ability. It seems fair to state that one or two final errors may be allowed, but these must always be rationally explicable. Below 9 years and for the group which are below what we have designated as fair or ordinary in ability, the type as well as the number of final errors very rapidly changes. There seems to be little sign of correlation of the ability to do this test with the Binet estimate of a 9 year mental age. We have observed this however on other performance tests and this is one of the points which leads us to believe there will have to be ultimately a greater differentiation of mental defectives according to special abilities.

Our findings on the psychoses with this test have been very interesting and very helpful towards diagnosis on account of the peculiar irregularities and irrationalities which some cases of mental aberrancy have shown. Altogether the idea of this test seems to be of distinct worth for mental diagnosis as offering another means for observing the mind in action, as it were, and avoiding the questionnaire method.

Qualitative Standardization of Tests of Mental Ability. CLARA SCHMITT, Chicago Child Study Department.

The results of five of the tests described by Dr. Wm. Healy and Miss Grace Fernald in "Practical Tests for Mental Classification" (PSYCHOL. REV. MON., March, 1911) are here presented. The data were obtained from the application of the tests to 150 normal children.

For the rating of Construction Puzzle B, Test 4, of the above mentioned series the following qualitative standard of performance was adopted: The case was counted as having done the work by the method of trial and error if he made six errors or more in the performance of the test; as having done it by the planned method if he made less than six errors; as having failed if he did not complete the test in 10 minutes. The resulting data are to the effect that more than 50 per cent. of children above the 1st grade do the test in a planned way. The test was then given as a learning test to the children who had failed to do it or had used the trial and error method. In the first case the child was shown how to do it and given as many trials as were necessary to do it without error. One child of the number to whom it was so given required a second learning trial. After the child had learned it the test was given upside down as a test in readjustment. Seventeen did it then with less than 2 errors, 3 with 2 or more errors.

For the Puzzle Box, Test 5, the planned method consisted in doing the test without error after the manipulation of the first step; trial and error method in the making of errors after the manipulation of the first step. More than 50 per cent. of the children in the fifth and sixth grades did the test by the planned method.

Cross Line A, Test 9, was performed at the first trial by 60 per cent. of first grade children, increasing to 100 per cent. with the fifth grade.

Cross Line B, Test 10, was performed at the first trial by 55 per cent. of children in the second grade, increasing to 100 per cent. in the sixth grade.

The Code, Test 11, was given with an additional step involving reasoning ability. Over 50 per cent. of the children from the fourth grade and on were able to accomplish the reasoning step.

Norms of Mental Efficiency. W. H. PYLE, University of Missouri.

The purpose of this study was to determine the most helpful and significant mental tests for use in ascertaining the mental capacity

or development of school children and to establish norms of performance in these tests for children from the ages of eight or nine up to maturity. In determining the value of a mental test, its correlation with other tests and with school standing was used as a criterion. After trying most of the standard mental tests that are at all practicable for use with school children in groups, I decided to use the following: (1) The learning or substitution test, which consists in learning to substitute arbitrary characters for the ordinary digits. (2) Logical Memory test, using *The Marble Statue* as prescribed in Whipple's *Manual*. (3) Rote memory, using a list of abstract words and another list of concrete words, prepared by the writer. (4) The cancellation test, using the "A" test as prepared by Stoelting. The Invention test, which consists in making as many words as possible in a certain time using certain prescribed letters. (6) The Ink-blot test, using the standard blots furnished by Stoelting. This is more valuable as a qualitative test than as a quantitative one. (7) Association tests, using the uncontrolled association test (3 minutes), the genus-species test, the part-wholes test and the opposites test.

It is not practicable in a brief abstract to give the table of norms, but they are to be published shortly. The tests have been given to several thousand children. It is the writer's belief that they constitute a reliable series of tests, easily administered by teachers and principals, easily and accurately graded, and that they give a very reliable indication of the pupil's ability. These tests should be given to all school children in the third grade and above, and the records carefully kept so that the growth of the child can be followed through the grades.

Psychophysiological Tests During a Prolonged Fast. H. S. LANGFELD, Harvard University.

Agostino Levanzin, age 40, a lawyer of Malta, underwent a 31-day fast at the Carnegie Nutrition Laboratory of Boston. The only form of nutrition was 750 c.c. of water daily.

His weight before was 60.6 kg.; after, 47.4 kg. There was a gross drop in metabolism of about 25 per cent., and a drop per pound of about 15 per cent.

The tests were made daily, including two days before and one after the fast, at 5 P.M. There are rather large fluctuations from day to day in most of the curves. Order of procedure and results based on general tendencies of curves are as follows:

1. Rote memory for words (10 words, auditory): Slight improvement.

2. Tapping (30 seconds): Fall midway with recovery to initial level. Fatigue midway. Initial spurt on last few days.

3. Strength test (dynamometer. 10 trials for each hand. Subject left-handed): Slight fall in right hand, considerable fall in left. More frequent initial spurts with right, especially during first twenty days, than with left, and less fatigue.

4. Tactual space threshold (esthesiometer, under side of left forearm. Method of minimal change): Very slight improvement. Av. cir. 6 cm.

5. Immediate memory for digits: No change.

6. Association reaction (20 words, 5 from each of 4 categories): Decrease in reaction time. Av. time cir. 1.6 seconds.

7. Repetition of same 20 words: Errors throughout negligible. Slight decrease in reaction time. Av. cir. 1.1 seconds.

8. A Test (100 A's, 50 each of other letters. Different arrangement daily): Decrease in time. Accuracy high throughout.

9. Visual Acuity: Decided improvement.

10. Memory for 10 words after 55 seconds: Improvement.

General Conclusion.—The prolonged fast brought about improvement in those higher centers involved in discrimination, memory and association. The effect of practice must be considered. There was a loss in muscular reaction.

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PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

SENSATION (GENERAL)

BY PROFESSOR MADISON BENTLEY

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Külpe's *Grundriss* (1893) may fairly be said to have done more than any other single book for the empirical derivation of the mental complexes from the elementary processes. His sections upon Centrally Excited Sensations and Connections of Conscious Elements are classical. Watt (**7**) now proposes, in the spirit of Külpe, to carry still further this empirical derivation. His method of "modalism" is, perhaps, less novel than the name implies. It consists in making diligent search among the sensations and their modes of integration for the grounds of mental experience. The point which Watt especially emphasizes is that causal explanation, rendered in terms of consciousness itself, may go much further than it has already gone by exploiting the attributive characteristics of the simple processes. He attempts, for example, to reduce feeling and recognition to modes of integration, and he suggests that the analysis of the thought processes themselves may, in time, be carried through by the same sort of reference. The article is an effective counterblast to the doctrine of formal elements; although it does not indicate a wide acquaintance with the literature of the *Gestaltqualität*. As regards perceptual, and certain other, complexes, Pillsbury (**4**) looks upon the given sensory materials as inadequate either for description or for explanation. Neither sensation nor movement offers a true account of perception. "Mental life," so he says, "is everywhere concerned not with immediate sensation or image but with things, with real events, and ideas. These things or ideas or concepts are not composed of sensations, but they are results of working hypotheses that

have sprung up spontaneously and have been confirmed by experiences, or have been modified with experience, until they have taken on a form that is adequate to experience." "Things are types, space and time are types, relations are types. All the products of perception that have any meaning are types, are the products of much organized experience brought to bear upon the momentary stimulus, rather than the immediate effect of that stimulus upon the organism." However helpful the concept of the "type" may be to the understanding of the "thing" perceived, it can hardly be expected to take the place of such minute empirical descriptions of perceptual complexes as are to be found, say, in Linke's stroboscopic assimilations, or Krüger's consonances, or Stumpf's fusions.

Paulsen (3) attacks the psychophysical basis of Ziehen's *Erkenntnistheorie*. Sensations regarded as "contents" are already "objective," and they do not therefore form a suitable psychological foundation upon which the cognitive functions are to be developed. Ziehen's idea (*Vorstellung*) suffers from the same kind of error when considered as a psychological datum: it differs from sensation not in its positive character but in its lack of vividness or, at most, in its independence from stimulus. Stimulus itself Ziehen uses without warrant, for it takes him behind the datum of experience, *i. e.*, sensation, to an object which is already the product of cognition. Paulsen would regard consciousness not as contents, not as "ein Schauplatz, auf dem willkürlich zugefällig Empfindungen auftreten, sich vereinigen und nach ihrem Verschwinden Vorstellungen zurücklassen"; but as the "unit of functional performances." Paulsen's discrimination of contents and consciousness strongly suggests Brentano's distinction between "Inhalt" and "Akt." A different interpretation of the reference of mind to the object is suggested by Nunn (2), who asserts in the name of "realism" that sensation carries with it "a guarantee of the extra-mentality of its content." Nunn's discussion, which turns chiefly upon the physical existence of secondary qualities, uses the term "sensation" not in the current psychological sense, but in the sense common to British philosophers. Nunn's defense of realism leads Schiller (2) to object that the *validity* of perceptual knowledge is guaranteed rather by the pragmatic method of test and selection than by the mere announcement of the object's existence.

Useful alike to psychophysics and to analytical psychology is Reimer's (5) critical and historical study of the concept of intensity in its psychological application. Reimer reviews the vicissitudes suffered by the doctrine of magnitude since Herbart gave it a place

in psychology, and after considering the numerous attempts to reduce intensity to some lower category, he arrives at the comforting conclusion that the attributive use of intensity has held its own against all criticism.

Sanford (6) sketches "the functions of the several senses in the general mental economy," concluding that "from touch we get the world of space and material reality, and force acting upon us; also, from motor touch, energy, active efficiency and freedom; from vision we get space and the world of things; from hearing we get our symbolic machinery of thought; from the general and organic senses, our most intimate intuitions of ourselves and the basis of our emotions."

Continuing his studies in sensory inhibition, Jacobson (1) discovers that odors generally suffer (for two out of his three observers) in intensity when attention is strongly concentrated upon an inhibiting sound stimulus; but that the inhibition is probably due to accessory, adducent processes rather than immediately to the sound itself.

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VISION—GENERAL PHENOMENA

BY PROFESSOR EDWIN B. HOLT

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In his excellent study of visual acuity and illumination Rice (30) finds that white light yields the highest acuity, red (and probably yellow) is but little inferior, green is much inferior, and blue is still somewhat below green. With "daylight acuity" taken as the standard unit, three-quarters acuity is yielded by an illuminating intensity of 8 to 10 meter-candles; "with a reduction of intensity below this point the acuity decreases rapidly, and with an increase of intensity beyond this point the acuity rises very slowly, unit acuity being attained with an intensity of from 40 to 50 meter-candles . . . after unit acuity is attained, further increase of intensity shows practically no gain in acuity." A very strong case is made out for the merits of flicker photometry for all heterochromatic comparisons. It appears that in the flicker method of comparing brightnesses no Purkinje phenomenon is encountered; and that with exception "of prolonged exposure to red, the fatiguing of the eye by any color did not produce any change in the luminosity sense" for that color! If this is true it speaks strongly in favor of Langfeld's contention that there are two kinds of brightness-judgement, and implies that the flicker method calls only one of these into play.

Now Zahn (33) discovers that the brightness-distribution of spectral colors *on the fovea* (as obtained by finding at what intensity, under light-adaptation, a very brief stimulation of 1/500 sec. ceases to show color) is virtually identical with the distribution as measured by von Kries's "periphery-values" (light-adaptation and "totally color-blind periphery" of retina), and with the distribution as measured by Siebeck's "minimal field brightnesses" (light-adaptation and *very* small paracentral field). The flicker method gives the same distribution (30). This kind of brightness may be due to cone-vision: while the other kind of brightness (which gives the Purkinje phenomenon, except on the fovea) may be due to rod-vision. (Zahn calls his brightnesses, gotten by the method described above, "minimal time brightnesses.") Furthermore the Zahn-von Kries-Siebeck-flicker brightness distribution agrees closely with the distribution as

found by Frauenhofer and König using direct color comparisons ("specific judgments of brightness") (33). Zahn agrees with von Kries "that the physiological substratum of eccentric colorless vision is also present on the fovea, while here the basis for color determinations is *added*."

Nevertheless Rice inclines to refer the "luminosity sense" to the rods, and the form and color sense to the cones (30, p. 50). It may be *inferred* from Rice's work that the diminished acuity found for low intensities (except for the very lowest) is as much due to the *added* functioning of the non-form-perceiving rods, interfering with cone discriminations, as to any reduced functioning of the cones. Klein (22) would ascribe the poor form discrimination of the rods to the diffuse reflection of light from rod to rod when, as in dark-adaptation, they are no longer isolated from one another by the pigment-cells. But Klein is driven to assume that the idio-retinal light diffuses itself in a similar way! Cobb (9) treats of other impairments to visual acuity by means of light diffused through the eye. But he says: "There is no parallelism between the depression of vision for detail on the one hand, and discomfort and other visual disturbances classed under the head of 'glare' on the other hand, resulting from light source in the field of vision." As against von Kries's duplicity theory Sivén (32) renews his contention that the monochromatic spectrum is not gray but bluish, that santonin (yellow) vision does not affect the fovea, etc. The rods are therefore not color-blind: they mediate the perception of the short-waved colors. Rice finds them specially *sensitive* to short-waved light, yielding, however, only colorless sensations, while Edridge-Green (15) declares himself to "know of no fact pointing to the view that the rods are percipient elements." (He also finds it easy to observe the Purkinje phenomenon on the fovea.) Henri and Larguier des Bancels (20) present a valuable compilation of research data on threshold luminous energies (for various color sensations, on various parts of the retina, for different exposure times, etc.) and on the rôle of the visual purple. Ferree and Rand (17 and 18) promise work in which the sensitivity of the retina, area of the color-zones, etc., are to be measured in *energy units*.

The same authors (16) renew the discussion of colored after-images from stimuli in which no color is perceived. They find two methods for getting such after-images: (1) by presenting the (colored) stimulus while the eye (at first light-adapted) has not yet had time to become adapted to the reduced intensity at which this stimulus is

illuminated. Stimulus is then removed and the colored after-image develops while the eye becomes more and more dark-adapted; (2) by using a preëxposure of black (of same size as the ensuing colored stimulus), this giving a brightness after-image which fuses with the now presented colored stimulus and reduces its saturation (*i. e.*, makes it appear colorless). The after-image of this is now projected on a black screen, and is found to be complementarily colored. By this second method a colored after-image from a (red, yellow, green, or blue) stimulus in which no color was sensed is obtained in 100 per cent. of the cases. "The technique of getting a colored after-image from a stimulus in which no color is sensed becomes merely a matter of fusing the least favorable brightness quality with the stimulus color and the most favorable with the after-image color." Simultaneous contrast color was also got from red, yellow, and dark orange at an illumination sufficiently reduced to obliterate the color in the inducing stimulus. Method 1 (above) greatly facilitates this, for "color induction is greatly enhanced while the retinal change corresponding to dark-adaptation is going on." This compares interestingly with what Dunlap (11) calls the "Mach phenomenon." Ferree and Rand further believe that the "Purkinje-Brücke" phenomenon is a case of colored after-image from a previously unsensed color-contrast effect. The authors lay stress on Purkinje's observations as to the way in which changes in brightness affect the saturation of colors. Day (10), in a paper partly undertaken as a response to Ferree and Rand, finds no satisfactory evidence to confirm their results. The reviewer finds the work of Ferree and Rand more convincing than that of Day. Lohmann (24) studies a phenomenon opposite to that used by Ferree and Rand in their method (above), *i. e.*, he studies the decreasing difference-threshold for brightness as the eye, at first dark-adapted, adjusts itself to a brighter illumination. This difference-threshold settles to its lowest (and steady) point in about 12 seconds: while the threshold of sensation continues to improve for 60 to 80 minutes according to the intensity of illumination to which the eye is becoming adapted.

Rand's paper (29) is on simultaneous contrast which she calls "induction." She finds that "induction" depends (in positive sense) on the differences between the brightnesses of the adjoining fields, increases with distance from the fovea, and (within the limits experimented on) with decrease of illumination. The reviewer does not think that the author's general statement is justified, viz., that a white field adds more black to a patch of color seen on it, than a

black field adds white to a similar patch of color; nor does the reviewer see how "induction" was prevented from affecting the surface which was employed to measure this very "induction." Brückner and Kirsch (5) find that the time-threshold of color perception increases with the brightness of a gray stimulus (of same size and position as the colored stimulus) which both precedes and succeeds the colored stimulus. The gray that succeeds modifies the time-threshold more than the gray which precedes the colored stimulus. Weber's law appears to hold of the difference-threshold between the gray and the colored stimulus. This paper seems to contain good quantitative work which ought to be available for comparison with subsequent researches, but which will probably not be available, owing partly to a perverse setting of the problem, and partly to the lack of standard units and conditions under which psychology so greatly suffers. In a subsequent paper (6) the same authors find that electrical stimulation of the eyeball gives (on both opening and closing the current) light flashes in three locations, according to the strength of the current—at the periphery, the center, and the blind spot. The threshold of this electrical stimulation, on the center and the blind-spot, is about twice as high for the light-adapted as for the dark-adapted eye (contra G. E. Müller, Nagel, Cords). But this can be shown only when the two eyes of one person are severally light- and dark-adapted simultaneously. Then the difference is more marked for supraliminal than for liminal stimuli. The authors believe that this heightened electrical sensitivity in dark-adaptation depends on conditions in the "central parts of the visual tract" rather than in the eye itself. Magnusson and Stevens (27) have an interesting paper on visual sensations due to stimulation by a magnetic field: the appearance is a narrow horizontal band of light moving up or down in the visual field. The papers of Edridge-Green (12, 13, 14, 15) and Hartridge (19) are brief, idiosyncratic, and unimportant.

Basler (1) finds that two successive visual stimuli may be recognized as distinct when a continued succession of the same stimuli at the same rate appears fused. In order to produce complete fusion the dark interval between the stimuli must be in the latter case about one third of what it is in the former case. Basler has found the same phenomenon in the sense of touch. The phenomenon whereby of two simultaneous visual stimuli, one central and one peripheral, the former generally appears in consciousness earlier than the latter is ordinarily referred to the attention ("prior entry"). Dunlap (11) finds that it can be excluded by careful fixation of the

eyes, and concludes that the illusion is due to eye-movement or a nascent innervation thereto. Using pairs of slightly unequal luminous lines which are to be judged as to their relative length, Lorentz (26) studies the number of such judgments that can be made when the material is exposed 135 σ. The threshold of difference is about twice as high for two pairs as for one pair. When more pairs are presented for judgment, it is not so much this threshold of difference (which is based on "equality" and "uncertainty" judgments) that increases, as rather the *measure of precision* that decreases. This latter decreases in geometrical progression as the "distribution of attention" (number of pairs to be judged—up to 4 pairs) increases in arithmetical progression. Where the material to be judged is heterogeneous (a pair of dots to be judged as to relative position, a row of dots to be judged as to their number, etc.) the measure of precision is improved. Thus the *Bewusstseinsumfang* is greater for heterogeneous than for homogeneous material. Baumann (2) studies the phenomenon (attributed to Fechner) of discs with black and white concentric patterns, which when slowly rotated show circular bands of color. The author gives this rule for the colors: "dark violet and blue tones when dark replaces light," *i. e.*, where black succeeds white, "brownish red and red tones when light replaces dark." Less *eindrucksvolle* (?) conditions "suffice to produce yellow and green." Rollett (31) interestingly describes an illusion of a flowing motion (like "falling snowflakes") across a pattern of closely-ruled parallel (or also reticulated) light and dark lines.[1] The flowing can be seen on a larger area of the visual field than that occupied by the inducing pattern. Rollett offers an ingenious (and to the reviewer not unplausible) theory of local cross-currents on the retina which equalize the (parallel lines of) different electrical potentials produced by the stimulating pattern. This is in harmony with the optical (electrical) resonance theory presented by Castelli (8), who says that "the dimensions of the retinal pigment granules of the frog are of the same order of magnitude as the wave-lengths of monochromatic rays comprised in the visible part of the solar spectrum . . . they vibrate at various periods according to their sizes." Carr (7) describes a case of after-image of a human eye (which the experimenter had been steadily fixating under special illumination) which after-image, of almost hallucinatory distinctness, was seen several times to *wink* (as the actual eye had of course done during the observation). Lohmann

[1]This is the same phenomenon as "the illusory dust-drift" described by A. H. Pierce in *Science*, 1900, 12, 208–211.

(25) concludes from some phenomena connected with a case of flicker-scotoma (*migraine ophthalmique*) and with colored audition, that color mixture and color contrast "are not necessarily solely dependent on processes in the peripheral visual apparatus." But Bourland (4) believes that *migraine ophthalmique* is almost always associated with hysteria: in that case it would be hazardous to draw conclusions regarding the field of sensation from any peculiarities of the scotoma. Kahn (21) describes an ingenious means of looking at one's own two eyes combined in a single image. The corneal and lens reflections are seen in this image in stereoscopic relief, and it is conceivable that this will be a very accurate means for studying the accommodation of the lens. Another means to this same end may be found in the fluctuations of chromatic aberration as mentioned by Rice (30, p. 37). Bocci (3) believes that the circular (Müller's) fibers of the ciliary muscle contract for near accommodation; and that the radial fibers (Brücke's) also actively contract for distant accommodation. The latter muscle at the same time stretches the choroid coat and the retina itself. Kugel (23) believes that persons suffering from anisometropia and from strabismus see predominantly if not solely with one eye—that one which gives the clearer vision. Anisometropes should not wear glasses attempting to correct the vision of the *weaker* eye, for the images given by it can never be like those of the other eye, and thus the more definite the former are made by the aid of glasses, the more painful will be the retinal rivalry that is set up. Munsell (28) presents a valuable scheme for the classification and designation of hues, shades, and chromas; with a notice of some carefully prepared standard color-charts which are now obtainable of Wadsworth, Howland and Co., Boston, Mass.

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VISION—PERIPHERAL AND FOVEAL

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The literature covered in this report is pretty evenly divided between medical and psychological interests.

Pick (7) discusses a disturbance of the macula which occurs in cases of myopia. It had been mentioned first by Foerster, later by Wecker, and was described at length by Fuchs. Pick confirms in general Fuchs's diagnosis and adds some details with regard to prognosis, cause of disease, etc. A brief summary of Fuchs's description is as follows. In some cases of myopia a black spot appears in the macula which is different and distinct from the customary macula alterations. The abnormality begins with a very sudden visual disturbance: visual metamorphosis, shrinkage of objects, undulating contours, positive scotomata, etc. In the beginning there is a small central scotoma which later increases in area until reading is rendered impossible. Objective examination shows a black spot, circular in form, sharply outlined, and reddish in the middle which later increases in size and brightness, and results in atrophy. Fuchs concludes that the blood vessel layer of the retina is the seat of the abnormality. This layer of the retina in the region affected becomes calloused and opaque. Hemorrhage, which other writers have considered to be the cause of the disturbance, is neither its cause nor an invariable accompaniment.

Pick adds to Fuchs's discussion the following data. (1) The seat of the disease in the beginning is not located in the fovea but directly above it. Frequently in increasing in size the black spot spreads to the fovea; more often, however, it spreads on either side, forming an open half-ring under the fovea. (2) Hemorrhages are frequently observed but not in every case. They do not seem to affect the course of the disease. (3) Using the eyes increases the abnormality; resting the eyes lessens it. (4) The disease generally occurs during middle life. The younger the patient, the better are his chances for recovery. (5) The degree of myopia has a great influence both upon the presence of the disease and the extent of the disturbance. The lower the degree of the myopia the more favorable is the prognosis. (6) The prognosis is not always so unfavorable as Fuchs found. The central and the paracentral scotomata always remain, but they often continue to be so small that close work can be done and small type be read.

Childs (1) makes an appeal for the inclusion of mapping the visual field as a part of the routine procedure in ocular examinations. This feature has very little value in diagnosis unless the norm of the patient is known. This ideal cannot be hoped to be attained in case of all people, but it can at least be attained for those who come into the hands of the oculist or the medical inspector. He emphasized the fact that the norm for the individual must be had to serve as the basis of comparison. A norm based on an average for a large number of cases will not serve this purpose.

Williams (10) describes a quick method for testing for reversal of the limits of sensitivity for red and blue in cases of intracranial pressure on the optic nerve. As a diagnostic this reversal of limits may indicate intracranial tumor, hemorrhage, nephritis, diabetes, etc.

In cases of hemianopsia it is frequently reported that the visual field bulges in the macular region, *i. e.*, instead of ending sharply at the vertical meridian passing through the center of the macula, the sensitivity of the macula beyond this meridian is retained over all or part of its area. The phenomenon, however, is in some dispute. Henning-Rönne (5) investigates 27 cases and finds the phenomenon in each case. He reviews the explanations that have been given of the phenomenon and advances one of his own. He believes that the macula shows sensitivity in these cases merely because it is normally more sensitive than the extramacular region. That is, while the disturbance is sufficient to render the extramacular region insensitive, it has not been great enough to destroy the sensitivity of the macula.

Rönne (9) discusses the relation between peripheral visual acuity and color sensitivity in certain cases of atrophy of the optic nerve and points out the usefulness of this relation for purposes of diagnosis. The report of his work may be divided into three parts. (1) He determines the relative acuity of seeing at different points in the peripheral retina. (2) He discusses the results of his work on acuity in its relation to hemianopsia. (3) He investigates the relation of color sensitivity to visual acuity in cases of atrophy of the optic nerve, and compares this relation to that found in the normal eye.

Van der Hoeve (6) took measurements of the size and position of the blind spot for 100 emmetropic eyes. The average position of the center of the blind spot in the eyes examined was 15° 33′ 47″ to the nasal side of the fovea, and 1° 40′ 41″ below the fovea. The

average horizontal diameter of the blind spot was 5° 42′ 55″; the average vertical diameter, 7° 26′. These values reduced to linear terms correspond very well with the measurements of the papilla of the optic nerve made by Müller, Charpentier, Schwalbe, Techot, Koster, Druault, Volke, and Kölliker. Around the blind spot a zone $\frac{1}{8}°$–$\frac{3}{4}°$ wide was found which was relatively blind to white; and surrounding this a zone $\frac{1}{8}°$–$\frac{3}{4}°$ wide relatively blind to color. In this latter zone the colors were not always seen as grays but were sometimes seen as a different color tone. For example, red was seen as rose, and blue as green or violet. The transition of tone, however, was not regular, as was found by Ovio.

Polimanti (8) describes an observation dealing with the sensitivity of the fovea at low illumination. Arago has said that stars seen in indirect vision fade away as their images are brought to the fovea. Von Kries observes with a dark-adapted eye at twilight small blue and white spots on a black ground. These spots are seen clearly so long as no one of them is fixated. When one is fixated, it becomes hazy and indistinct. The phenomenon becomes more marked in increase of dark-adaptation. Polimanti repeats Von Kries's observation by moonlight and gets similar results. He believes with Von Kries that the cause of the phenomenon is the difference of the sensitivity of the rods and cones at low illumination. The presence of the rods with their visual purple accounts for the sensitivity of the peripheral retina and their absence in the fovea for its insensitivity.

Dittler and Koike (2) attempt to get an estimate of the increase of sensitivity of the retina to colorless light with dark-adaptation and to compare the rate of increase for the fovea and the extra-foveal regions of the retina. Hering's method of double images was employed by them in this work. The procedure was as follows. The observer sat in a room well-lighted by daylight for 10 minutes. A dark bandage was then placed over one eye for a length of time depending upon the degree of adaptation wanted in the experiment. The subject then entered a dark cabinet in one wall of which was a small opening to admit the stimulus light. This light came from a white screen behind the opening lighted by a 100 c.p. Nernst lamp. The light from the Nernst was first passed through a blue-green filter to render it whiter. A fixation-point was taken so that an image of the stimulus fell on the fovea of the dark-adapted eye, and on a point slightly displaced from the fovea on the light-adapted eye. Conclusions as to the relative rate of adaptation in the light- and

dark-adapted eye were drawn from a comparison of the brightness of these images. It is obvious that the right to draw these conclusions rests on the assumption that when both eyes are equally light-adapted, the image falling on the fovea of one eye will be equal in brightness to the image slightly displaced from the fovea in the other eye. This is a pretty broad assumption, but Dittler and Koike claim to have found it to be true in previous experiments. Three lines of investigation were undertaken. (1) The shortest period of adaptation that will increase the sensitivity of the eye to the stimulus was determined. This was found to be 10–12 seconds. (2) An attempt was made to get a method of measuring in terms of the intensity of the stimulus how much the eye had increased in sensitivity as a result of the different periods of adaptation. This was done by cutting off the light from the more sensitive eye in known amounts by means of smoked glass until the two images were of the same brightness. It was found that after 5 minutes of adaptation, the light had to be cut down for the dark-adapted eye to $\frac{1}{5}$–$\frac{1}{6}$ of its original intensity; and after 30 minutes of adaptation to $\frac{1}{14}$–$\frac{1}{20}$ of its original intensity. (3) A few experiments were conducted to compare the rate of increase of sensitivity of the central and peripheral retina. As far as the work was carried, it was found that in dark-adapting the retina increases faster in sensitivity progressively from center to periphery.

Dreher (3) gives a preliminary report of a method for determining what colors are invariable in tone either in passing from the center to the periphery of the retina or from low to high intensities. Some work is described and a discussion is made of the results obtained in terms of G. E. Müller's color theory in its revised form. The method is based on the assumption that if a light appears to be of longer wave-length in the center than it does in the periphery of the field of vision, a light of shorter wave-length placed in the periphery will match the central light. If, Dreher argues, in one region of the spectrum the central light is matched by a light of shorter wave-length placed in the periphery and in another region the central light is matched by a light of longer wave-length, there will be a light between these, intermediate in color tone, which should be seen the same in tone in both center and periphery. He purposes to determine what this intermediate light will be indirectly by means of a coördinate system, rather than directly by means of experiment. For a full description of this method one must consult the original. The following results were obtained.

In the series for the determination of colors invariable in tone for center and periphery of the retina, only one point in the peripheral retina was used, namely, a point in the nasal meridian 14° from the fovea. In determining by his method the colors which should be invariable in tone for both the center and this point, only one color was found. This occurred near the D line at λ 588.3. In the intensity series, only three degrees of intensity were used. The results of the method showed that three different wave-lengths should give colors invariable in tone for these three intensities. These wave-lengths varied slightly for different observers, and were in the region of the yellow-green, the green-blue, and the red-blue. For one observer, for example, they were at λ 566.6, λ 483.2, and λ 460.2. The important features of this article are the description of apparatus and the method of working.

As the culmination of a series of studies the object of which has been to standardize the investigation of the color sensitivity of the retina, Ferree and Rand (4) have undertaken to determine the retina's sensitivity to colored light in terms of radiometric units. Having completed their work of standardizing the factors extraneous to the source of light, they are now trying to secure better control of the source. Standardization of the source, so far, can be considered successful only with regard to the quality of the light. No adequate work has been done upon the standardization of the quantity of light. They believe this can be done only by means of energy determinations.[1] Moreover, energy determinations are not

[1] To standardize first of all requires a method of measuring. No other method is adequate for measuring the intensity of colored light. The photometric method, for example, can not be used directly for this purpose for two reasons. (*a*) Direct radiometric measurements of energy show that the relative values of the colors of the spectrum, as determined by the two methods, do not at all coincide. The photometric curve, for example, of the spectra of all light-sources of normal intensity is highest in the yellow-green and lowest in the red and blue. The radiometric curve of the visible spectrum of sunlight of the same intensity is, on the other hand, according to Langley, highest in the red near the C line and lowest in the violet; while the radiometric curves of most of the artificial sources of light, such as the Nernst, tungsten, and arc lights, are highest in the extreme red and lowest in the violet. (*b*) The relative photometric values of the colors of all spectra differ widely for different intensities of the same light-source. For medium intensities, for example, the curve is highest in the yellow-green and lowest in the blue. But as the intensity is decreased, the curve levels, while its maximum shifts to the green and its minimum to the red. In short, the photometric value of a color is not a constant but a variable function of its intensity. It is obvious, then, (*a*) that the photometric method can not be used to estimate the relative intensities of the colors of the spectrum even for a single intensity of light-source unless for each part of the spectrum considered a factor be determined

only needed to standardize the stimulus, but they are also needed that we may be able to express the sensitivity of the retina to the different colors in terms of units that can be compared. At present, we have no direct estimate of the comparative sensitivity of the retina to the different colors further than is expressed, for example, by the relative width of the collimator-slit that has to be used to arouse color sensation when a source of light of a given candle-power is used. This kind of comparison is obviously unfair because such different amounts of energy are represented from point to point in the spectrum that a given width of s it would admit many times the amount of energy at one part of the spectrum that it would at another. In short, no adequate estimation and expression of the retina's sensitivity to color, comparative or absolute, can be made by the methods now in common use.

In a preliminary note, Ferree and Rand outline the kinds of problem that demand the direct objective standardization and show that there is a need for the control and regulation of the stimulus in terms of a common objective unit of measurement, even in problems in which it is desired to make the intensity of the lights proportional to the sensitivity of the eye.

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VISION—COLOR DEFECTS

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Color tests have again received considerable attention in England. The committee of the Board of Trade appointed in 1910 to enquire into the efficiency of the tests in use, print an extensive report (22) accompanied by minutes of evidence and records of experiments upon color-blind subjects. The committee finds "no evidence showing conclusively that defective vision has caused any appreciable number of accidents at sea"; but to provide against the possibility of danger in the future, the committee recommends certain modifications in the wool test, the addition of a lantern test, and the use of Abney's luminosity test with spectral apparatus in case of appeal.

Two memoranda of importance are published with the minutes of evidence. Burch (2) criticizes the official tests and suggests that if proper red, white and green signal-lights were used on ships, only the red-blind need be excluded from service, the other types (the green, blue and violet blind, after Young) being able to distinguish such lights. Burch describes a new form of apparatus for the display of lights, by means of which the conditions at sea may be closely simulated, and explains his method of testing color deficiency by fatiguing the eye with spectral lights. Rivers (23) calls attention to the recent German work upon minor color defects, and the prevalence of acquired color-blindness, and suggests that, since there are without doubt large numbers of valuable men in the service[1] whose color vision is below normal and who are nevertheless able to distinguish certain colors, the wise course to pursue would be to determine by extensive experiments just what the color discrimination of such persons is, and then to adopt, and standardize, by international agreement, lights which they can distinguish. Upon the information at present available, Rivers concludes that "cases of total color-

[1] According to the table printed in the minutes of evidence, page 140, during the years 1894–1909 only .8 per cent. of the candidates were rejected because of color defects.

blindness and of diminution of the luminosity of red lights (6, p. 460) are obvious sources of danger"; but that since the partially color-blind, and persons showing minor color-defects are able to distinguish red from white by its saturation, and blue from red or white by a fundamental difference in hue, danger of confusion in the discrimination of signals may be avoided by the alteration of the present green signal-light to a blue-green, especially if, as is commonly believed, color-defectives often show higher powers of color discrimination than the normal individual.[2]

Many persons interested in color tests have made minor contributions. Edridge-Green (4) refers to a series of cases in which color-blindness has caused dangerous situations at sea, and (5) describes his new spectral apparatus for showing one color at a time; Pryn (21) compares the color tests used in the navy with those recommended by the Board of Trade; Butler (3) emphasizes the need of annual tests to detect the rise of acquired color-blindness, four cases of which came to him within a month, and recommends the use of a good lantern test; Taylor (24) claims to have noted peculiarities in the face and voice of color-blind persons, peculiarities which sometimes plainly indicate the color defect before any tests have been made. "A color-blind person's face is devoid of warmth and humor; it is dull, still and monotonous in the sameness of its expression." Gray (9) suggests that color-blindness and a tendency to melancholia are both manifestations of the same fundamental condition of the neural material of the brain,—a condition analogous to high conductivity for nervous currents.

Nagel (19) gives a detailed description of the various methods of investigating the color sense with simple and complex apparatus, adding suggestions for the diagnosis of the different types of color-defect. By a series of experiments upon von Brücke, a protanope, von Brücke and Inouye (1) construct a curve showing the distribution of red and green values throughout the spectrum, making their calculations upon the basis of a series of equations, in which changing amounts of colors from different sides of the neutral zone are made to match a constant amount of neutral green. Zeeman (26) describes a relatively simple and inexpensive spectral apparatus suited for study, demonstration and clinical work, by means of which spectral colors may be shown singly or in any desired combination, and the

[2] Lieberman and Marx found a protanope clearly inferior to a normal subject in distinguishing differences in color quality, throughout the whole series of spectral lights. *Zsch. f. Sinnesphysiol.*, 1911, 45, 103–108.

wave-length, intensity and saturation of the colors used may be accurately measured. Zeeman's assistant, Weve, reports upon the use of this apparatus with normal and color-defective subjects. Weve concludes that, while slight variations in the proportion of red and green in the Rayleigh equation are likely to occur with normal persons, great variations indicate anomalous trichromatism—protanomalous when the proportion of green falls below 35 per cent. of the red, deuteranomalous when the proportion of green rises above 90 per cent. of the red. Dichromates accept the normal Rayleigh equation, and also such wide variations from it that either the red or the green may be accepted as equal to the yellow. Guttmann (12) reviews his earlier work upon the anomalies of the color sense, and demonstrates a method of experimentation designed to prove that the heightened sensitiveness to contrast found in anomalous trichromatism is due to changes in the eye itself, and is not the result of changes in the cortex. Edridge-Green (6, 7) describes his spectrometer for determining the number of monochromatic patches distinguishable by normal persons and color defectives, and reports the results of experiments. Normal individuals *name* only 6 distinct colors, but are able to *distinguish* 18 monochromatic patches; exceptionally gifted persons find from 22–29 patches; persons of slightly defective color sense find from 8–10 patches; the typically color-blind from 2–7. In his Hunterian Lectures (8) Edridge-Green outlines his theory of color-vision and the evolution of the color-sense, discusses the facts of color-blindness in the light of his theory, and makes recommendations for efficient color-tests, giving cuts and descriptions of his lantern and spectrometer.

Gertz (10) reviews the contradictory evidence for and against the existence of a central scotoma in total color-blindness, suggests a method of deciding the question by asking each subject to count series of equidistant dots, and (11) reports experiments upon a new case of total color-blindness,—a girl of 16, who shows photophobia, nystagmus, typical color-confusions, the Purkinje phenomenon and low visual acuity. Juler (16) reports upon 3 totally color-blind children in a sibship of 7, all three showing low visual acuity, photophobia and nystagmus. As all three children are very young, and show nystagmus, Juler was unable to determine whether there was any contraction of the field of vision, or a central scotoma. In spite of extended inquiry, the author failed to learn of any other cases in the ancestry of the children.

Nettleship (20) reports three pedigrees of red-green blindness,

which may have considerable importance for the discussion of the way in which this defect is inherited: (*a*) A pedigree showing color-blindness in both sexes and also a digital deformity; (*b*) a pedigree showing color-blindness in the younger only, of a pair of twin girls whose 4 brothers and 1 sister are all normal; (*c*) a pedigree showing color-blindness in the younger only, of a pair of twin girls whose only brother and 2 of whose 3 sisters are also color-blind; and (*d*) a pedigree showing color-blindness in 2 sisters and all their sons. Usher (25) reports an extensive pedigree extending over 7 generations, in which 22 males are believed, or known, to have been color-blind. No color-blind females were discovered and Bateson's assumption that color-blindness is a sex-limited character dominant in males and recessive in females is probably sufficient to explain all the facts known about the pedigree. The reviewer has tested 8 of the 11 living color-blind males in Usher's pedigree and finds evidence that in the fifth generation there was intermarriage between a deuteranopic and a protanopic stock,—a deuteranopic man married a normal woman carrying protanopia, which she transmitted to both her sons, while the man's deuteranopia was passed on by his normal daughters to all their sons. This would indicate that the two generally accepted types of partial color-blindness do not mix, but that each passes on in the sex-limited way suggested by Bateson.

Von Kries (18) gives a general survey of the facts of normal and abnormal color vision, with a discussion of the theoretical explanations of the facts. Jerchel (15) discusses the practical significance of red-green blindness for the individual affected: the possibility of æsthetic enjoyment of color, the probability of lowered efficiency in painting, on ships and trains, in the army, in the study of botany and chemistry, and in the various branches of medical specialty, basing the latter part of his article upon his own experience,—the author himself being a red-green blind physician. Hilbert (13) passes in review the various conditions under which sensations of color arise, and vainly tries to establish a dividing line between the physiological and the pathological. Clearly physiological are the color sensations aroused in the normal eye by ether waves of various lengths, certain of the color sensations aroused by the activity of the visual apparatus itself—contrast colors, negative after-images, etc.—and color effects due to the imperfection of the refractive media of the eye—chromatic aberration, astigmatism, cloudiness of the media and artificial coloring of the cornea. Clearly pathological are the color sensations experienced in acquired color-blindness due to functional or structural defects of the retina, the optic tract or the cortex,—in

color scotoma, in changes in the color fields and in the temporary color-blindness experienced in hypnosis, hysteria, epilepsy, and after severe wounds on the head, or following stimulation with a dazzling light. In the long list of color sensations which may be classed as either physiological or pathological, Hilbert includes color sensations arising from mechanical, thermal, electrical or chemical stimulation of the visual apparatus, a considerable group of sensations arising through the activity of the visual apparatus itself: the colored patterns seen against closed lids by Purkinje, König, Hilbert and others, under conditions which do not seem adequate to explain the phenomena; the color sensations aroused by toxic agents; the non-complementary negative after-images reported by Aubert and Hilbert; and the color sensations experienced in congenital color-blindness. In (14) Hilbert reports 6 rare cases of colored vision accompanying pathological conditions: yellow vision with chorioretinitis albuminurica, during pregnancy; brown, yellow, red and green vision with chorioretinitis of unknown origin; yellow vision from mushroom poisoning; green vision after an overdose of santonin; a violet outline around all objects for about 3 minutes upon awakening from rest after strenuous and long-continued work; and the persistence for several days of 2 oval green specks about as large as peas, appearing on the outside of the visual field of the right eye. Köllner (17) gives a detailed study of the kinds and causes of acquired color-blindness, and shows how this knowledge may be of great clinical value in the diagnosis of disease. Blue-yellow blindness occurs with diseases of the retina, especially those in which there is an exuding process. Acquired red-green blindness indicates some much graver disorder and may be a sign of reduced functioning at any point along the optic tract from the retina to the cortex. It is not an isolated color-disturbance, but a middle stage between normal vision and total color-blindness, and is generally accompanied by loss of visual acuity and lowered sensitiveness to light. The location of the disorder must be determined by the defects in the visual field—central scotoma, bilateral color-hemianopsia, etc. Acquired total color-blindness has much less diagnostic value, since it may arise in many ways—as a final stage of red-green blindness, as a result of the combination of some form of congenital color-blindness with an acquired defect, as a result of loss of color-memories, etc. Chromatopsia (colored vision), on the other hand, has considerable diagnostic value, since particular colors are ordinarily seen with particular disorders.

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HEARING

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In 1908 Liebermann and Révész reported certain anomalous results obtained from a study of the paracusis suffered by the first-named investigator (6). They found, in brief, that pseudo-tones which appeared in the region above e^2, were apparently corrected when any two tones, one or both of which were pseudo-tones, were sounded together. This phenomenon was termed "orthosymphony." The investigations were made with the harmonium, organ, piano, and tuning-forks. The pseudo-tones, when tested alone, were found to be constant for fairly long intervals of objective pitch. For instance, c^3–b^3 all sounded as g^3. During orthosymphony it was found that the beats were normal, and that, upon analysis, the subject could again detect the pseudo-quality of the tone or tones corrected. In the moment of analysis it was not found that the fusion effect of the interval under investigation was in any way altered. It was therefore concluded that the orthosymphonic effect must be independent of the cochlear resonators assumed by Helmholtz. Tests were also made with another paracustic subject which, while not so convincing as those with subject L., were still sufficient to demonstrate the phenomenon. Orthosymphony was obtained with the octave, but not so well with the other intervals, and it was concluded that the observer tended to base his judgments upon an analysis of the components.

Investigations made a year later (7) indicated some exceptions to the results of the preceding report. Intervals were found for subject L. in which orthosymphony was not produced. The pathological conditions of the subject had changed. In April, 1911, the paracusis was in a chronic state, without becoming noticeably worse. Experiments were begun again, and it was found that part of the pseudo-tones gave normal accords with all other tones, while with others it depended upon the interval used. Tests were made with pure tones, which demonstrated by the persistence of the phenomenon that it was not due to an illusion occasioned by the presence of overtones.

The authors now reject the assumption of the earlier paper that the pseudo-tone appears normal in the accord, and an explanation for the phenomenon is sought in the differentiation of the pitch-attribute into two factors: *pitch*, properly speaking, as referring to the relative highness or lowness in the tonal manifold, and *quality*, or that factor which enables us to establish resemblances and differences in the tones of the scale. Applying this differentiation, it was found that the paracusis affects quality, but not pitch. This important conclusion was tested by a variety of experiments. By simultaneous presentation the subject was able to select a tone in the paracustic region in octave relationship with a tone normally heard as accurately as the normal ear hears. Furthermore, investigations with special instruction indicated that judgments of interval, when made with reference to quality, were passive and naïve; when made with reference to pitch, they required time and consideration. Naïve judgments of quality were best in the lower range of pseudo-tones; for pitch, however, they were better in the higher range, because in the lower range, where the falsification was less, the difference between pitch and quality was not so evident as in the higher ranges. A third evidence appears in the fact that while judgments of interval were often false, judgments of *distance* between tones approached correctness, the subject often noting that the pitch distance did not coincide with the qualitative interval.

In a third paper (8) the authors have recorded a peculiar phenomenon in the lower range of L.'s unfalsified tones. In was found that the successive tones C_1–C often gave the effect of the fourth, C_1 being taken for g. This phenomenon also persisted after overtones had been eliminated. The effect was not constant, as in the case of the pseudo-tones of the higher region, but appeared rather as an extremely labile variation, always dependent upon a comparative tone, and held by the authors to be of central origin. Again it was found that the pitch remained constant, while only the quality suffered alteration. When C_1 was taken for g, and then the objective G_1 was sounded, the latter was often judged normally, and not identified with the falsified C_1. Sometimes C_1, appearing as g, changed again to c, and the subject noted that the pitch was not thereby altered. Distance judgments, as made in the previous experiments, also substantiated this distinction between pitch and quality.

These papers are a striking example of the assistance which pathological cases may render to the analyses of normal psychology.

Weld (15) has made an interesting contribution to the study of musical enjoyment by his analyses of the introspective results obtained from eight musical observers who listened to instrumental selections played on a phonograph. An effort was also made to correlate these results with plethysmographic and pneumographic records which were simultaneously procured. No positive correlations were obtained, however, which had direct bearing upon the distinctly musical character of the observer's attitude, save in a specially instructed series where breathing was correlated with musical phrasing.

The introspective results are described under six headings: visual imagery, auditory imagery, motor reactions (actual or imagined), reactions to descriptive music, emotions and moods, and individual differences. The striking thing about visual imagery was the special manner in which it was related to the music in the case of three of his observers. This imagery was entirely involuntary, being determined by the musical "movements" which it invariably followed. "We are convinced," he adds, "that the traditional laws of association are powerless to explain the visual imagery which our introspections have revealed." Auditory imagery was less frequent. It was detected in the reports of half the observers, but conspicuously only in one case. Here it seemed to serve as a sort of anticipatory means of criticism, this observer being the most erudite, in a musical sense, of those engaged in the work. In this connection the statement is made that it does not seem "necessary to show that the auditor who possesses a profusion of auditory imagery will *ipso facto* be better qualified not only to detect the recurrence of *motifs*, but also to appreciate the composer's modifications and exploitations of his original *motifs*." While realizing that in perception and recognition the image is not indispensable, the author apparently adheres to the belief that in difficult and non-mechanized recognitions some relevant imagery, in this case either auditory or a surrogate, must be present. Bodily movements, actual or imagined, were reported by all save one observer, and that one invariably reported visual images which were themselves full of movement. This finding is made the central feature of the results. It is regarded as the subjective basis for the sense of rhythm, which, however, is distinguishable from the sense of *Takt*, the latter being often absent. When present it is added to the sense of rhythm. Whenever the musical movement becomes objectified some corresponding movement takes place in the body of the listener, and it is suggested that eye movements may serve largely in this respect.

An interesting section is given over to the introspective reports of a piece of descriptive music, which seem to demonstrate the impossibility of arousing anything like a definite idea of the setting intended, except, occasionally, by the introduction of imitative sounds. Either pleasantness or indifference was found to be the rule with reference to the feeling side of the experiences. Instead of experiencing displeasure, the hearer merely lost interest when pleasure was not aroused. A sense of movement was also noted which may be described under Wundt's category of excitement-repose. The frequency and independence of feelings referable to this dimension lead the author to believe that it is a justifiable addition to the categories of feeling. The detailed study of individual differences which follows we need not here recapitulate.

In his conclusion, the author states that he has "endeavored to include every important item which seemed to have significance for the appreciation and enjoyment of music," and expresses the surprise of both himself and his co-workers "at the invariable presence and apparent functional significance of their kinesthetic experiences, both sensational and imaginal. . . ."

Interesting and suggestive as these results are, one may not impertinently raise the question: How far has the author actually succeeded in contributing to the psychology of musical enjoyment? It is evident that he stands squarely upon the sensationalistic basis, and therefore considers his task achieved when he has analyzed the sensations and feelings which his auditors experienced. But there is another way of looking at these matters, and to one who does not regard sensation as the *alpha* and *omega* of psychology, the transferal of stress from audition to kinesthesis indicates but a shift of interest from the unanalyzed data of audition to certain concomitants which may, it is true, be universal accompaniments of the musical experience. One looks in vain for any reference to what Stumpf has called "musical thought." Intellectual attitudes are regarded entirely as critical in their nature, thus becoming contributory rather than realizing factors in the appreciation. To be sure, one could not expect analyses of musical thought after periods of listening which lasted from 3½ to 4½ minutes. But one may properly object to the identification of musical enjoyment with such gross expressive contents as come to light in these analyses. It is also noteworthy that the involuntary movements recorded by pulse, volume and breathing showed no correlation with the experience, and there was no objective control for the kinesthetic effects which the introspections revealed.

Now, it is not a matter of indifference whether these latter effects were actual or imagined. If they were actual, it might have been possible to register them. As the author mentions, many theorists have assumed certain correlations with involuntary movements such as he was unable to detect. It may be the same with movements of the voluntary muscles. If these kinesthetic effects should, in fact, prove to be but crude approximations of the delicate movements of the music, a much more detailed introspective study would appear to be desirable before any significant correlation between these movements and their imaginal counterparts could be said to have been established.

Auerbach's *Grundlagen der Musik* (1) is intended primarily for popular consumption. It embodies a series of eleven lectures delivered at the University of Jena, and treats of the principles of music from a purely physical point of view. Although, for the psychologist, such a setting is distinctly incomplete, he will nevertheless find here, in concise form, a clear presentation of the main facts which physics is able to adduce concerning the various kinds of sound vibration in the various media which produce and conduct them. Of especial interest is the treatment of the musical instruments and their physical properties. Objection may be raised to the treatment of combination tones as entirely objective. The possibility that these tones may be produced in the ear is briefly dismissed with the statement that "an der objektiven Existenz der Kombinationstöne ist nicht mehr zu rütteln."

As might be expected, the theories of Helmholtz with reference to hearing and harmony are upheld. In the former instance, no other conception is mentioned. In the latter case, a paragraph is devoted to the theory of Oettingen, and a brief destructive criticism is accorded the views of Stumpf. The Helmholtz explanation of harmony by recourse to the presence or absence of beats is held to be the only theory which is scientifically based. All psychological theories are rejected because they are said to depend upon gratuitous assumptions concerning unknown brain states. As for metaphysical theories, they are, in the nature of the case, both indisputable and undemonstrable. In treating the problem of tonality, however, the author innocently reveals the insufficiency of any purely physical theory to account fully for the facts, since, in explaining melody, he is forced to refer to the action of memory, and assume "psychic beats" to explain the agreeable and disagreeable impression from related and unrelated tones in succession. Again he finds it necessary to

make a tacit reference to "epistemology" in justifying the statement that "melody is but temporarily distributed harmony," since he admits that historically melody has the priority.

Stumpf's interesting volume on the beginnings of music (14) has already been treated in this journal with a special review.[1]

Guttmann, in a brief and rather general paper (4) on the investigation of the voice, urges the need for greater understanding of the real problems of singing,—physiological, psychological and historical,—on the part of investigators. He substantiates his contention by reference (1) to the artificial results which are obtained under the ordinary conditions of medical examination; (2) the inadequacy of recording instruments; and (3) the lack of control and proper analysis when a singer tests his own voice. Certain technical problems are discussed, such as that of "throwing" the voice at a distance, and the question of a singer's "register." The paper concludes with some interesting suggestions regarding false intonations with various intervals. In particular it is noted on experimental evidence that trained singers falsify the fifth more often than the third. This the author thinks may be due to the fact that the fifth is regarded in present-day musical practice as "empty" and unsatisfactory, whereas, he fancies that a singer of the Middle Ages would have found no such difficulty attaching to the then more favored interval. It is also stated that false intonations are likely to appear in those regions of the scale where the singer must pass from one "register," or muscular setting, to another.

Three articles may be mentioned which bear upon the conductivity of sound in the head. Zimmermann's experiments with microphone and a "prepared" ear (17) contradict v. Eicken's results concerning the importance attaching to the bones of the ear. He found that the sound goes directly through the skull bones, especially the *promontorium*, to the fibers of the end-organ. Wolff (16), testing the results of Struyken, who concluded that the highest monochord tones could be heard better through the skull bones than *via* the ear, finds this to be true for deaf, but not certainly so for normal, ears. With tones of lower range he found that normal ears hear equally well by bone or air conduction; the deaf, however, better *via* the air. He concludes that this distinction must have its basis in the function of the middle-ear apparatus. Nikiforowsky (12) criticizes the methods of studying conductivity by means of the observer's judgments. These results tend to show that the bones of the skull

[1] Cf. this journal, 1912, 9, 200–203.

conduct better than the softer parts, but they are vitiated by the fact that one judges on the basis of the duration of the tones heard, which depends upon individual acuity of hearing and attention. The present investigation measures the sound with a microphone especially constructed for the purpose and very perfectly isolated in a lead receptacle. There were three series of experiments. The first studied the effects of sounds produced by the subject speaking the vowels with chest tones and in falsetto. With the former (ordinary speech) the sound flows in greater part through the natural openings of mouth and nose. The softer parts of the face were found to conduct better than the rigid parts of the skull, the amount coming from the skull being less than 1/10 the amount coming from the ears and softer parts. With falsetto tones the same general condition prevailed. The second series studied sounds produced by a tuning-fork applied to the center of the skull. Opposite results were obtained. From the rigid parts, especially the ears, the sound flows with greater energy than from the softer parts. The third series was intended to study the flow of energy when the sound stimulus was at a distance, but the conditions were unfavorable, owing to insufficient energy of the sound, and the results were not significant.

A comparison between the availability of the Galton whistle and the Schulze monochord for determining the upper limit of hearing, made by Helmholz (5), substantiates, with 100 normal subjects, Schulze's result that the limit is approximately 20,000 v.d. The author was able to control the Galton whistle by means of a water-drum bellows of constant pressure, and thus obtained from it approximate uniformity with the monochord results. At about c^7 the whistle was the better instrument, but with the monochord the upper tones were more constant and allowed the limit to be set more definitely.

Marage makes an interesting contribution to the study of the sounds of consonants (9). The consonant is defined as a supralaryngeal noise which precedes or follows the intermittent aerolaryngeal vibration which one calls a vowel. Speech consists of two sorts of vibrations, periodic, and non-periodic. Photographic records of the consonants revealed two classes of tracings: (1) two-part tracings, in which the mouth and nose intervene to give the nasal sounds, and (2) one-part tracings, which are formed in the mouth. Duration was found to be less important in consonants than in vowels, analysis showing that vowels continue 10–20 times longer than consonants. One may understand from this why, at the beginning of hypoacusis, certain parts of a word are heard less well than

others. In otitis sclerosis the hearing of vowels is retained best because of their longer duration. Two practical applications are made of these results. First, the importance of teaching vowels and consonants together, which means a great saving in time for the pupil. Second, that in order to avoid the sudden parting of the vocal chords (*coup de glotte*) experienced by singers in beginning an exercise on a vowel, it is only necessary to add an explosive consonant to the vowel in order to reduce the explosion materially.

The same author contributes to our knowledge of deaf-mutes (10). The results which he has obtained in curing the deaf with the vowel-siren, lead him to attack the usual methods of classifying the deaf on the basis of hearing for noises, tones and words. It is possible for a deaf-mute to hear noises very well, but not tones or words. That the degree of deafness is not so important is illustrated by the citation of three cases. The first had passed for half-deaf, the second for almost completely deaf, and the third for absolutely deaf. Yet after treatment the last named case was able to hear and understand phrases at one meter distance. The second case was able to make similar progress in less time than the third, being younger, but the first case proved refractory, as the tests showed "gaps" in his hearing. One should therefore classify with reference to the form of acuity. If gaps in the hearing occur, the siren treatment will prove unavailing as a means of training the acuity. Even in favorable cases where the acuity is markedly increased, it often requires much time and patience to secure comprehension for the sounds heard.

Marx reports certain results from the destruction of the cochlea in guinea-pigs (11). The animals were first tested by Urbantschitsch's closed-pipes and the Preyer ear reflex, then the cochleas were destroyed. In many the ear reflex remained for high tones, although the destruction was afterwards found to have taken place more or less completely in all parts of the cochlea. It was never found that the reflex was lost for high tones, and retained for low tones, which, the author concludes, is no support for the Helmholtz theory.

The following two contributions from the field of physics are of some interest to psychologists. Stewart's paper (13) is based upon certain mathematical considerations in extension of Lord Rayleigh's work on the intensity of sound at different distances when the source is located upon a rigid sphere. Passing over the applications to architectural construction, the author makes some interesting deductions with regard to the apparent intensity of sound from a source at a distance, as dependent upon the position of the head. The conclu-

sions are: (1) that the apparent intensity is always greatest when the head is turned with an ear towards the source; (2) the variation of the apparent intensity with the position of the head is more marked the nearer the source to the hearer; (3) with decreasing wave-length the maximum value of apparent intensity occurs with greater sharpness; (4) the maximum variation of apparent intensity is least with lowest tones; (5) the maximum variation of apparent intensity does not increase without limit, for at wave-length 30 cm. it has already begun to decrease. Brown reports some experimental results of an attempt to secure an accurate picture of a sound wave from a vibrating flame (3). This is known to be difficult, owing to the complicated action of the flame. The plan of the investigation consisted in vibrating a flame with sound waves of known form, and modifying the conditions until the wave form was obtained. By the method of a soot-tracing the author was able to detect in his records a thread of soot, apparently coming from the center of the flame, which exhibited the only longitudinal vibration of the flame, and nearly approximated a sine curve. With photographic records of the flame he discovered that the lower luminous edge seemed to be exceedingly sharp, and to vibrate with considerable amplitude. Records of this part of the flame were found to agree very well with those obtained by the soot-tracing, which indicates that with more refined methods an accurate record of the sound wave may be obtained.

New apparatus for acoustical experiments is reported by Bentley, Boring and Ruckmich (2). Comments upon these instruments have already appeared in the BULLETIN.[1]

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[1] Cf. this journal, 1913, **10**, 32–33.

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TASTE AND SMELL

BY PROFESSOR E. A. McC. GAMBLE
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For the years 1911 and 1912 the writer has been able to find no new work upon taste reported in English, German, French or Italian, and has been scarcely more successful in the case of smell. Readers of Swedish may note that a ten-page paper upon "*dektriska smaken*" appeared in the official publications of the University of Upsala for 1911.

Zwaardemaker (3) devotes to the jubilee of Onodi a brief paper on the effect of ultra-violet light-rays on odorous gases. This paper represents a rather laborious series of experiments. In the latest form of Zwaardemaker's precision-olfactometer (which the writer has not seen in any American laboratory), the experimenter inhales not directly from the bore of the odorous cylinder but from a retaining-chamber of glass, which is equipped at the top with a short tube for insertion in the nostril and which is connected horizontally with the

bore of the odorous cylinder in such a way that a current of air can be readily drawn through both by a Bunsen air-pump. For these recent experiments the end of this glass chamber opposite to the one from which the scent issued was filled with a quartz lens of about seven diopters and in the focus of this lens was placed a mercury lamp (in the later experiments a quartz-lamp, which, however, has a certain serious draw-back). The odorous gas subjected to the parallel rays of light amounted in every case to two olfacties, so that if its effectiveness were reduced by half, it would become a merely liminal stimulus. Representatives of all Zwaardemaker's classes of smells were tested and the time required for virtual deodorization was recorded. Among the scents which suffered most are skatol, pyridin, valeric acid, and oil of turpentine, which were deodorized respectively in forty-five, ten, five and five seconds. Nitrobenzole and oil of pock-wood proved refractory to the influence of the light. It is impossible to draw conclusions from these experiments in regard to the relation either of chemical composition or of smell-quality to power of resisting the disintegrating effect of ultra-violet light. They prove, however, that the ultra-violet light contained in ordinary daylight is a most potent agent in the deterioration of scents.

Laval (1) summarizes a thesis offered by Itie at Toulouse in 1909. This thesis is largely concerned with methods and instruments for testing the freedom of the nasal air-passages and the course of the nasal air-currents. The writer of the thesis tested 370 subjects with the manometric rhinometer of Escat and found that in children the air-pressure in inspiration is likely to exceed the pressure in expiration. His results for adults conformed to the received opinion in regard to the relative force of expiration and inspiration.

Mercier-Bellevue (2) summarizes an article in the first number of *Le Larynx*, unsigned, perhaps an editorial. The writer of the original article describes the different kinds of anosmia (mechanical, toxic, and so on) and the appropriate remedies, and makes the interesting point that lesions of the olfactory membrane are irreparable in their consequences for smell, since the filaments of the olfactory nerve do not end free but in the olfactory cells,—since in other words, the membrane itself contains the peripheral sensory ganglion of smell.

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SYNÆSTHESIA

BY PROFESSOR A. H. PIERCE
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Though contributing little, if any, new material to aid in the understanding of synæsthesias, Marinesco (1) presents an unusually rich assemblage of facts. First, a case of colored hearing is described with particular wealth of detail. The subject is a Roumanian woman of thirty-five. It is remarked incidentally that her heredity is bad. All spoken or written words and sounds are colored, the endless variety of color and shading being the special feature of the case. The colors are always seen hovering in space; and ordinarily in the form of a strip or patch, usually brilliant, and in all grades of transparency. Sometimes the letter or word is seen dimly outlined on this colored background. The color of a word is generally determined by the colors of prominent vowels and consonants. Many details are given, and two excellent colored plates reproduce concrete instances. Reading is accompanied by very vivid auditory imagery, and the usual color experiences are evoked.

From a collection made before his death by Edouard Grüber (of Jassy) the author cites a considerable number of cases of colored hearing, schematized forms, etc. A table, representing the reports of 23 individuals, is drawn up for a comparison of the colors given the letters of the alphabet and the notes of the musical scale. The main result is to emphasize the wide range of individual variation.

Analyzing his material, the author concludes: (1) that no generalizations can be established as to sound and color correlations; (2) that the color of words is sometimes that of a prominent constituent, sometimes that produced by a mixture of the colors of the components; (3) that synæsthesias are not indicative of pathological conditions; and,finally, (4) that their existence points to an individual predisposition the main features of which are a special impressionability of the visual and the word-hearing centers, and an unusual diminution of inhibitory influences of these centers upon each other.

A condensed historical summary and a bibliography of the less commonly cited titles add to the value of the article.

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SPECIAL REVIEWS

Leçons de Philosophie. I. Psychologie. D. Roustan. Paris: Librairie Ch. Delagrave, 1911. Pp. 520.

The first volume of Roustan's *Leçons de Philosophie* is devoted to psychology. The author has taken much of his material from Wundt, Ribot and James. In fact he has been greatly influenced by the latter and the book is modelled rather after the *Principles* than after more recent treatises. The emphasis is placed upon those subjects which we are accustomed to find of most interest to the French school of psychologists. Experimental psychology is practically ignored and physiology is entirely omitted. The part on sensations occupies only eighteen pages and mentions only those facts which are of the most general interest to students of the intellectual functions, such as the value of the different senses for the mental life and the possibility of improving them by education.

Throughout the book special attention is given to the important theories and the reader is guided, often with keen judgment, to a final choice. The older theories receive more attention than the modern ones, so that the book gains in historical perspective to the neglect of contemporaneous thought. With the exception of Wundt, Höffding, Bergson and other more or less important French writers, few living men are mentioned. For example under attention the only references made are to Condillac, Wundt, Höffding, Ribot, James, Bergson and Nagrac.

The volume is divided into four parts, treating respectively of general problems, which include a discussion of the purpose and limits of psychology, the subconscious, attention, personality, etc.; of the effective life, that is, pleasure and pain, the emotions, inclinations, and the passions; the intellectual life, which includes sensations, space perceptions, memory and association, generalization, judgment and language; and finally of the active life, embracing instinct, habit and will. Each chapter is preceded by a minute summary and is closed by a very incomplete bibliography.

The book is neither a text-book nor is it sufficiently up to date or inclusive to justify referring the student to it for collateral reading. The manner of treatment, however, is interesting and the style is very pleasing. One can follow the writer with profit as he illuminates

many of the theories which form the history if not always the foundation of the science.

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The Interpretation of Religious Experience. (The Gifford Lectures for 1910–12.) JOHN WATSON. Glasgow: James Maclehose and Sons, 1912. 2 Vols. Pp. xiv + 375; 328.

The title of these lectures is, I fear, misleading, for they do not deal with "religious experience" in the sense in which the layman and the contemporary psychologists use the term. Professor Watson's extensive work is an historical review of the solutions proposed by the great philosophers for the question of the ultimate nature of reality. The first volume contains a critical account of these solutions, beginning with Greek philosophy and ending with Hegel. The second volume, called constructive, deals with Faith, Knowledge and Mythology, The Fallacy of Radical Empiricism, the Realistic and the Scientific View of the World, Body and Mind, Personal and Absolute Idealism, the Problem of Evil, etc.

The more general outcome of philosophical speculation is, in Professor Watson's opinion: "No dualistic or pluralistic conception of the world, in whatever form it presents itself, can be regarded as a satisfactory solution." And the conclusion of his own investigation is "that man as a spiritual or self-conscious being is capable of experiencing God, who is the absolutely spiritual or self-conscious being, and that the influence of God upon man is not external or mechanical but spiritual, and so far from being destructive of freedom, is the condition without which freedom is inconceivable."

JAMES H. LEUBA
BRYN MAWR COLLEGE

DISCUSSIONS

ESTIMATION OF TEMPERATURE

To the Editor of the PSYCHOLOGICAL BULLETIN: The following observation of Mr. R. Amundsen made during his recent antarctic expedition seems to be of general psychological interest. It is found in his book *The South Pole*, Vol. I., pp. 280–282.

"On several previous sledge journeys I had made the experience that thermometers are very fragile things. It often happens that at the beginning of a journey one breaks all one's thermometers, and is left without any means of determining the temperature. If in

such circumstances one had accustomed oneself to guess the temperature, it would have given the mean temperature for the month with a fair degree of accuracy. The guesses for single days might vary somewhat from reality on one side or the other, but, as I say, one would arrive at a fair estimate of the mean temperature. With this in mind I started a guessing competition. As each man came in in the morning he gave his opinion of the temperature of the day, and this was entered in a book. At the end of the month the figures were gone through, and the one who had guessed correctly the greatest number of times won the prize. . . . Each man's entrance was awaited with excitement, and one man was not allowed to make his guess in the hearing of the next—that would undoubtedly have exercised an influence. Therefore they had to speak as they came in, one by one. . . . The monthly results were interesting. So far as I remember, the best performance the competition could show in any month was eight approximately correct guesses. A man might keep remarkably close to the actual temperature for a long time, and then suddenly one day make an error of 25°. It proved that the winner's mean temperature agreed within a few tenths of a degree with the actual mean temperature of the month, and if one took the mean of all the competitors' mean temperatures, it gave a result which, practically speaking, agreed with reality. It was especially with this object in view that this guessing was instituted. If later on we should be so unlucky as to lose all our thermometers, we should not be entirely at a loss."

In reading this one must admire the straightforward way of putting the question and solving it. It seems that our estimation of temperatures is materially different from that of time, where the mean of the estimates of even a large number of persons differs materially from reality. These results, however, were obtained from individuals who had no special training in estimating time, while Amundsen's men necessarily had great interest in the weather and acquired some practice. It would be interesting to make similar experiments on the estimation of time intervals and of distances, giving the subjects considerable practice in this work, in order to find out whether under these circumstances the mean of the estimates comes anywhere near the real value. Mr. Amundsen's experience shows clearly that such results may be of practical value.

F. M. URBAN

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CHRONOSCOPE WITHOUT SPRINGS

The review of recent improvements of Psychological apparatus, published in the last BULLETIN, mentions Dunlap's attempt at doing away with the spring in the Hipp chronoscope, but fails to mention Schulze's successful solution of this problem. The chronoscope without springs and without variability of magnetic intensity, designed by Schulze and built by Zimmermann, seems to be much less known than it deserves. In the writer's opinion, who regards himself as fortunate in having a Schulze chronoscope in his laboratory, Schulze's ingenious method of utilizing, in connection with a peculiar permanent magnet, the induction currents of the make and break of a single primary current is much superior to Dunlap's method of doubling the primary current. However, no one could point out the relative advantages which either method probably possesses, as well as Professor Dunlap himself. Let us hope that he will give su the benefit of his experience in this matter.

MAX MEYER
UNIVERSITY OF MISSOURI

BOOKS RECEIVED DURING JANUARY AND FEBRUARY

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Henderson, L. J. *The Fitness of the Environment.* New York: Macmillan, 1913. Pp. xv + 317. $1.50.

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A Contribution to a Bibliography of Henri Bergson. New York: Columbia University Press, 1913. Pp. xiii + 56. 25 cents.

NOTES AND NEWS

The Southern Society for Philosophy and Psychology will hold its meeting this year at the Johns Hopkins University, Baltimore, on April 8 and 9.

Professor J. Mark Baldwin sailed on February 1 for Paris to lecture for the Comité France-Amérique on "French and American Ideals." He had recently returned from the South, where he lectured in the University of South Carolina and the Columbia College for Women.

Professor J. B. Miner, of the University of Minnesota, has been granted a sabbatical leave of absence for the coming year. He expects to sail for Europe about the middle of June.

Professor W. B. Pillsbury, of the University of Michigan, is in Europe on a semester's leave of absence.

THE New York Branch of the American Psychological Association met on February 24, in conjunction with the Section of Anthropology and Psychology of the New York Academy of Sciences. The following papers were read: "Psychology As the Behaviorist Views It," Professor J. B. Watson, of Johns Hopkins University, non-resident lecturer in Columbia University; "Illusions and Hallucinations in Insanity," Mr. D. O. Lyon; "A note on the Retention of Practice," Dr. F. Lyman Wells; "Painting and the Learning Process," Mr. C. M. Sax; (1) "Methods of Orientation and Imaginary Maps" and (2) "The Probable Explanation of Certain Flock Formations of Birds," Professor C. C. Trowbridge.

ON January 27th last, Dr. James Ward, professor of mental philosophy and logic in the University of Cambridge, completed his seventieth year. In recognition of his valuable contributions to philosophy and psychology and as a manifestation of the esteem and affection in which he is held by a large circle of colleagues, past and present pupils, and other friends, his fellow-teachers in moral science in the University propose to raise a fund for the purpose of having Dr. Ward's portrait painted. It is hoped that the sum collected will be sufficient to allow of the portrait being reproduced in photogravure or by some similar process, so that each subscriber may receive a copy of the reproduction.

THE following items are taken from the press:

DR. FREDERIC LYMAN WELLS, assistant in pathological psychology at the McLean Hospital, is conducting a course of lectures and discussions on "Pathological Psychology" at Harvard University.

ON February 7, Professor Edward L. Thorndike, of Teachers College, Columbia University, delivered in the afternoon a lecture on "Social Instincts" before the department of psychology of the John Hopkins University; and in the evening he addressed the Educational Society of Baltimore on "Retardation and Elimination in High School."

DR. YUJIRO MOTORA, professor of psychology in the University of Tokyo, died on December 12. Dr. Motora took the doctor's degree in psychology about twenty-five years ago at Johns Hopkins University.

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PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE FUNCTIONS OF THE CEREBRUM

BY PROFESSOR SHEPHERD IVORY FRANZ

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General.—In every science it is advisable from time to time to consider how much of our apparent knowledge is conjecture or assumption and how much is inherent in the results of our observations. It is obviously necessary to do this frequently in connection with the subject of cerebral localization. Using the title "new phrenology" to designate the ill-founded conclusions of the histological localizations, Franz (23) criticized certain recent views, and this has led to a number of counter-criticisms, based upon misreadings of the paper or upon preconceptions. Pike (49), for example, has apparently disregarded the meaning in which the term "new phrenology" was used, and assumes that an attack has been made upon the possibility of cerebral localization. Bouché (8) also has been led to defend the old cult, although he approaches the standpoint he attacks, for he is forced to admit that at the present time we are ignorant of the histological appearances which characterize function. In its proper form, the general doctrine is acceptable, but in the way it is exposed by some recent authors the doctrine is not only open to, but invites critical attack. To question what and how far histological studies may contribute to our knowledge of the localization of mental function is not in itself hostile to localization; it is simply an attempt to limit some of the vagaries of reasoning which are rampant when the mental functions of the cerebrum are being considered. In the reasoning regarding the relation of the brain and mental processes it is not uncommon to find middle terms omitted, in a fashion like the following: Destruction of the occipital

cortex is followed by blindness; therefore, the cells in the calcarine type of cortex normally contain visual memories and ideas. Regarding this matter van Valkenburg (60), who has critically considered the facts, has written: "One cannot say more than that the said region (occipital cortex) has something to do with visual impressions . . . the simplest function possible, the feeling of a touch or the hearing of a sound, is for the present not capable of localization in an anatomical sense."

The diaschisis hypothesis (see PSYCHOLOGICAL BULLETIN, 1911, 8, 112–113), which explains many of the symptoms in cerebral lesions not accounted for on the ground of separate centers, is again set forth by von Monakow (46) in a well-written article.

Attempts have been made to answer the question: By what parts of the nervous system may an animal form associations? The answers have usually been, "the cerebrum." This is the answer given by Burnett (10) who deprived frogs of their cerebral hemispheres, and later tried to get the animals to acquire a simple habit. Although, the author concludes, the frogs died too soon for the question to be answered definitely, the animals exhibited no different reaction after a series of tests sufficient in number for a normal animal to form the association.

Although the extirpation of small areas of the cerebral cortex in mammals is not without certain technical difficulties, the total extirpation of one or both hemispheres with retention of life by the animal is attended with difficulty proportionately greater than the relative amounts of substance taken away. Karplus and Kreidl (33, 34) have, however, been able to extirpate one or both hemispheres of monkeys. When one hemisphere was taken away the animal exhibited motor disturbances, more marked in the opposite fore limbs, and sensory alterations. When both hemispheres were taken away (in two animals which lived respectively eight and twelve days) the animal became paretic, slept (?) most of the time, but when awake, or with eyes open, the latter were moved in all directions and reacted to stimuli. The movements of the head and eyes were not greatly impaired by the removal of the cerebrum, but the greatest effect was a lack of spontaneity. Unfortunately, the brief accounts of the work do not include descriptions of the brains after death, and these will be awaited with interest.

Movement.—The relation of the parts of the cerebrum to the production of movement has been the most studied problem in cerebral localization, but there yet remains much to be done before

there is a complete understanding of it. The cortex anterior to the central fissure is now generally believed to be motor, and that posterior to that fissure sensory, but Bianchi (7) has described movement disorders following destruction of the posterior region. It is true that these effects are only transitory, but they are sufficiently evident to cause some doubt regarding the purely sensory function of the postcentral cortex. In fact, Rothmann (54), from experiments on monkeys, concludes that the cortex surrounding the central fissure is sensory-motor, and in this he returns to the view more generally held fifteen years ago. He believes that the two parts, anterior and posterior to the Rolandic fissure, have the same general function, but that there has been some differentiation in that the posterior part is more sensory than motor.

Franz (19) and others have described cases in which the principal symptoms from lesion in the postcentral areas were motor, *e. g.*, epileptic seizures, and it is also known that disease of a part of the brain other than that surrounding the central fissure may cause epileptoid phenomena. This condition has been reported for the temporal lobes by Astwazaturow (2), who in an examination of the literature also found half of the cases of temporal lobe tumor associated with an epilepsy.

By means of an ingenious method, that of passing very cold solutions over parts of the motor area so that the temperature of the cortex became much lower than normal (as low as 13.3° C.), Trendelenburg (59) produced a temporary condition similar to that produced by the extirpation of the cortex. The phenomenon of paralysis was particularly noticeable, and this corresponded with the results of stimulation and extirpation by other investigators. Mott, Schuster and Sherrington (45) have continued to make stimulation tests and report the results of the examination of the brain of the gibbon. The most noteworthy results are those in relation to the eye movements following stimulation of the occipital cortex. They report that the eye movements result from the stimulation of the cortex surrounding the calcarine fissure, but not from the stimulation of other parts of the occipital pole.

Grauer (26) has described some of the motor phenomena, excluding paralysis, occurring after cortical lesions, with especial reference to athetosis. Jones (32) has attempted to differentiate cortical zones for the tongue movements and has suggested an explanation for the variations in the deviation of the tongue in hemiplegia. An interesting study has been reported by Lewy (36) who studied in monkeys

the histological characters of muscles in the paralytic and spastic conditions following the extirpation of the motor cortex. At intervals after the removal of parts of the cortex he took pieces of the muscles and found that the striations persisted and that, notwithstanding the paralysis and spasticity, there was no evidence of muscular degeneration. These facts are of special interest in connection with the question of nutritive control by the cortical cells.

In addition to the cortex, the lenticular and caudate nuclei are known to be concerned in the production of, or to have a controlling effect upon, movements. Principally because of the contentions of Marie, many studies have been made of the conditions accompanying lesions of the lenticular nucleus and the associated structures. The functions of the lenticular nucleus, as shown by the symptoms in the patients observed by Mingazzini (42) are not simple. He observed that lesions of this nucleus were accompanied by slight facial paresis and a paresis of the extremities on the opposite side, and at times atrophy of the extremities and slight disturbances of the skin sensations. He also observed that if the posterior part of the nucleus be destroyed dysarthria results, and if the lesion includes part of the putamen, excepting the outer third, paresthesias result. Vogt (61) has also found motor defects accompanying lesions of the corpus striatum, but concludes that this body does not produce, but controls, movement. Although the optic thalamus is now admitted to be a subsidiary sensory center, motor effects, especially choreiform and athetoid, are accompaniments of its destruction, but Holmes and Head (30) did not find these in the patient under their observation, and they found little or no paralysis.

Vicarious Function of Cerebral Areas, as Shown by Motor Control after Nerve Anastomosis.—It is well known that if two motor nerves be cross-sutured there may eventually result a return of function in both parts. Thus, in infantile paralysis it is possible to obtain a return of function in a paralyzed part by taking a part or all of a nerve and uniting it with the nerve which normally effects movement in the paralyzed part. Feiss (17) reports a case which well illustrates this fact. This procedure has been made much use of during the past few years, and it has been shown that the return of function results even when the nerves cross-sutured innervate different anatomical segments. Several years ago, Kennedy crossed the nerves for the flexor and extensor movements of the dog's leg and noted that after a time the animal was able to move the leg quite properly. He also found that when the brain in the motor region

was stimulated, the stimulation of the normal flexion center was accompanied by an extension, and vice versa, indicating that new brain connections had been made. These results are somewhat open to question on account of the proximity of these two cortical centers, but the probability of new connections being formed has been amply demonstrated by the work of Osborne and Kilvington (48), who crossed part of the central portion of the left brachial plexus to the peripheral portion on the right, tying off the central part on the right side to prevent regeneration. They found that after three hundred days there was a return of function in the right leg, and upon stimulation of the cortical center on the right, which normally results in movement on the left, they found movements of both fore limbs, indicating that the control from the right side of the cerebrum was made for both limbs. This demonstrates that "an interchange of function can readily occur in the motor centers of the cerebral cortex." The further series of experiments by Kennedy (35) are also of interest, for he found that it was possible to obtain return of function by connecting the spinal accessory with the distal part of the facial or the hypoglossal with the facial. The first movements in the facial area followed the operations in fifty-eight and thirty-two days respectively, and complete voluntary control of the closure of the eye, normally controlled by the facial nerve and center, occurred in about one hundred days. Results of this nature indicate how little we now know regarding what has been believed to be a simple relation of cerebral action and movement.

Skin and Movement Sensations.—A few years ago one of the most unsatisfactory chapters in cerebral localization was that dealing with the skin and muscle sensations. There have now been published, however, numerous reports of examinations of patients with disturbances of these types of sensation, which are leading to a better understanding of the functions of the cortical areas and the underlying gray masses. The most extensive and important recent contribution to this subject is that of Head and Holmes (28), who have dealt with the course of the impulses as well as with their cortical and subcortical centers. Of the ganglionic gray masses the optic thalamus, and of the cortex the postcentral area, are the most important parts for the sensations. Destruction of the thalamus produces marked disturbances of these sensations, more particularly of that of posture and that of movement; touch is frequently diminished, temperature stimuli are not correctly appreciated, but the vibration sensations and the recognition of degrees of roughness are not greatly affected.

Lesions of the cerebral cortex produce heightened thresholds of different nature; at times, *e. g.*, in temperature tests and tests of vibration sensations, the sensations are only less plain than from a corresponding normal part; the appreciation of weight, of size and of form and the sense of posture and of movement are most frequently affected, but painful stimuli are equally as painful as on a corresponding normal area. It has also been pointed out by Muskens (47) (*a*) that the defects of sensibility from cortical lesions concern the peripheral more than the proximal portions of the limbs; (*b*) that touch, the sense of localization, stereognosis and the muscle sense are more strongly represented in the cortex than the sensations of pain and temperature; but (*c*) that the sensory cortical areas for the limbs are greater than the corresponding motor areas. Bianchi (7) has noted certain variations. In five cases of lesions of the parietal region he has observed disturbances of movement, which are transitory, with a more or less complete hemianesthesia and astereognosis. Holmes and Head (30) also describe a case in which the ventral and lateral parts of the optic thalamus were softened and the patient exhibited a complete loss of tactile and posture sensations on the opposite side of the body with loss of the appreciation of temperature sensations. The case of Beyerman (6) with lesion in the outer part of the left lenticular nucleus, in the right thalamus, and in part of the parieto-occipital cortex, showed left anesthesia, no temperature appreciation, a hypersensitivity to pain and disturbance of the muscle sense. On the other hand, a cyst in the postcentral region of the cortex in the case described by Franz (19) resulted, on the sensory side, in only slight hypoesthesia in the shoulder. Edwards (16) has also described a case in which a tumor near the supramarginal convolutions was associated with impairment of sensation in both arms and abolition of muscle sense and astereognosis. After operation, the patient improved, although there persisted some impairment of muscle sense and of stereognosis and of touch. Hemianesthesia was found by Spiller and Camp (57) accompanying lesions of the posterior part of the internal capsule and the lenticular nucleus, and Mingazzini (42) also found hypoesthesia in disturbances of the lenticular nucleus, and, if part of the putamen be included, paresthesias.

The general conclusions of Head and Holmes (28) regarding the relation of the thalamus and the cortex are summed up as follows: the thalamus "contains the termination of all secondary paths . . . (in it) the sensory impulses are grouped afresh and redistributed in two directions . . . to the cerebral cortex . . . and to the gray

matter of the thalamus itself." The gray matter of the thalamus "forms the center for certain fundamental forms of sensation." The sensory cortex is "concerned more particularly with the discrimination and with the relation between two sensations, or between a sensation and its representation." Moreover, "all stimuli which appeal to the thalamic center have a high threshold. They must reach a high intensity before they can enter consciousness, but once they have risen above the threshold they tend to produce a change of excessive amount and duration and this it is the business of the cortical mechanism to check."

Hearing.—Although normally the temporal lobes are comparatively smooth, Auerbach (3) has found the first temporal convolutions markedly tortuous in a musician, and this change he associated with musical ability. A case of deafness, the brain of which is descrbed by Berger (5), showed lesions in the first and second temporal convolutions on both sides, but Berger associates the deafness with the lesions in the first temporals alone. A somewhat similar condition was observed by Gans (25) in a deaf-dumb-blind individual, the temporal cortex exhibiting a decrease of cells in the granular and multiform layers. Associated with the cortical deficiencies there were changes in the posterior quadrigeminal and the internal geniculate bodies. The disturbances of hearing reported by Holmes and Head (30), probably resulted from the affection of the internal geniculate body or the interruption of the corticopetal fibers from the latter. An anatomical study of the acoustic fibers is reported by Fuse (24), who describes the striæ acusticæ in man. These fibers, he finds, do not completely cross to the opposite side of the brain, although the relative amount of the crossing is not known.

Vision.—Of the sensory areas of the cortex, that for vision has been the most investigated, for both in animals and in man deficiencies in visual ability are relatively easily determined. The apparent definiteness of the facts has, however, led to superficial conclusions, as has been indicated above, and it is now recognized that the earlier views of the cortical localization of visual processes are as inadequate as those of motor localization. That the calcarine type of cortex is the part to which the impulses originating in the retina go is now generally believed, and this view has received confirmation for the brain of the dog by the researches of Minkowski (43, 44) who concludes; (*a*) that this is the only part of the cortex which primarily receives the visual impulses, and (*b*) that each occipital lobe is connected with the corresponding parts of the eyes. In monkeys Franz

(20, 21, 22) has shown that the destruction of the lateral, or convexity, portions of the occipital lobes does not produce a blindness, but that it produces inaccuracies of visuo-motor reactions. The latter results, which appear out of harmony with much previous work, are in harmony with the conclusions of Minkowski (44) that on the convexity of the dog's brain there is an optical motor center. In the brain of the gibbon, however, Mott, Schuster and Sherrington (45) found the optico-motor centers ranged along the calcarine fissure, but their results are not necessarily antagonistic to those of Franz and Minkowski.

The paper by Savage (56) is an attempt to prove by reference to a schematic diagram that there is an "actual existence" of nine conjugate and fusion centers in the brain. The confusion of "must be" or "I assume" with "is" is a not uncommon fault of certain strict localizationists, and the article is cited here as an extreme example of some current methods of thought and localization methods. Two somewhat similarly discursive and inconclusive articles by Dufour (14) and by Brückner (9) may also be mentioned; Dufour elaborating an hypothesis of monocular and binocular scotomas, and Brückner, from insufficient data, concluding that light adaptation is due to central processes in the visual path.

Two interesting cases are described by Redlich (50); one with left hemianopsia (later complete blindness), and the other with right hemianopsia, failed to appreciate their defects. These facts are of interest in connection with supposed perceptual centers in the cerebral cortex.

Much dispute regarding the cortical localization of visual sensations has arisen because of the believed-to-be impossibility of separating effects from the cortex and from the underlying fibers. Henschen (29) believes that this is possible, and, although he brings forth no new evidence, he asserts that sufficient facts demonstrate this. We know, however, that there are cortical fibers as well as cortical cells and that at least some of the fibers are continuous with the subcortical fibers. Since all the facts may be accounted for as von Monakow has done, and only some of them as Henschen does, it is more reasonable to believe in the explanation of the former.

The brain of the deaf-dumb-blind patient described by Gans (25) showed a decrease in the number of fibers in the occipital cortex and a decrease in size of the corpora geniculata externa. Although the case of Hoppe (31) was complicated, clinically and anatomically, by cerebellar and pontine disturbances, visual defects were present

and these were associated with lesions of the corpora quadrigemina. The clinical symptoms in the patient described by Winkler (62) are of great interest, since vision for light was retained but recognition of shapes was lost. This was accompanied by destruction of the left pulvinar, including the ventral and medial nuclei of the thalamus. However, the conclusion that the recognition of shapes is due to light impulses elaborated by connections "prepared within the thalamus, [which] become able to communicate to definite portions of the cortex the data enabling the latter to recognize shapes," is another example of the assumption that the cortical cells are of the nature of homunculi, or individual minds, which do the seeing.

Association.—Attempts to establish a relation between certain parts of the brain and the so-called higher mental processes have been numerous and the frontal lobes are the parts usually selected. That these parts are important is evident from the clinical and experimental evidence, but there are certain facts which negative the conclusion that they are the "seat" of the intellectual faculties. In dogs, Feliciangeli (18) found little change following the unilateral extirpation of the prefrontal region, but when the lesion was more extensive there resulted slight, but temporary, sensory disturbances on the opposite side of the body with a tendency to manège. Ascenzi (1) describes a case of an illiterate man who, with an extensive destruction of substance in the right prefrontal region, exhibited no notable changes in mental capability, except that of slight diminution of the "imaginative power and of phantasy and intuition." It is usual to find mental disturbances of a more marked character associated with frontal lobe lesions, and these have been found by Constantini (11), by Curti (12), by Donath (13), by Edes (15), by Mingazzini (41), by Roncorini (51), by Serog (55), and by Sullivan (58). Many of the cases described by them are not clear cut, and the mental symptoms are not always the same. Thus, for example, the patient of Constantini was arteriosclerotic and although his mental condition was not normal it is not clear that it was different from that of a patient with cerebral arteriosclerosis without special frontal lobe lesion. Curti's patient, in whom the right frontal lobe was destroyed, had classical symptoms of frontal lesions, and likewise Donath's patient, in whom a tumor on the left side also produced anarthria and aphasia for three languages, which, after operation, the patient partly relearned. Because of the extension of the effects of the original lesion the symptoms in the case described by Mingazzini were complicated with motor phenomena and in some respects the

symptom-complex resembled that in cerebellar disease. The symptomatological similarity of frontal lobe and cerebellar lesions has frequently been remarked. Serog, and Roncorini discuss in a more general way the relation of frontal lobes to mental states; both conclude that there are no special symptom-complexes associated with frontal lesions. Roncorini holds a view similar to the diaschisis hypothesis of von Monakow, and Serog maintains that there is no reason to believe that the "intelligence" is situated in the frontal lobes, and that "the activity of the whole cerebral cortex must be assumed as the foundation of intelligence," but that the frontal lobes may play a special part in the associations.

Although frontal lesions are most often accompanied by mental disturbances, Guilarowsky (27) believes we must not omit from consideration the temporal lobes.

The impetus to the study of the aphasias is still evident by numerous contributions, which will be considered in another review. It may, however, be mentioned that Marie (38) criticizes Heilbronner, and Dejerine[1] for speaking of his view as the "dementia" view. Marie has, however, written: "Chez les aphasiques il y a une diminution tres marquée de la capacité intellectuelle en générale." Moreover, he disclaims any generalized hypothesis regarding aphasia, limiting himself to the recording of facts, which, among other things, demonstrate that a lesion in the third frontal convolution, not involving other structures, is not accompanied by a true and persistent aphasia of the Broca type. A relation of the insular area to speech function has been believed in by many neurologists, but Manoia (37) reports a case in which this part was affected without producing any speech disturbance, and he concludes that no fibers carrying impulses for articulation or speech understanding pass by the gyri longi posteriores insulæ.

Cerebrum and Cerebellum.—The cerebellum, as well as the cerebrum and its gray masses, sends impulses to the motor cells in the spinal cord, and it is connected efferently and afferently with the cerebrum. The exact functional value of these connections is not understood, but it is believed that the cerebral activity is controlled by the cerebellar and the cerebellar by the cerebral. By noting the currents of action Beck and Bickeles (4) have found that when the motor cerebral cortex is stimulated the cerebellum is affected, the influences being more active on the opposite side. A similar result

[1] And, in a private communication, the reviewer, who had used the term, but who also wrote that "the relation of aphasia to dementia or to mental deterioration . . . is to be settled only by definition" (PSYCHOLOGICAL BULLETIN, 1911, 8, 115).

was found when the cerebellum was stimulated and the electromotive condition of the cerebrum was noticed. Rossi (53) has obtained confirmatory results by a different method, for he has observed that the stimulation of parts of the cerebellum increases the excitability of the motor cerebral cortex on the opposite, but not on the same, side. Rossi (52) also found that the irritability of the motor cortex was decreased after hemiextirpation of the cerebellum in dogs, and this decreased excitability continued during the period of time that the symptoms of cerebellar insufficiency persisted. When compensation (for the cerebellar loss) took place the motor cerebral cortex became more irritable. It would appear, therefore, that the cerebellar impulses act as a check upon, or as an activator of, the cerebral.

Histological Studies.—Two histological studies of functional interest may be mentioned. Mellus (40) has compared the cortex in Broca's center and in the temporal lobes on both sides of three brains and has found the left deeper. Marinesco and Goldstein (39) have made a careful study of the hippocampal region, and have drawn therefrom certain physiological deductions regarding the cortical localization of smell and taste sensations in this region.

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CEREBELLUM AND BRAIN-STEM

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Several methods have recently been employed in the study of the functions of the cerebellum and their localization. Preisig (6), from a thorough histological examination of the nervous system in a case of congenital or very early atrophy of the cerebellum, with idiocy and defect of locomotion and other motor functions, reaches the conclusion that the mental defect need not be connected with the condition of the cerebellum, since the cerebrum also was affected. There had been a meningeal inflammation with involvement of the adjacent cortex of both cerebrum and cerebellum. The motor defects shown by the patient can be attributed to the condition of the cerebellum, and the mental defect to the cerebrum. This case throws light on similar cases in the literature, in which idiocy appeared in cerebellar atrophy, but in which the cerebrum was not histologically examined. Secondary atrophy was found in several structures connected with the cerebellum on the afferent side, such as the middle peduncle and pontine nuclei, the olives, the column of Clarke, direct cerebellar tract and inferior peduncles. On the other hand, little change was visible on the efferent side, namely, the dentate nucleus, superior peduncles and red nucleus.

Rothmann (7) extirpated limited portions of the cerebellar cortex in dogs, and found evidence of localization of function, inasmuch as destruction of the cortex of the quadrangular lobe affected the action of the fore leg, and destruction of the semilunar lobe, the hind leg, while destruction of the vermis affected the trunk muscles. In this last case, the effect was contralateral and is described as a paralysis, but in the former two cases the limb affected was on the side of the lesion, and the effect was an apparent disturbance of the sense of position.

Löwy (4), by cutting the nerves of the hind limb in a young animal, caused delayed myelinization in the median posterior lobe of the

cerebellum, and concluded that this part of the vermis is connected with the hind limbs.

Beck and Bikeles (3) stimulated various peripheral nerves, having first connected the surface of the vermis to a galvanometer, so as to detect action currents aroused in the cortex of this part of the cerebellum by impulses coming in from these peripheral nerves. An action current in the vermis under these conditions would be evidence of an afferent pathway thither from the nerve stimulated. In fact, action currents were in evidence with sufficient frequency to indicate such a connection, though they appeared somewhat less regularly in the vermis than in the motor area of the cerebrum, which was similarly examined for purposes of comparison. No evidence of sensory localization within the vermis was obtained, since action currents appeared in any part of it, no matter whether the fore or the hind limb was stimulated. Evidence of a path to the vermis from the vagus nerve was also obtained by this method.

The same authors (2) used the method of action currents in a study of the reciprocal connections of the cerebellum and cerebrum. Not getting satisfactory results from the usual electrical stimulation of the cortex, they tried a thermal stimulus, consisting of a temperature of 55°–58° C., applied in the same manner as in temperature sense experiments, and found this to be very effective. When they thus excited the motor cortex cerebri, they obtained action currents in the cortex of the cerebellar hemispheres. These action currents, without being absolutely regular, were still very frequent—most frequent in the side of the cerebellum opposite to the part of the cerebrum stimulated, but fairly frequent also on the same side as the stimulation—indicating therefore both a crossed and an uncrossed path from the cerebral to the cerebellar cortex. When, instead of the motor area, the region behind this was stimulated, there was little sign of effect on the cerebellum. When, finally, the experiment was reversed, the cerebellum stimulated and the cerebrum examined, action currents appeared less frequently than before, but still frequently enough to indicate a path leading from the cerebellar to the cerebral cortex. The currents appeared most frequently in the motor area, but sometimes also behind it.

The book by André-Thomas (1), now translated, gives a very useful account of present knowledge regarding cerebellar functions. Part I. is devoted to an exposition of facts, including the anatomy and connections of the cerebellum, the results of extirpation and excitation experiments (including many of the author's own), and

the symptoms of cerebellar disease in man. Part II. is devoted to interpretation. Gall's theory of a sexual function of the cerebellum is rejected as based on a few coincidences, which are more than offset by negative instances. The theory that this is an organ of intelligence is also based on no real evidence; and, though many sensory pathways lead into the cerebellum, especially perhaps from the muscles, the evidence is against the cerebellum being the organ for conscious sensation or perception. Even the vestibular nerve, which has often been regarded as having its center in the cerebellum, has probably a cerebral center, and is not, as a matter of fact, connected very richly with the cerebellum. It is true that a few fibers find their way from this nerve into the base of the cerebellum, and also that many fibers pass between the cerebellum and the terminal nucleus of this nerve (nuclei of Deiters and Bechterew and triangular nucleus), but these last fibers are found to be efferent, enabling the cerebellum not to be affected by the vestibular nerve, but to affect its terminal nucleus and the motor paths that lead out of the latter. Thus is explained the curious similarity between the symptoms of injury to the vestibular nerve or its end-organs in the inner ear, on the one hand, and the symptoms of cerebellar injury on the other. Since both act, in part, on the same lower mechanisms, their actions are similar though not identical. The vestibular nerve contributes to the maintenance of equilibrium against impressed movements, while the cerebellum aids in the equilibrium of active movements, both reflex and voluntary (pp. 196–197).

The author rejects some of Luciani's generalizations regarding cerebellar function. The muscular *asthenia* after cerebellar lesion, which led Luciani to infer a sthenic function for the cerebellum, is not confirmed as a fact by André-Thomas; and the *atonia* is not general, but affects only the muscles most concerned in maintaining equilibrium. Luciani's *astasia*, or tremor in muscular contraction, due to a want of fusion of the elementary contractions, is fully accepted by the present author, who adds, as a further general symptom of cerebellar lesion, a *dysmetria*, or lack of proper measure in the force of muscular contraction. The lack of measure shows itself as an excess of movement. The legs are lifted too high, the trunk pushed too strongly to one side or the other, and the excess of upward and backward thrust, in mounting stairs, is likely to cause the subject, whether man or dog, to fall over backwards. The function of the cerebellum is thus to exert a steadying and moderating influence on movements initiated by the cerebrum or by reflex paths.

A certain degree of localization is admitted by the author, largely on the basis of the comparative anatomy of the cerebellum. The vermis, phylogenetically older, is closely related to the cord and bulb, and concerned with bodily equilibrium. The cerebellar hemispheres, closely connected as they are with the cerebrum, are probably related to the control of voluntary movement. The cortex of the cerebellum is in close relation to the afferent paths, while the ganglia in the interior (dentate nucleus, nucleus of the roof, etc.) are in direct relation to the outgoing paths.

While, certainly, very much remains to be learned before the functions of the cerebellum can be understood, this work perhaps conveys as clear and sound a conception of the matter as can be expected at the present moment.

The physiology of the striatum and thalamus is still extremely confused and confusing. Some little evidence has accumulated, first and last, for a heat-regulating center in one or the other of these structures, in warm-blooded animals. Nikolaides and Dontas (5) have applied an ingenious method in studying this function. When a warm-blooded animal is subjected to high external temperatures, the rise of body temperature is combated, in part, by polypnea, or rapid breathing. Placing a dog in a warm chamber and raising his temperature till polypnea resulted, these authors then transected the brain stem at some level above the respiratory center. The shock of operation caused a temporary inhibition of breathing, but, if the section was high enough to leave the striatum or part of it in connection with the bulb, the polypnea returned, whereas if the section severed the striatum from the bulb, there was no return. This heat-regulating reaction was therefore dependent on the striatum, though the authors add that the thalamus seemed to have some influence in the matter.

Madame Vogt (8), reviewing recent cases of human lesion of the striatum, generalizes as follows: The combination of symptoms which appears when injury is limited to this organ does not include motor paralysis, nor disturbance of sensibility, nor diminution of intelligence; but it does include spasms of various muscles, athetoid movements, rhythmic oscillations, associated movements, spasmodic laughter and weeping. Apparently the whole musculature is represented in the striatum. The author's interpretation of the spastic phenomena is that they arise from the removal of an inhibitory influence normally exerted by this organ. Its internal structure, with the variety of cell-forms shown, indicates that it is by no means a simple relay

station—such a station would call for only one type of cells—but affords provision for complicated switching operations.

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PSYCHOGALVANIC, CIRCULATORY AND RESPIRATORY PHENOMENA

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The only important contribution to the literature of the psychogalvanic phenomena in the last two years is that of Wells and Forbes (23). This paper deals in a discriminating way with the numerous difficulties of technique, method and interpretation—difficulties which the majority of experimenters in this field have apparently failed to appreciate. The authors point out the impossibility of using metallic electrodes, and the fact that the so-called non-polarizable calomel electrodes are only relatively non-polarizable, and do not necessarily assure freedom from electrode currents. Pairs of electrodes tested gave deflections of the galvanometer (d'Arsonval) up to 400 mm., from the potential difference of the electrodes alone; but it was found possible with care to reduce this difference to a negligible quantity.

As a result of their experiments, Wells and Forbes conclude that variations in both body resistance (when a battery is used) and potential differences between the two skin areas employed are involved in the production of galvanometric deflections. The potential dif-

ferences are probably due to activity of the sweat glands, although vaso-muscular action currents are not excluded.

Although using the d'Arsonval galvanometer, Wells and Forbes note that it should be replaced by improved instruments. Sommer (18) emphasizes the fact that the string galvanometer must be used in psychogalvanic work. Yet nearly all of the investigators cling to the inadequate d'Arsonval. Worse yet, most of them still use plate electrodes. For example, Klasi (8) uses brass, Moravcsik (13) nickel, and Radecki (14) zinc plates, and obtain accordingly results of conventional valuelessness.

A method of differentiating the effects of change in potential and change in bodily resistance described by Albrecht (1) depends on simultaneous registration through two circuits, one of high, the other of low, external resistance. The description is too brief to be quite clear.

The mass of experimental literature on respiration and circulation is so enormous that it is not possible here to do more than note a few typical articles along lines of most interest to psychologists.

Weber (22) criticizes O. Müller and his school for omitting respiration registration in plethysmographic work, and shows from specific experiments that the respiration waves in plethysmographic records do not indicate the actual fluctuations in respiration. Leschke (9) gives a review of literature dealing principally with the work of Weber. Frankfurther and Hirschfeld (3) report their attempt to find the effect of music and consonant and dissonant chords on the arm plethysmogram. They show a distinct lowering of the volume curve for all cases with normal patients, although they state that certain hypnotized patients showed the reverse effect with agreeable chords. Sikorski (16) describes an investigation of the relation of "mental states" to sphygmogram and pneumogram form and to expression of face and attitude. He believes that the "attentive" state is characterized by an equilibrium of arterial innervation; emotional states by preponderance of the tonic or the depressor. The sphygmogram form has distinct individual characteristics, like the handwriting, the speech, etc. Strassburger (20) describes a new recorder for plethysmographic work, on the principle of a gasometer, which has the advantages of the piston recorder without the friction. Hoffmann (5) describes a device for recording the pulse with the string galvanometer, embodying the principle of the simple magnetic telephone. (A telephone receiver has been used for this purpose by several persons.)

Lombard (11) reports a method of observing superficial blood vessels under a microscope by using a drop of oil or glycerine to render the skin transparent.

Coming now to live issues: Hofbauer (4) finds effects of lowered blood pressure on respiration, which make it seem probable to him that the affective modifications of respiration are due to blood pressure changes, although he does not attempt to explain the mechanism. Hooker (7) concludes that carbon dioxide relaxes the tone of arterial muscle when acting directly thereon, which seems to agree with the results of Stewart (19) who finds forced breathing for from six to nine minutes decreases the flow of blood through the hand. Sollmann and Pilcher (17), on the other hand, find that accumulation of carbon dioxide in the blood causes reflex constriction of arteries cut off from its local action. The number of investigations on the effects of carbon dioxide, and of extracts of ductless glands on automatic processes is very large.

Important experiments on the effects of muscular activity on circulation have been carried out by Hooker and by Lowsley. Hooker (6) investigated the effect of exercise on venous pressure, finding a rise of from fifty to three hundred per cent. after from eleven to fifty-two minutes exercise on a stationary bicycle. Lowsley (12) measured the systolic and diastolic pressures and the pulse pressure and rate during bicycle riding, and after various moderate, vigorous, fatiguing, and exhausting games and athletic tests. He found in all cases rise in pressure and rate, the height of systolic and pulse pressure varying with the vigor and exhaustingness of the exercise. The practical conclusion is that "field" events are safer than "track" events and rapid games, from the point of view of strain on the circulatory system.

In connection with effects of muscular exercise on the circulation, it is of interest that the experiments of Aulo (2) seem to him to indicate the decrease of vagus tone as the primary cause of heart acceleration.

Linhard (10) found a change in respiration with the seasons in the cases of six subjects. In the summer the respiration frequency and alveolar carbon dioxide tension are higher, and the expiration volume lower than in winter. This variation the author thinks is due to the variations in the light, because he found that subjecting the subjects for an hour or less to arc-light baths in January brought about the respiration condition characteristic of summer.

Tullio (21) describes a method of registering respiration by means

of a cord running over pulleys from a weight on the chest or abdomen of the semi-reclining subject, to the writing lever, with a small weight below the lever to keep the cord taut. Regen (15) has been able to register the respiration of insects by confining them in a perforated test tube, with a "needle" pressing at one end against the insect's abdomen, and at the other against the short end of the writing lever. This method will doubtless be of value to the insect psychologist.

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THE PHYSIOLOGY OF NERVE

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An able paper by Lillie (22) offers perhaps the clearest idea yet given of the nature of the nervous impulse. The cell membranes of irritable tissue are when unexcited only semi-pervious to the passage of ions, and the process of stimulation consists (according to the Nernst theory) in an increase in the permeability of the membrane. This increase accompanies, perhaps is caused by, a depolarization of the membrane at the same point. Phase boundaries in general are the seat of electrical forces, and by the plasma membrane, which is the essentially irritable part of the cell, and which "in spite of its extreme thinness is apparently less permeable than the most impermeable of the precipitation membranes thus far known," the protoplasm is sharply delimited from its surroundings. Cations probably pass through even when the membrane is unstimulated, but not the accompanying anions. "The possibility that the cation concerned in the phenomena of demarcation and action currents is no other than the hydrogen ion must be regarded as experimentally substantiated." "The most probable explanation of the action current . . . is that the plasma membrane undergoes during stimulation a sudden increase in its permeability" so that all ions (even the anions) are now free to diffuse from the cell: and this works to decrease an already existing polarization of the membrane. Thus "the wave of excitation is accompanied by, or equivalent to, a wave of depolarization, *i. e.*, of increased permeability . . . and it is to be assumed that this region, acting then as a cathode, influences electrically the adjoining regions, depolarizing these in turn and causing a corresponding increase in permeability; in this manner the effect is propagated along the membrane at a rate which in any particular case will evidently depend on the sensitivity or quickness of response

of the tissue." In a second paper (23) Lillie further discusses the same theory (vide p. 393): and shows that "anæsthetics are substances which render the plasma membrane of the irritable tissue more resistant than normally to changes of permeability." McClendon (27) similarly finds that during muscular contraction there is an "increase in permeability of some structures within the muscle to anions (since the muscle appears already permeable to certain kations)." Eucken and Miura (9) discuss the Nernst theory, approving the modifications of Nernst's original formula which have been suggested by Lucas and Hill. They say that the break-stimulation is still not satisfactorily explained. Wilke (40) and Wilke and Atzler (42) offer what they call the "acoustical theory" of nerve transmission, *i. e.*, that the nervous impulse is a physical deformation wave which travels along the nerve substance. In spite of the reactionary quality of this theory several aspects of the subject are ingeniously handled; and the authors assert that a deformation wave travelling along a cylindrical mass of gelatine exhibits an electrical phenomenon comparable to the action current of nerve, and even that electrical stimulation of such cylinders will produce vibratory movements in them. They claim also to have demonstrated fine physical oscillations in frog nerves as a result of stimulation with non-polarizable electrodes.

This question of rendering nervous processes visible to the eye or to the camera still engages attention. Wilke and Atzler (41) tried to produce stationary waves in a nerve fiber and to photograph them in the ultraviolet microscope (after Höber), or else to see them by the aid of intravital staining processes. They have so far failed, as Auerbach (2) has also failed in a similar attempt. Auerbach reports photographing with the ultraviolet microscope interesting *structural* features of axones. Schwartz (30) finds that at least live axis-cylinders are differently susceptible to intravital stains at anode and at cathode (Bethe's *Polarisationsbild*). This makes it possible to study with the eye some phenomena of nerve excitation.

Tigerstedt (32) states that the fatiguability of medullated nerve fibers is easily demonstrated, specially in low temperatures: in fatigue the latent period is lengthened. Thörner (31) reports the same. Haberlandt (17) finds a reduced rate of transmission in fatigued medullated axones (frog): the axones showed rapid recovery. Wedensky (39) found no fatigue of motor nerve during several hours of constant stimulation. Maydell (26), using a series of induction shocks to stimulate the sciatic nerve (frog), found a steadily increasing

latent time for the heterolateral gastrocnemius reflex: but the height of this contraction increased at the same time.

Hill (18) finds no temperature change due to the transmission of a nervous impulse, and shows that if such change exists it cannot exceed one hundred millionth of a degree C. "for every single propagated disturbance. . . . This suggests very strongly, though of course it does not finally prove, that the propagated nervous impulse is not a wave of irreversible chemical break down, but a reversible change of a purely physical nature." Thörner (31) finds that nerves fatigue less readily in high temperatures than in low, but they suffocate (in the absence of oxygen) more readily in high temperatures than in low. Both phenomena are probably due to accelerated oxidation and diffusion processes in the higher temperatures which abbreviate the refractory stage. Verzár (35) studies the electric current produced in a nerve when two portions of it are brought to different temperatures. When the point of higher temperature is 20° C. or less the current flows (within the nerve) from the cooler to the warmer point. Ganter (13) finds that for temperatures between 0° and 30° C. the rate of propagation of the nerve impulse is approximately proportional to the temperature. The rate of transmission at $(t + 10)°$ divided by the rate at $t°$ (Van 't Hoff's quotient) gives on the average 1.75: a value which agrees closely with the quotients obtained by Lucas and Maxwell.

Bramwell and Lucas (3) study whether the refractory period of nerve is due to the propagated impulse or (perhaps) to some local effect of the electric current at the seat of excitation. They conclude "that the diminished excitability which follows an effective stimulus is entirely due to the passage of the propagated disturbance over the tissue, and is not caused to any measurable degree by a local action of the exciting current." Vészi (38) states that the action current from an induction shock imparted to a nerve during the phase of positive after-discharge (*positive Nachschwankung*), produced by previous repeated induction shocks, is very much reduced. The reduction can be due only in very small part to fatigue of the nerve. Dittler (7) partly confirms Vészi, but believes that the conditions are more complicated than Vészi describes them. From his studies with cinchonamin Ellison (8) concludes that "the injury current and the negative variation are independent phenomena"; and that "a negative variation does not necessarily accompany a nervous impulse." This latter result is disputed by Dittler and Satake (6) who find that in cinchonamin poisoning there is never

nerve action (muscular contraction) without action current (negative variation). They point out how Ellison was probably misled.

Lucas, in an important paper (24), shows "that a stimulus falling within the refractory period set up by a previous stimulus does not prolong the refractory state" (contra Fröhlich): but it *may* serve to increase the response provoked by a subsequent effective stimulus. The above holds true for either nerve or muscle, although the refractory period of nerve is a different thing from that of muscle. "If two stimuli are sent into a nerve at such an interval of time that the second produces a small second response in the muscle it is possible by interpolating a stimulus between them to abolish the second response" (simplest form of the Wedensky effect). "The abolition of the second response results only if the interpolated stimulus is so timed that it falls outside the refractory period of the nerve and sets up in the nerve a propagated disturbance which fails to excite the muscle." The Wedensky effect depends on a property of the myoneural junction (similar to that of the synapse of the central nervous system) "namely a resistance to conduction greater than that of the continuous axon." But one still wonders why the interpolated stimulus does not augment rather than inhibit the effect of the succeeding stimulus. Adrian and Lucas (1) find two kinds of summation—the "summation of local excitations" set up by the electrical stimuli, and the "summation of propagated disturbances." The latter occurs whenever propagated disturbances encounter a "region of decrement," *i. e.*, of reduced conductivity such as a synapse or myoneural junction. "The summation of propagated disturbances commences with intervals between stimuli slightly greater than the relative refractory period, passes through a maximum, and disappears as the interval is increased. . . . The summation of propagated disturbances depends on the falling of each successive disturbance in the supernormal phase of recovery after its predecessor." The two Lapicques present a brief study of summation (20) and a "law of summation" (21). Foà (11, 12), Buytendyk (4), and Fahrenkamp (10) have studied the periodicity of motor nerve impulses (by means of the string galvanometer). Foà, like Sherrington, believes that the rhythm of motor impulses originates in the spinal centers. Vészi finds that the "all or nothing law" holds for all modes of stimulating the strychnine frog (36), and that it holds generally of fresh and uninjured nerve fibers; but it does not hold of a nerve fatigued, as by faradic stimulations (37).

Magnanígo (25) finds that chloroform diminishes only slightly

the excitability of nerve trunks: chloral hydrate and chloretone have no effect on the motor fibers of peripheral nerves. Of the various drugs experimented on ether is the only one which was found to be capable of abolishing the conductivity and "consequently" the excitability of peripheral nerve trunks. Garten (16) found that a 1 : 1,000 solution of curare produced no change in the rate of propagation nor in the negative deflection of nerve impulse in medullated fibers. Ishikawa (19) found that the irritability of nerves is generally decreased when they are immersed in a hypotonic solution, but increased in a hypertonic solution. The rate of propagation of the nervous impulse is a function of the irritability of the nerve (cf. Lillie, 22).

Piper (29) discusses the action current of the retina, criticizes the theory of Einthoven and Jolly, and presents a theory of the electrical phenomena of the retina. Garrey (14) believes that there is in the heart a conducting tissue which is more sensitive to compression than ordinary motor nerves or skeletal muscles, also (15) that "compression establishes in nerves a condition as a result of which the passage of one or more impulses renders it [them] refractory to a succeeding impulse." Meek and Leaper (28) also study the effect of compression on nerve conduction. Carlson (5) finds that physically stretching a nerve decreases its rate of conduction. Tschagowetz (33) has an interesting study of "electrical sleep," *i. e.*, the sleep induced by repeated induction shocks (in the ascending direction) to the spinal cord: all reflexes are augmented, much as in strychnine poisoning. Maydell (26) used this "sleep" to obtain certain reflexes.

Verworn's valuable paper on the general topic of irritability (34) is a German translation of his article *Irritabilité* in Richet's *Dictionnaire de Physiologie.*

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RECENT CONTRIBUTIONS TO OUR KNOWLEDGE OF THE NEURONE

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Recent investigation of the neurone has been largely along four lines, viz. (1) to ascertain the method of interneuronal connection; (2) to determine the relations of the neuroglia to the cell body and axones; (3) to determine the actual morphologic entities in the cell body and axone and so free the nomenclature from unnecessary and reduplicated terms; (4) to determine the morphogenesis of the neurone and its various structures.

1. *Interneuronal Connection.*—There has been considerable investigation directed to the solution of the structure of the axonal terminations, called by Held *Endfüsse*, and their relation to the cell body on which they terminate. These have recently been studied by Kató (10) in the spinal cord of the cat. He found that an axone divided into several parts, each ending in a bulbous enlargement applied to different parts of the cell body of another neurone and also to its dendrites, but not to the axone except at the cone of origin. Kató divides these terminations into three types. The most numerous type consists of a peripheral loop with crossing fibrils embedded in a plasmatic basis. In the second type one of the terminal branches of the axone divides at its entrance to the *Endfuss* into several twigs like the neurofibrils of the cell, forming a net-like structure, the whole mass being generally elliptical in shape. In the third type, also elliptical, the terminal branches of the axone split into fine fibrils which possess small granules. The *Endfuss* in general seems then to consist of a plasmatic matrix in which are embedded the fine fibrils of a terminal branch of an axone. The plasmatic portion of the termination resembles somewhat the cytoplasm in reaction and there is a seeming fusion of the two. In spite of this apparent fusion the fibrils of the *Endfuss* have no connection with the endocellular fibrils of other neurones, and the two sets of fibrils have different chemical characters and reactions. This view of the non-continuity of these terminations and the cells is concurred in by Ramon y Cajal, Meyer and others. If this represents the true relation between the axones and the cell bodies then Held's *Endfüsse* are rather in favor of the neuronal entity than against it.

Lenhossék (14) has investigated the termination of the oculomotor

nerve in the ciliary ganglion of reptiles and finds that the fibers end as a network of fibrils in a disc closely applied against the cell, but staining differently. He found no evidence of the connection of the disc fibrils with the endocellular network. Carpenter also describes in the ciliary ganglion of the bird a calyx-like expansion of the oculomotor axone around one side of the ganglion cell but found no evidence of a relation of continuity.

2. *Neuroglia.*—There seems to be at the present time a renewed interest in the neuroglia, especially in its relations to the axones and cell bodies and its function. Marano (18) investigating these relations in the spinal cord of the teleosts, finds that the glia in no instance simply separates the nerve elements, but in all cases presses into the myelin sheath and forms a supporting myelinic skeleton. In the case of the nerve cells the glia fibrils extend into the interior of the cytoplasm and form an endocellular reticulum reaching even to the nucleus. In addition there is also a pericellular glial network. No suggestion is made as to a possible function, but if such a glial relationship exists it may possibly be expressive of a nutritive or secretory function as has been suggested recently by some investigators (21) who have described granules, apparently of secretion, in the glia cells and consider the neuroglia, therefore, more of a secretory structure than a supporting one. The recent work of Paladino (22) is quite in harmony with the observations of Marano. He also finds that this endocellular penetration of the glia cells is more marked in senile than young cells. While several investigators have recently described somewhat similar findings it seems to the writer that we are here probably dealing either with artefacts or are misinterpreting the appearances as to this seeming penetration of the nerve cell and axone by glia cells. At any rate further work is necessary for the complete elucidation of this matter.

3. *Morphologic Entities.*—If the recent work of Maccabruni (17) prove correct, we shall be compelled to revise our conception of the structure of the axone. Heretofore we have thought of it as a mass of parallel neurofibrils with a perifibrillar matrix interrupted possibly at the nodes of Ranvier. Maccabruni by a silver reduction method finds bacilli-like rods in the medullated axones of fish, amphibian and man, arranged parallel to their axes, but not in non-medullated axones or in medullated axones before their sheaths are assumed. These rods do not stain by the usual methods for mitochondria (see infra). In spite of the fact that he vigorously contends that these rods are not imperfectly stained neurofibrils, the fact that he has not

been able to stain both rods and fibrils in the same axone leaves much doubt as to the existence of these rods as distinct entities. While some recent investigators have contended that the axonal neurofibrils are artefacts, the preponderance of evidence is against this view and in favor of their existence as morphologic entities.

The cell body has proved an attractive field for investigation recently as well as in the past. It is very unfortunate, however, that so great confusion should exist in the nomenclature of the neurone from the multiplicity of names for apparently identical structures. Probably there will never be a satisfactory nomenclature until it becomes possible by stains and chemical processes to differentiate in one and the same cell all the described morphologic characters. Even then the possibility exists that our morphologic differentiations may be artefacts, but they still would represent at least differences of material.

There have been described in the cell body of the neurone as morphologic entities a number of structures to each of which several names have been applied, as the *neurosomes*, *neurofibrils*, *mitochondria*, *Nissl's bodies*, the *canalicular system*, *Golgi's endocellular net*, *Binnennetz*, *chondriosomes*, *chondriocontes* and *chromidial apparatus*.

The *neurosomes*, first described by Held, have been considered as artefacts by some, or imperfectly stained neurofibrils by others. Cowdry (5), in a recent study of the ganglion cells of the pigeon, thinks that there are two kinds of neurosomes, one of which is the more variable in size and irregular in shape and, staining with erythrosin, occurs densely crowded together with its fellows in the axone hillock. The nature and significance of these he was unable to determine, but believes that they are not artefacts because he has been able to demonstrate them after using a considerable number of different fixatives. On the other hand the more rod-like granules he considers *mitochondria*, as their staining affinities are similar. These latter true neurosomes are found extending out into the axone and dendrites, and are well shown by the iron-hæmatoxylon method.

The *mitochondria* are protein granules originally demonstrated by Benda and since studied by many observers in various kinds of cells. They are thought to be of importance in cell metabolism as many of the chemical changes in the cell occur in them, and they are closely associated with the most active part of the protoplasm, the perinuclear region, and are probably formed under the influence of the nucleus. In some cases threads are formed from them called the chondriomitome fibrils. They are probably identical with the

chondriosomes, chondriocontes and chondriomites of various observers.

Nissl's bodies, known also as tigroid substance, or chromatophile substance, have been shown not to be artefacts, and to be morphologically independent of the neurosomes, neurofibrils and mitochondria. Nothing new as to their function has been disclosed.

The *canalicular system*, apparently a series of branching canals in the cytoplasm of certain nerve cells, was first described by Holgren in ganglion cells, who claimed that the canals contained the branching processes of other flattened cells applied closely to their periphery and forming the *trophospongium*, from their supposed nutritional function.

This system has been studied by Kopsch, Bensley, Cowdry and others, and appears as clear colorless spaces by some methods of fixation and staining, while they are colored purple or brownish black by other methods. The fact that they stain at all would indicate that they were not empty spaces but possibly contain some fluid or semifluid substance. Similar spaces found in the cells of glands are considered as channels for secretions. Cowdry divides this canalicular apparatus, according to its arrangement, into the diffuse, eccentric and circum-nuclear type, which types he claims occur with considerable constancy.

The diffuse form, according to Cowdry, occupies almost the whole extent of the cytoplasm in large ganglion cells; the eccentric consists of a small collection of canals, mostly on one side of the nucleus; the circumnuclear is a rather close network near the nucleus and found in the small cells. He considers this canalicular system as morphologically distinct from the mitochondria, Nissl's bodies and neurofibrils, as he is able to differentially stain them in the same cell, and further believes that it is identical with the *spiremes* of Nelis, the *Binnennetz* of Kopsch and the *Saftkanälchen* of Holgren. Bensley and Cowdry consider this system as an osmotic mechanism more or less continuously varying in the living cell.

4. *Morphogenesis.*—The multicellular origin of nerve cells is still maintained by Fragnito, Copobianco, Held and others, in spite of the work of Harrison (7), Lewis (16) and Burrowes, which clearly showed the falsity of this conception. Marcaro (20), on the ground of recent experiments, maintains, as against multicellular origin, that Held's interneuroblastic connection and plasmodesms are artefacts due to pyridin fixation and Cajal believes that if such connections exist at all it is only to a slight extent. The anastomoses which form when neuroblasts are growing *in vitro*, as Lewis and others have shown,

make it seem not unlikely that similar anastomoses may occur in the body and that here too they may be transitory and changing.

Marcaro believes that the neuroblast is a discrete cell at a very early stage and doubts Cajal's statement that there is an apolar stage between the germinal cell and the bipolar neuroblast. He believes that the neuroblast can be early identified by the criteria of bipolarity, an elongated nucleus rich in chromatin and a cytoplasm containing neurofibrils. At a very early stage neuroblasts have two processes, one short directed centrally and the other longer toward the periphery. Even at this early stage delicate fibrils can be shown by silver reduction methods completely differentiated and entirely independent of one another. The process of differentiation begins, according to Marcaro, in the central process, extends around the nucleus and continues into the peripheral process. He finds the neurofibrils present as early as a fifty hour chick, extending throughout the cytoplasm in a net-like arrangement, and nowhere isolated fibrils such as Besta claims. The fibrils increase rapidly and the growth is from within out, each cell acting as a genetic unit.

This is contrary to the observations of Besta, Fragnito and Held. Held holds that the formation of fibrils begins in a fibrillogenous zone on the axonal side of the nucleus, and that the function of the neuroblasts is to form a specific neurofibrillar substance which spreads through preëxisting plasmatic paths. Besta believes that the neuroblasts form many connections with one another, and that the earliest fibrils are peripheral and connect different neuroblasts and only later form the perinuclear network. The exact order and method of the differentiation of the neurofibrils, therefore, seem still somewhat uncertainly known. If the function of the neurofibrils is conduction, as is generally held, rather than support, as Lenhossék believes, then the very early differentiation of the morphologic basis for conduction is a matter of interest.

All investigators agree that *Nissl's bodies* are developed later in embryonic life than the neurofibrils. According to Biervelt, in the cells of the spinal cord as early as the second fœtal month a few fine granulations can be seen, principally near the nucleus. In the third month the first chromatophile granulations are to be seen at the periphery of the cells. In the fourth month the peripheral differentiation has advanced to particles of chromatophile substance, and by the sixth month Nissl's bodies have an appearance quite similar to that of adult bodies and, while quite generally scattered through the cell body, they are absent from a small perinuclear zone. Marcaro

believes that Nissl's bodies have a cytoplasmic origin inasmuch as they are formed first at the cell periphery. Other observers, however, on the basis of experimental investigations, disagree with this conclusion. According to Fragnito a ring of chromatophile granules is formed first around the nucleus, then a series of rings are formed, advancing centrifugally, and he concludes from this that Nissl's bodies are derived from the nucleus. Collin maintains that the chromatophile substance first appears in the intermediate part of the cytoplasm, and later wanders toward the periphery; he, however, holds the view that it is derived from the nucleus, probably as the result of the activity of the chromatin. This assumption of the chromatic origin is supported by various chemical and biological facts indicating an analogy with chromatin. Marcaro (20) basing his opinion on his own work dealing with the histogenesis of Nissl's bodies in the chick, agrees with Biervelt as to the early period of development, and the peripheral position of these structures. Marcaro maintains that even if the migration of Nissl's substance from the nucleus, as described by Collin, be true, and although the substance exhibits some chemical similarities to chromatin, it is not necessarily derived from the chromatin.

An *endocellular net* was first described by Golgi, and since then it has been subjected to the careful scrutiny of many investigators and variously regarded as an artefact, as Nissl's substance or the canalicular system. Perronicito recently has claimed to see it in living cells. Marcaro (19) has observed it in the nerve cells of chick embryos, and has studied its various stages of development. He describes this net as beginning very early in little spots in the cytoplasm on one side of and close to the nucleus, and advancing with the development of the cell. In the bipolar neuroblast it is more complicated and arranged partly on the sides of the nucleus, and gradually forms a complicated net throughout the cytoplasm. He has succeeded in staining both Nissl's bodies and this net in the same cell, proving that they are different entities. The same thing is indicated by the fact that the net starts developing much earlier.

The *mitochondria*, already mentioned as morphologic entities, are vital granules or granular fibrils which were first described by Benda, and since have been found in various cells by many investigators. Their existence, function and morphogenesis have been especially studied in the case of the nerve cell. Meves has been able by staining to show mitochondria in embryonic cells which he believes have an important function in the development of the cell, being

instrumental in the process of cell differentiation. He describes the mitochondria in the neuroblast as thin short fibrils, irregular in course and arrangement in the cytoplasm, and believes them to be identical with the neurofibrils. Hoven maintains that the neurofibrils arise directly from the mitochondria and that with the increase of the neurofibrils, there is a diminution of the mitochondria. Marcaro (20) dissents from this view and describes the mitochondria as thin, short threads variously arranged but never extending into the axone; while on the contrary the neurofibrils are fine long straight threads arranged in the long axis of the neuroblast and continuing directly into the axone. Also there is a difference in their staining reaction and while mitochondria are found in many kinds of cells, neurofibrils are peculiar to nerve cells.

There have been no recent investigations which would invalidate the usual belief that the motor spinal nerves are outgrowths from the neuroblasts of the cord, and that the sensory spinal nerves are developed from the neuroblasts of the ganglia, processes growing both centrally into the cord and peripherally to the end organ. In the case of the sympathetic system, however, there are still a few investigators who claim a mesodermal origin for its cells. But Kuntz (11) recently has studied the development of the sympathetic system in a number of amphibians and finds that the process agrees with what he has found in other vertebrates, and consists of the migration of neuroblasts along both the dorsal and ventral spinal roots to form the ganglia, and a still further migration of some cells to the walls of the viscera.

The case reported by Edinger (6) of a child born without brain or cord, with no motor nerves, but with spinal ganglia and sensory nerves, affords a striking confirmation of the results of embryology as to the method of development of the spinal nerves.

Braus (4), in a very interesting article, discusses the influences which determine the direction of the growth of neuroblastic axones. He considers the outgrowth of the axone as a means for enabling the neurofibrils to reach the end organ. From his experiments in transplanting limb buds of amphibia to various parts of the body, he finds that the nerves of that particular region grow into them, even the trigeminus, so that the limbs will spontaneously move and also respond to electrical stimulation. From this he concludes that it is not an inherent directive power of the neuroblast, but rather the peripheral attraction of the end organ which influences the direction of growth. Again the same thing is indicated by the fact that motor

and sensory nerves run side by side till they reach the periphery, when one makes a connection with the muscle *Anlage*, and the other with the sensory *Anlage*. In this growth of the axones through the tissues of the embryo, use is probably made of the scaffolding of the mesenchyme cells and processes as a support. Harrison has called attention to a similar phenomenon occurring when neuroblasts are grown *in vitro*. The axones seem to require some support for growth, as the fibrin of the plasma, threads of cobweb or silk, or the surface of the cover glass. This phenomenon of the attraction existing between the outgrowing axones and solids has been called stereotropism. This force, however, cannot act as a directive power in the embryo in bringing the axone to its proper definitive end organ. The apparent need which axones have for support during growth has been interpreted by some as indicating the necessity for predemined pathways such as Held's plasmodesms would afford.

The study of cultures *in vitro* would seem to indicate that the growth of axones is a form of amœboid motion, exhibiting many branches which are pushed out and withdrawn as though they were seeking some object. When the end organ is reached in the embryo the terminal branches of the axone fasten upon it, perhaps as the result of a positive chemotaxis, after which, very likely, many of the side branches, being no longer useful, may mostly retract and disappear.

Investigations along the line of experimental embryology have recently shown great activity, especially in the study of these cultures *in vitro*, following the method devised by Harrison. The Lewises (16) have studied the growth in cultures of the sympathetic nerves from the intestine of chick embryos. They found that the sympathetic nerves grow out from the cells, in some cases over a millimeter, by an amoeboid motion showing frequent lateral processes which anastomose extensively with those of other cells. These processes in their growth show positive stereotropism, varicosities and, in fixed and stained specimens, the neurofibrillæ, apparently made of granules which possibly are artefacts.

W. H. Lewis (15) also transplanted small pieces of the neural plate of certain amphibians cut from the neural plate of the gastrula and placed in the otic region of older embryos. One piece developed part of the anterior end of the brain which invaginated and formed the various cell layers of the embryonic retina. He concludes that each part of the neural tube has a specific capacity for forming a definite part of the nervous system independent of its usual environment.

On the contrary the lack of such specificity in the case of the surface ectoderm has been shown by Lewis, who found that a dislocated optic vesicle stimulated by its presence the formation of a lens in an unusual part of the surface ectoderm.

Legendre (13) has cultivated *in vitro* spinal ganglion cells. After eight hours, however, he found morphologic changes beginning, such as chromatolysis and shrinkage of the nucleus. Marinesco was more successful, and was able to develop pericellular networks and plexuses. Growth was more extensive when the ganglia were removed from young animals.

Ingebrigtsten (9) has succeeded in the cultivation *in vitro* of pieces of the cerebral cortex from six day chicks. Up to twenty-four hours the outgrowing axones seemed structureless, ending either in bulbous enlargements, points, or with finger-like branches. After forty-eight hours the axones showed side branches which anastomosed with neighboring processes; nodosities appeared and also fibrillation. When cut, the axones grew out again from the cell ends. After five or six days, growth ceased and the fibers disappeared. He likewise succeeded in growing *in vitro* cells from the cortex and cords of young rabbits, cats and dogs, but found their growth less extensive and slower.

Laigmel-Lavastine and Pitulescu (12) have recently studied the neuro-fibrillar changes in the superior frontal convolution of the cerebral cortex in cases of dementia paralytica. They found the endocellular fibrils more attenuated than the extracellular and that the change was more marked in the small pyramidal and polymorphic cells than in the giant pyramidals and was more extensive in the region of the axone hillock and the nucleus, finally terminating in a fragmentation and complete disappearance of the fibrils. Bickel (1) has found that the neurofibrils in the cell body degenerate before those of the processes and those most remote from the cell body are most resistant.

Bonfiglio (3) and others have described in dementia paralytica and other severe destructive diseases of the brain certain intranuclear changes in the pyramidal cells of the cortex, consisting of some small metachromatic bodies staining with basic dyes, the significance of which is not understood.

Several observers have studied the processes of regeneration in the central nervous system and find, contrary to previous opinion, that regeneration of axones may occur, but always from the cell end, as in the case of the peripheral nerves, and to a much less extent.

Hooker (8), in his study of the regeneration processes in the tail

of a lizard after amputation, found that while the spinal cord regenerated as a smaller tube containing many nerve fibers, no nerve cells of any description could be found.

Recent experimental evidence we believe has demonstrated beyond a reasonable doubt that the axones *in vitro* and, therefore, presumably in the body, are developed from the cell bodies as a genetic center. Recent histological investigation also supports this conclusion and more certainly than in the past indicates a relation of contiguity between the neurones rather than one of continuity. Experimental pathology, however, has added but little to our knowledge of the interrelationship of the neurones, their structure, function or genesis.

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NOTES AND NEWS

IN accordance with the plan outlined by Mr. Kirkpatrick of Fitchburg, Mass., photographs of psychologists are being secured. Copies of a uniform size of eight by ten will be made. Mr. Kirkpatrick does not attempt to decide whose pictures should be included in the series. He will have negatives made only of those asked for by a sufficient number to justify it. Any one desiring pictures of certain men should therefore notify him at once. The call for pictures of philosophers, educators, and scientists is, up to the present time, slight and scattering as compared with that for psychologists. Autographs will probably accompany the pictures.

THE second convention of the *Società Italiana di Psicologia* was held in Rome during the last week in March. The following questions were discussed: The Classification of Mental States (De Sarlo); Mental Phenomena and the Nervous System (De-Sanctis); The Psychological Problems of Psychotherapy (Assagioli).

THE present number of the BULLETIN, dealing especially with the physiology of the central nervous system, has been prepared under the editorial care of Professor Roswell P. Angier.

THE following items are taken from the press:

DR. LLOYD MORGAN, F.R.S., has been appointed Herbert Spencer lecturer for 1913 at the University of Oxford.

AT the ceremonies connected with the opening of the Phipps Psychiatric Clinic of the Johns Hopkins University Hospital, beginning on April 16, addresses will be given by Sir William Osler and Professor William McDougall, of Oxford; Frederick W. Mott, F.R.S., of London; Professor Heilbronner, of Utrecht; Professor Bleuler, of Zurich; and Professor Orovino Rossi, of Italy.

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THE

PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE EIGHTH ANNUAL MEETING OF THE SOUTHERN SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY, BALTIMORE, MD., APRIL 8 AND 9, 1913

Report of the Secretary

The Eighth Annual Meeting of the Southern Society for Philosophy and Psychology was held at the Johns Hopkins University, Baltimore, on Tuesday and Wednesday, April 8 and 9, 1913. Three sessions were held: one on Tuesday afternoon, one on Tuesday evening, and one on Wednesday forenoon. On Tuesday afternoon at 5 o'clock the members of the Society were invited to attend the University lectures on Bergson's Doctrine of Time given by Professor A. O. Lovejoy in the Donovan Room of McCoy Hall. The sessions were held in the lecture room of the biological laboratory, President R. M. Ogden, presiding. The President's address, entitled The Relation of Psychology to Philosophy and Education, was given at the session on Tuesday evening. Preceding this address, the local members of the Society entertained the visiting members at a dinner at the Johns Hopkins Club, and after the address they entertained them at a smoker in the rooms of Professor Lovejoy. The following items were passed upon at the business meeting, which was held on Wednesday morning.

1. It was decided to hold the next meeting at Atlanta, Georgia, during the recess of the Christmas holidays, in conjunction with the meetings of the American Association for the Advancement of Science.

2. The following officers were elected for the year 1913. President, H. J. Pearce, Brenau College; Vice-President, A. O. Lovejoy, Johns Hopkins University; Secretary-Treasurer, W. C. Ruediger,

The George Washington University; Council for three years, Bird T. Baldwin, Swarthmore College and Josiah Morse, University of South Carolina.

3. The following were elected to membership. Professor W. H. Chase, University of North Carolina; Professor L. R. Geissler, University of Georgia; Miss H. B. Hubberd, Baltimore; Miss E. D. Keller, Baltimore; Dr. Frank A. Manny, Baltimore Training School; Professor Mark A. May, Murphy College; Father Thomas V. Moore, Catholic University of America; Mrs. Jacob Taubenhaus, Newark, Delaware; Mr. Jacob Ulrich, Baltimore; Professor H. H. Williams, University of North Carolina.

4. The accounts of the treasurer were audited by a committee of the Council and showed a balance on hand, April 9, 1913, of $68.70.

5. Votes of thanks were extended to the authorities of the Johns Hopkins University for the use of the lecture room of the biological laboratory and to the local members for the dinner and the smoker.

W. C. Ruediger, *Secretary-Treasurer*
The George Washington University,
Washington, D. C.

Abstracts of Papers

The complete text of Professor Ogden's presidential address and Professor Watson's paper on "Image and Affection in Behavior" may be found in the May, 1913, number of the Psychological Review. Informal reports were given by H. M. Johnson on visual acuity and brightness difference as affected by brightness of surroundings; by J. P. Porter on work in progress at Clark University, and by W. C. Ruediger on retinal rivalry. The symposium on "The Self and the Ego," was participated in by Professors Dunlap, Lovejoy, and Ruediger.

The Relation of Psychology to Philosophy and Education. President's Address. R. M. Ogden, University of Tennessee.

The theme of this address consists in a plea for a closer sympathetic relationship between psychology and philosophy, and a more exact study of psychological principles as a basis for educational science. It is pointed out that the practical divorce of psychology and philosophy in our universities has operated to the disadvantage of each. It is maintained that psychology is an essential propaedeutic to philosophy, and that in realizing this, the psychologist should

shape his introductory course and, in a measure, his experimental problems more in the direction of philosophical aims and needs. With regard to education, there is a tendency for the educator to base his work upon inadequate principles. It is the business of the psychologist to check this tendency by engaging himself more earnestly in an endeavor to establish principles which may be truly basic for educational science.

A promising field of investigation which bears upon the needs of both philosophy and education is recognized in the newer psychology of thought. Two special problems are then discussed. The first refers to the unwarranted procedure of the new realism in denying the efficacy of psychology and its epistemological data as an adequate foundation for metaphysics. The second considers the nature of the learning-process, as indicated in the work on animal behavior. It is maintained that the conception of the *determining tendency* is a more adequate explanation for acquired behavior, than is the assumption that "feelings of satisfaction and dissatisfaction" are the efficient agencies of the learning-process.

The Essence of Mental Healing: False and True Psychotherapy. Tom A. Williams, Washington, D. C.

The widespread psychotherapy of the populace begins and ends in suggestion, *i. e.*, the domination of a person by a notion or formula imposed by some one else. It is making a puppet. There is no guarantee as to who may not pull the strings. It makes one the creature of another.

Scientific psychotherapy makes a character, a personality, by education, self-knowledge, self-reverence, self-control, one after the other. It is not a magic. The physician is only the starter and supervisor. The work must be done by the patient's patience as well as by the doctor's insight.

The field for pernicious psychotherapy is vast: for it grows where reverence replaces reason; for what one does not understand one stands in awe of and is easily impressed by; as the sailor who fears no real danger is in terror of an omen.

Metaphysics and supernature, to the average man, are beyond criticism. So most attempts at suggestion are disguised in religious and occultist cloak; and possession by spirits or negation of the world settle all difficulties by their powerful suggestion.

To those prejudiced against metaphysics, the guise adopted by suggestion is an undemonstrated physical agent, such as psychic

force, or one which is supposed to have mysterious qualities such as radium, electricity, or a particular manipulation of the spinal nerves. Even in our day when science has replaced speculation even in psychology, spiritual possession still parades as a subconscious or second self.

The latest form of this doctrine, which the popular medical mind is swallowing as it once did the ideas of Messmer, is the theory of the complex, by which is meant a buried though festering idea of a past painful experience.

By this sciolistic conception the doctrine of the dual nature of man still seeks place in science, and its advocates try to guide practical life.

A Psycho-Educational Study of the Fourth and Fifth School Grades. Bird T. Baldwin, Swarthmore College.

For purposes of psycho-educational analysis it should be recognized that every child has five interrelated ages: a *chronological age* in years, months and days, denotive of the temporal span of life; a *mental age* denotive of the ripening of certain instincts, capacities and mental traits; a *physiological age* denotive of stages of physical maturity and growth; a *school standing age* denotive of the rate and position in school progress; and a *moral or religious age* denotive of fairly well-defined nodes of development in moral judgment and religious awakening. These ages may or may not correspond in their stages of development.

It is the aim of this paper, which is a very brief report of a section of a larger investigation, to inquire into the interrelations of the chronological age, the school standing age and the physiological age of normal children. The fundamental questions are: How do children progress through the elementary school? How do children grow and mature physiologically during their elementary school life? What is the relation between these two aspects of development when both are studied consecutively throughout the elementary school?

It must be recognized that since we are investigating the *school standing age* and since promotions are based on marks, these records must be taken at their face value, because they represent school practice and because they offer tangible criteria of the efficiency of the individuals and of the school. The progress through the elementary school of the twenty-five boys and the twenty-nine girls followed in this report is based on 10,579 final quarterly term marks.

Some of the main facts are: Girls maintain a higher school

standing than boys; there are also more repeaters among the boys and fewer cases of "skipping" a grade. In the fourth and fifth grades the boys and girls of the group are approximately the same age but in the last year of high school the boys are older on the average. Pupils who are relatively poor in the first few grades are relatively poor in the upper grades; that is, poor marks in the early school course are indicative of low standing throughout the school course. Boys and girls of normal school age or younger maintain a better school standing both as to grades and marks than those over age for grade. The age of entrance after six or seven years determined the age for completing the work of the elementary school. With very few exceptions these children progress through the elementary school at the rate of one grade per year, regardless of the chronological age at entrance. A more careful study of individul marks reveals that there are waves or nodes in the marks from year to year for each individual, the most prominent drops coming at the entrance to the high school and in the fourth and fifth grades. The subjects in which the boys do poorest work during the fourth grade are mathematics, penmanship, spelling and manual training; during the fifth grade penmanship, art, manual training, spelling, mathematics. The subjects in which the girls' marks drop back during the fourth grade are mathematics, geography, reading, penmanship and history; during the fifth grade mathematics, art, penmanship, geography and spelling.

A detailed study of the individual growth curves in height, weight, and lung capacity, weight-height and vital indices, and periods of physiological changes, shows that the taller and heavier boys and girls, who are also the younger of the two groups of children, mature physiologically earlier than those below median height. These physiologically accelerated boys and girls complete the work of each grade in the elementary school at an earlier age and with a higher average mark than the short, light, or physiologically retarded boys and girls.

The growth curves show there is a correlation between the *decrease in annual increment in growth* in height, weight, lung capacity (and their corresponding indices) and the *lowering in general school averages in school standing during the ages included in the fourth and fifth grades for boys and girls*. What this means will be taken up in a later paper.

A New Test of General Intelligence. L. R. Geissler, University of Georgia.

This test is intended to provide a continuous and graduated measure of acquired knowledge and native rationality of pupils whose age ranges between 9 and 19 years. The material consists of two equally long lists of words chosen systematically from the various realms of human experience in such a way that every word on one list is related to a word on the other. One list is hung up before the pupils and a word of the second list is written on the blackboard with the instruction to find some word on the exposed list to which the single word is related, to write down the pair and to give the reason for pairing. Then another single word from the second list is written on the blackboard with the same instruction, and this procedure is continued until the second list is exhausted.

The general intelligence is assumed to express itself in the number of words correctly paired, the fitness of the pair, the number of correct reasons, their fitness, and in spelling, expression, etc. Each of these factors is marked separately, and their total is a measure of the individual's general intelligence. With the valuable aid of Miss Ruth Collins and Miss E. A. Anderson the test has been applied to 62 girls of a preparatory school, whose ages range between 14 and 19 years. The results were correlated according to the rank-difference-method, with those of a general information test devised by Miss Collins, giving a coefficient of .75, with the pupils' ages, giving .57, and with a strength of grip test using the improved Smedley dynamometer, giving .176 as a correlation-coefficient. The test should be useful in comparing white and colored children and normal and abnormal minds. Its great advantage is the fact that it allows continuity through all grades and minute gradation of all degrees of intelligence within its limits.

A Comparative Study of White and Colored Children by the Binet Tests. Josiah Morse, University of South Carolina.

A preliminary report of a study being made of the public school children of Columbia, S. C., by Miss Alice Strong. Goddard's 1911 revision of Binet's tests used. Number of children tested to date: white, 119; colored, 120. Of the whites, 25.2 per cent. tested below age; 42.9 per cent. at age; 28.6 per cent. above age. Of the colored, 60.8 per cent. below age; 30 per cent. at age; 9.2 per cent. above age.

The graph for the whites resembles closely that given by Goddard, but that for the colored is strikingly different. The range of indi-

vidual difference is greater for the latter, but the excess is on the deficiency side. Of the 119 whites, one was 3 years below age; seven 2 years below; twenty-two 1 year below; total, 30.

Of the 120 colored, one was 5 years below age; one 4 years; eight 3 years; twenty-seven 2 years; thirty-six 1 year; total 73. The whites also had one 3 years above age; seven 2 years; twenty-six 1 year; total 34. The colored had, none 3 years above; one 2 years; ten 1 year, total 11.

The "near-white" showed the widest variation both above and below standard. Four were so irregular that it was difficult to determine whether to count them with the six year group, or seven, or eight, or nine. They are therefore grouped as irregular.

From another table it appears that for the colored, 60 per cent. of the tests are too difficult; 20 per cent. too easy; 20 per cent. right. For the white, 25.7 per cent. of the tests are too difficult; 25.7 per cent. too easy; 48 per cent. right. Counting as satisfactory those who test at age, and one year either above or below gives 83 per cent. of whites and 68 per cent. of colored.

Another table yields the following results:

	White, Per Cent.	Colored, Per Cent.
In lower grade according to physical age	44.5	44.2
In lower grade according to mental age	46.2	15.8
In right grade according to physical age	53.9	47.5
In right grade according to mental age	42.9	44.2
In higher grade according to physical age	1.7	8.3
In higher grade according to mental age	10.9	40

Concerning the Origin of the Ideas of Gods. W. T. SHEPHERD, Washington, D. C.

Two definitions may be given of God or of gods: (1) A being conceived as possessing supernatural power, who is to be propitiated by sacrifice and worship; a deity; an object of worship. (2) The Supreme Being; The Eternal and Infinite Spirit; The Creator and Sovereign of the universe. The paper deals only with the origin of ideas of gods of class 1.

The writer attempts to maintain views as follows: (1) Ideas of gods, of the class considered, have arisen not from any one class of phenomena, as has been urged, as from the personification of natural objects and forces, from the personification of abstractions, from totemism, from the deification of heroes, or from Great-Makers, but from all these sources. (2) The principal factors in the genesis of

these conceptions of gods have been: imagination, primitive reason and primitive credulity. (3) There has been a progressive evolution of god-ideas with increasing intelligence and moral elevation, in peoples. (4) There has been no universal degeneration of these ideas as some have held, as that would be inconsistent with evolution. (5) Many instances of a centralization of god-ideas and of gods can be cited.

The child employs imagination, untutored reason and much credulity to explain the phenomena of the world. Primitive man employs much the same mental processes to explain his world.

We invoke evolution to explain phenomena in the animal and plant worlds, in sociological and other fields: though not yet so well worked out in the field of religion, the scientific mind can hardly deny that it applies here also. To deny it would be to deny the law of continuity.

The writer is not convinced that ancestor-spirits have been worshipped as gods. The ancestor-spirits have been reverenced.

GENERAL REVIEWS AND SUMMARIES

CUTANEOUS, KINAESTHETIC AND MISCELLANEOUS SENSES

BY JOHN T. METCALF

Yale University

Cutaneous Sensation.—Practically all the literature of the past year on cutaneous sensation has had to do with the temperature sense. Perhaps the most significant article is that of Goldscheider (12). He has been led to a retrial of his results by the disagreement of other authors. Where he found 68 cold and 56 warm spots, Sommer found only 13 cold and 2 warm. Blix and Donaldson found thick spots so large that one of them would cover a number of Goldscheider's. von Frey maintained that warm spots were not sharply-defined points, but rather little fields in which sensitivity shades off at the edges. Goldscheider's retrials all support his earlier conclusions. The differing results of other investigators are due, he thinks, to the fact that they have not used fine enough stimuli, and have not, therefore, succeeded in stimulating single spots. Further, the warm and cold spots represent the only peripheral sense-organs for temperature stimulations. The interspaces are not sensitive to warm and cold. Wherever this seemed to be the case it was always found that certain single spots had been overlooked. In opposition to Head, who held that the phenomenon of adaptation is connected with the interspaces, Goldscheider maintains that it is everywhere connected with the spots. Finally, he has succeeded in arousing a paradoxical sensation of warmth by stimulating a warm spot with a moderately cold stimulus. He thinks that the failure of previous investigators to observe this phenomenon is due to the fact that they have used stimuli that were too cold, the cold acting as an inhibition on the warmth nerves.

Rubin (20) also notes paradoxical sensations of warmth. In general the results of the experiments reported in his article lend a support to the Weber theory of temperature sensation. This theory holds that sensations of warmth and cold are conditioned by a rise or fall in the temperature of the skin. By stimulating a small por-

tion of the skin with a carefully regulated stimulus, Rubin finds that a sensation of temperature results only as long as the temperature of the skin is changing. The Weber theory, however, meets its greatest difficulty in cases of long-continued cold or heat. The hand exposed to the freezing air feels cold for a very long period. According to the Weber theory the skin must be changing in temperature during all this time. To test this, Rubin had the subject bare his arm in a cold room. A thermometer, fastened to the skin gave a pretty good rough estimate of its changes in temperature. The experiment lasted from 40 to 60 minutes and the thermometer recorded a decrease during all this time. Moreover, the greater the drop in temperature during any period the more intense were the cold sensations experienced. Other sensations—those of dull pain and stiffness—were also experienced, and the author thinks that in ordinary observation these are not distinguished from cold.

The influence of different skin temperatures upon the pressure sense is investigated by Godefroy (11). His experiments take their departure from a statement made by von Frey to the effect that temperature had very little influence upon the threshold for pressure. The method followed was to keep the hand of the subject immersed in water of the desired temperature, and to determine the threshold for pressure of a certain spot at different temperatures. The spot to be investigated was previously marked, and the hand was held in such a way that the spot lay just beneath the surface of the water. The results show that temperature has no effect upon the sensitivity of the spot itself, but that it has an effect upon the sensitivity of the skin immediately surrounding it. Thus, if the stimulus is fine enough to affect the spot alone, there will be no change in the threshold with different temperatures; if, however, a coarser stimulus is used, it will cover more than the spot and the threshold will be affected. This result seems to reconcile von Frey's statement with the common observation that our hands are less sensitive to touch when they are cold than when they are warm.

Babák (2) contributes a comparative study. He found in earlier experiments that a decerebrated frog breathes with great regularity as long as it is undisturbed, but that any disturbing stimulus will effect a change in the rate of respiration. He now uses the changes in rate as an indication of the frog's sensitivity to warm and cold. As stimuli he used radiant heat and cold, a thermoæsthesiometer being held 1 mm. from the frog's skin. The radiant form of stimulus was preferred because contact would give vitiating sensations of

pressure. Results showed that warm stimuli cause a marked increase in the rate of breathing. Cold, on the other hand, causes a decrease. For purposes of comparison special experiments were made with the same stimuli upon human subjects. The stimuli which had produced such marked changes in the frog's respiration were scarcely sensed by the human subjects. The author regards the "polarity" of his results—that warm and cold produce opposite effects upon the breathing reflex—as of great theoretical importance. He thinks it is evidence in favor of the theory that warm and cold processes are qualitatively different.

A very thorough study of cutaneous after-sensations has been made by Hayes (13). Eleven forms of stimulus were used, all of which produced very definite after-sensations in a large percentage of cases. A clear distinction between primary and secondary after-sensations is maintained throughout. A primary after-sensation is a sensation which persists after the stimulus has been removed, a secondary after-sensation is one which reappears after an interval during which there is no sensation. The secondary after-sensation does not occur as frequently as the primary, and when it does appear it is usually preceded by the latter. A secondary after-sensation sometimes differs in quality from that aroused by the original stimulus, but ordinarily it is the same. It is impossible to summarize the numerous particular results obtained, and they can be appreciated only by reference to the original article.

The results of Kiesow (14) have already been published in German, and were reviewed in the BULLETIN last year. Chinaglia (8), who was one of Kiesow's subjects, makes a preliminary report of an investigation growing out of Kiesow's. This was that flat, hollow objects, such as rings and triangles, when laid upon the skin were subjectively filled out so that they appeared continuous. Chinaglia finds that the phenomenon disappears when figures of greater size and weight are used. A pointed stimulus applied to the skin within the border of the figure will be localized somewhere outside it. If the skin is explored with a blunter stimulus this will be correctly localized. Another study along somewhat similar lines is made by Arps (1). He finds that when stimuli of some temporal duration are used, one sensation has an assimilative effect upon another. A normal stimulus of constant objective intensity seemed subjectively to vary in intensity with the varying comparative stimulus. No such effect could be found when stimuli of momentary duration were used.

Before closing the account of cutaneous sensation mention should

be made of the work of Kiesow and Ponzo (15), although it has to do more with reaction-time than with sensation. Ponzo (19) reports two new pieces of apparatus. One of these is an improved æsthesiometric compass, the other is his "dermocalimeter" which measures the direction as well as the amount of error in point-localization on the skin.

Kinæsthetic Sensation.—Three studies on the sensation of movement have appeared during the year. That of Erismann (10) undertakes a thorough investigation of the sources of error in experiments of this sort. It addresses itself further to the solution of two chief problems: (1) to investigate the difference-sensitivity for active and for passive movements and show their relation, and (2) to ascertain whether, in comparing two extents we depend essentially upon the times necessary to perform them. With regard to the first point he found that the difference-sensitivity for active and for passive movements is about the same. If anything, greater sensitivity is to be found in active movements. As for the second point, spatial estimates are influenced only slightly by temporal considerations, this influence being perhaps a little greater for passive than for active movements. In connection with the latter point, the work of Störring (21) is interesting. He found that the subjects fell into two classes. Those who depend in their estimation chiefly on visual imagery and the position of the hand were not influenced by the rate of speed at which the stroke was made. On the other hand, the subjects who made their estimation on the basis of the movement sensation itself were influenced in this way. Störring also makes a determination of the lowest threshold for movement. For this experiment he devised a very sensitive piece of apparatus which would measure movements of 1/600 of a degree. Using this apparatus he found that horizontal movements of the elbow-joint could be sensed when their amplitude was no more than 1/200 of a degree. Hitherto the smallest threshold has been that of Goldscheider, which was about ½ of a degree. Störring thinks that his smaller result is due to the fact that in his experiments pressure sensations were not eliminated, and that these gave the subject his perception of movement.

Winter (23) is chiefly concerned with the question of whether the sensation of movement is derived from the muscles and tendons or from the joints. He determines the limen of movement at four different speeds and with the arm held so that the elbow-joint makes different angles. He also uses the electric current and ether for

anæsthetizing parts of the arm. Anæsthetization of the joint produces little if any effect upon the limen of movement. The angle at which the arm is bent in the experiment is found to have a great influence upon the limen. As this angle has a great effect upon the shape and position of the muscles and tendons, and very little effect upon the joint's action, it points toward the conclusion that the muscles and tendons are the seat of the sensation. This conclusion finds further support in the fact that anæsthetization of the muscles raises the limen more than anæsthetization of the joint. Allied to these investigations of the sensation of movement is the work of Ducceschi (9). He has discovered the little end-organs of Ruffini in the tongues of birds. His morphological conclusions do not concern us here, but his conclusion as to the function of these bodies is interesting. The first indication of this he found in the fact that the bodies are present in large numbers in the tongue of the parrot, but almost entirely lacking in the chicken's tongue. The parrot's tongue plays an important part in the process of eating and the chicken's a very minor one. The author is led to the belief that these bodies are the end-organs for the sense of movement. This view is further supported by other considerations, the most important one being that in the higher animals these bodies are present in greatest number in the connective tissues between the muscles, and in the periosteum.

Organic and other Sensations.—Cannon and Washburn (7) outline at length the two theories with regard to the sensation of hunger. One theory holds that it is a general sensation with a local reference, the other that it has a local peripheral source. Their own experiments support the latter view, showing as they do that the sensation of hunger is accompanied, or just preceded by a strong contraction of the stomach. These contractions were recorded directly on a smoked drum. Washburn, who acted as subject, accustomed himself to swallowing a rubber tube, to the end of which there was attached a small rubber balloon. He did this every day for several weeks, keeping the tube in about two or three hours each time. When he had grown quite accustomed to it the experiments were made. The balloon was inflated inside his stomach, and the end of the tube was connected with a water manometer provided with a float recording-device. Whenever the subject stated that he experienced the hunger sensation, powerful contractions of the stomach were invariably recorded. The contraction always coincided with the reported sensation, but came a little before it. This is taken as evidence that the contraction is the cause of the sensation. The intermittent char-

acter of the hunger sensation which psychologists have noted is explained by the periodicity of the contractions.

Neumann (18) recurs to the question of the sensibility of the inner organs in some experiments performed upon dogs. These form a continuation of his previous work with frogs. He succeeds in arousing pain reactions by pinching the intestine between the fingers and by stretching it. He also reaches further conclusions with regard to the distribution of nerves from the sympathetic system to the viscera.

Beck (5) reports a study of the static sense of deaf-mutes. In an investigation of thirty young deaf-mutes and an equal number of normal children he finds that the inferiority of the mutes shows itself only under artificially arranged conditions. As long as they have their eyes open they can balance as well as normal children. He had all the children perform various balancing feats blindfolded. It then appeared that the mutes were very much inferior to the normal children, and that the percentage of failures is great in proportion to the degree of deafness of the individuals. He also tested the mutes for their orientation in the water, and found that most of them were able to dive and swim perfectly well with their eyes blindfolded. Among those who did this successfully were some whose vestibular apparatus would not respond to the *Drehstuhl* experiment. These facts contradict the statement often met that deaf-mutes lose their orientation in the water.

Mann (16) describes the vestibular reactions that occur when a galvanic current is passed through the head from ear to ear. The functions usually attributed to the labyrinth are augmented on the cathode side and decreased on the anode side. One of these is bodily tonus. This does not manifest itself in a sinking or relaxation of one side of the body, but if two equal weights are held one in each hand, that in the hand on the anode side will appear heavier than the other, owing to the greater innervation necessitated by the decrease in tonus on that side.

Camis (6) shows that extirpation of the labyrinth on one side in rabbits, cats, and dogs, produces the same effect upon certain reflexes —pupillary, vaso-motor, etc.—as the severing of certain sympathetic nerves. Maxwell (17), experimenting with the horned toad on the turn-table, finds that its compensatory movements are not affected by a change in the distance of the animal from the center. With the same rate of rotation the compensatory movements are equal in extent whether the animal is 25 mm. or 300 mm. from the axis of

rotation. But if the animal is kept in the same place and the rate of rotation increased, the compensatory movements become greater. Thus, they are excited not by the centrifugal force, but by the angular velocity.

Two authors have attacked the question of sensations of tickle. Basler (3) finds the relation between the weight of a stimulus drawn across the skin and the intensity of the sensation of tickle aroused. There is a certain range of weight within which stimuli arouse maximum tickle sensations. If the stimulus is increased beyond, the sensations of tickle decrease, until finally only pressure sensations remain. His second article (4) is simply a continuation of the first, reporting experiments in which the method was applied to the sole of the foot. Basler is led to the conclusion that the end-organs for sensations of tickle are localized both in the skin and in the deeplying structures. Thöle (22), producing anæsthesia of the cord by injection of stovain and cocain, finds that sensitivity to itch disappears just before sensitivity to pain, and regenerates just after pain. Tickle bears a similar relation to touch. He concludes from his observations that itch is due to a partial arousal of pain fibers. Tickle is related to touch in the same way.

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PSYCHOPHYSICAL MEASUREMENT METHODS

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The relation between the method of just perceptible differences and of constant stimuli is one of the most disputed problems of psychophysics. It has been shown that both methods give the same result, if the calculations are made on the same material, while the results differ if the material for the method of just perceptible differences is collected in the traditional way. The reason is that in these experiments the subject almost unavoidably obtains some information as to the objective relation of the stimuli, while all such information can be withheld in the method of constant stimuli. The attitude of the subject in the two methods is different and one must not expect that the results obtained under different conditions should be directly comparable. Fernberger (2) raised the question whether the experiments for the method of just perceptible differences could be performed in such a way as to prevent the subject from obtaining

any information of this kind and succeeded in doing so by mixing them up among those for the method of constant stimuli. He experimented with lifted weights, keeping the subject always completely uninformed as to the objective relation of the stimuli to be judged. His results warrant him in saying that under these circumstances there is no significant difference between the results of the two methods. On account of the large number of experiments performed Fernberger had an opportunity to study the effect of practice in psychophysical experiments. In an unpracticed subject the change is at first progressive, but after a rather great number of experiments (about 400 with each comparison stimulus) a stationary condition is reached and the results vary in the same way as those of a subject who had considerable practice at the start. This seems to restrict the use of the method of constant stimuli for anthropological research, owing to the impossibility of making the large number of experiments necessary to reach the maximum of practice.

The interest in Weber's law does not flag, as is seen by the papers (3) and (4). Groselj starts from the distinction between distance and difference (*Abstand*) and gives an interpretation of the logarithmic formula similar to the one offered by Meinong. He sees in Weber's law an abstract principle which is not impaired by any exceptions: it would retain its value even if it did not hold exactly in a single case. This view is quite frequently found among Austrian psychologists. Henri and Larguier des Bancels discuss Weber's law with reference to animal psychology. It does not seem that abstract discussion will advance the problem considerably. This so-called law is an empirical proposition and one ought to begin by collecting a large empirical material and by finding out the real facts about it.

Lipps (5) criticizes Wirth on two grounds, first for supposing that there are limits outside of which the judgment never varies, and second for not taking into account that the upper threshold can not be smaller than the lower threshold.

Lorenz's paper (6) shows how the psychophysical methods work in actual application. He studies the influence of different distributions of attention on the estimation of the length of lines shown to the subject by means of a tachistoscopic arrangement. The subject had to direct his attention to one of the several pairs of comparison stimuli exposed, but judgments had to be given on all of them. The results are treated by Wirth's formulæ for the method of constant stimuli and show very characteristic variations in the values of the quantities h and S.

Stephanowitsch (7) studies the method of mean error. Müller's criticism of this procedure is that it is not sufficiently well defined, since one does not know by which steps the value of subjective equality was reached. It may be suspected that certain values of the comparison stimulus occur more frequently than others do. Stephanowitsch experimented with straight lines, requiring the subject to make a variable line equal to the standard. Hitched to this instrument was a graphical recording apparatus which showed the length of the lines which in the course of an experiment actually were compared with the standard. It is found that the subject judges small differences much more frequently than larger ones. Another series of experiments serves for the comparison of this procedure with the method of constant stimuli. The experimental arrangement is very clever but the paper is written so carelessly that one can hardly rely on any one of the conclusions.

Thomson (8) takes up the study of the method of groups as described by Stratton and W. McDougall. Using the notion of the probability of a judgment, he arrives at formulæ which are analogous to those for the method of just perceptible differences. These formulæ are tried out on a material obtained from experiments on tactual sensations, and compared with those for the method of constant stimuli. The coincidence is satisfactory, from which it follows that the method of groups is a real psychophysical measurement method. Thomson then proposes a new form of the totalling process in the method of constant stimuli, which seems to be a correct consequence of the definition of the threshold. Suppose that 56 heavier judgments were given in 100 comparisons of 100 and 102 gr., and 73 such judgments in 100 experiments on the comparison of 100 and 104 gr. The threshold has been examined on 200 occasions. In 73 cases it was below 104, and in 57 cases below 102 gr.; if, however, the threshold is below 102 it also is below 104 gr., from which it follows that the total number of cases in which the threshold was below 104 gr. is in these 200 experiments $57 + 73 = 130$, and the relative frequency is $\frac{57 + 73}{100 + 57} = \frac{130}{157}$. It is shown how these numbers are calculated in the case of a larger number of comparison stimuli. The end of the paper contains a very interesting study of the variations of the sensitivity during a sitting, by a novel procedure.

Thomson's paper is very significant in several respects. Experimental psychology and anthropology use a great many procedures which can by no means be classified among the old psychophysical

methods. The method of groups is one of them and it has done excellent service, but it has found practically no recognition in the books of Müller, Titchener, and Wirth. A conscientious methodology ought to take up every one of these processes separately and make it the object of a special study such as Thomson's of the group process. His new totalling process at first sight seems merely to be interesting. A little consideration, however, shows that it has far reaching consequences, although not pointed out by Thomson. There does not seem to be a fault in the argument by which the relative frequencies are determined that the threshold will be below a certain value. From this it follows that these numbers, and not the relative frequencies of the different judgments, have to be used in the formulæ deduced from the old notion of a threshold. It has been shown before that the notion of a threshold is useless, because all the problems of psychophysics can be solved without it, and it now is seen that this notion also is misleading.

My paper (9) contains tables which serve the purpose of facilitating the calculations in the method of constant stimuli. The older treatises presented this method without any regard for its practical use, the consequence being that it was entirely unpractical owing to the long and tedious computations, which not only required much time but also a good working knowledge of the method of least squares. It is necessary, in order to make this a real working method, to eliminate all cumbersome calculations and to avoid involved mathematical reasoning. These tables are the result of my efforts in this direction and it seems that they leave little to be desired. The computation for one set of data, a "*Vollreihe*," takes on the average not more than 25 minutes and I have seen sets worked out in less than 15 minutes. The little book (10) gives these tables and some practical hints on working out data, when these tables can not be used. It is important to notice that the tables can be used only when the comparison stimuli are equidistant, which shows the importance of a careful selection of the intervals.

Reference (11) is a critical review of W. Wirth's textbook on psychophysics. In so far as the practical application is concerned our agreement is almost complete and differences of opinion exist only in regard to the following points: (1) The notion of the threshold, which I consider as a useless and inconsistent hypothesis; (2) the value of the ideas of Bruns, which I consider entirely unpractical on account of the cumbersome computations required, which are not offset by any advantages to be gained; (3) the definition of the

point of subjective equality, which Wirth does not base on empirical evidence; (4) the method of just perceptible differences, to which Wirth attaches very little or no value, while I must insist that this method has stood the test of practice and can not be discarded by purely theoretical considerations. The last point is very briefly dwelt upon, because my intention is to make it the object of a separate study.

Wirth (12) takes up the definition of the point of subjective equality. The paper is chiefly of a mathematical nature but not void of interest for a reader who is thoroughly familiar with the ideas of Bruns. It shares however the weakness of all papers which make use of the propositions of the "*Kollektivmasslehre*." A great variety of formulæ is given, but no reason is advanced why any one particular formula should be used. Wirth believes to have reasons why my definition of the point of subjective equality (*i. e.*, the stimulus on which greater and smaller judgments appear with the same frequency) should be given special prominence, but his arguments do not seem sound. According to his principles he should have merely said that it is one of the many possible definitions of this quantity, which happens to be distinguished by certain interesting properties. He fails to see that the definition of the point of subjective equality must contain an empirical element and that mathematical speculations can decide nothing about it. A result of historical interest is the close relation which Wirth finds between certain of his formulæ and Fechner's old method of right and wrong cases. Wirth's second paper (13) contains a discussion of Lipps's theory of mental measurement.

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AFFECTIVE PHENOMENA—EXPERIMENTAL

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Weld (4) publishes the results of experimental work on musical enjoyment. Plethysmographic and pneumographic records were taken. Phonographic reproductions of various compositions were used. Normal curves were taken, then the music began and lasted about five minutes. Afterwards the subject gave a careful introspection.

The music was almost always accompanied by decrease in the volume of the arm. The plethysmographic curve fluctuated with the state of attention, and the author thinks the reaction is really due to attention. The heart rate became accelerated regardless of the character of the music. Respiration conformed to the phrasing when attention was directed to the phrases. The most usual effect on breathing was to make it irregular and in some subjects it varied in rate and depth with the changes of the music.

For the majority of observers, the most important factor in musical enjoyment is the motor reaction, real or imaginal, including adaptation to the *Takt* and to the larger rhythms, mimetic movements and movements corresponding to changes in pitch and intensity. Of less importance is the play of visual imagery determined mostly by these motor responses. Other observers derive more enjoyment from the intellectual analysis of the musical structure, mostly on the basis of auditory imagery. Music cannot convey the same imagery to all observers. Besides pleasantness-unpleasantness, the music directly arouses feelings of excitement and repose, depending on the character of the rhythms, length and pitch of notes and use of major or minor keys.

The Leipzig laboratory has furnished two articles. Sartorius (3) reports on the feeling character of a succession of two chords and the effect on respiration and pulse. The chest breathing and the radial pulse were recorded. Each test consisted of a normal period followed by a succession of three pairs of chords with a short interval of time between each pair. An introspective description of the experience and comparison of the three pairs was then taken. After a discussion of the introspections, the author concludes that the feelings described are complexes according to the Wundt tri-dimensional theory, each dimension representing a manifold of qualitative variations. A noticeable feature which is emphasized is the mixture of opposite qualities, such as excitement and repose, in one experience. A few extracts from the records are reproduced, though they are too short to give the reader a satisfactory perspective. The pairs of chords usually lasted from two to four breaths. Tables are made in which the tests are grouped according to the feeling complexes present and for each there are given the variations from normal in length and depth of breathing, in the ratio of inspiration to the total breath ($I : L$), in the ratio of the depth at the middle of inspiration to the total depth ($Hi : H$) and in the similar ratio for expiration ($He : H$).

The author concludes that for excitement there is shorter and deeper breath, increase in the ratios $I : L$ and $Hi : H$ but not in $He : H$. Repose gives relatively little decrease in length and a shallower breath, decrease in the ratios $I : L$ and $Hi : H$, and increase in the ratio $He : H$. Disagreeableness is characterized by decrease in all factors. With strain there is increase in the ratios $I : L$ and $He : H$ and decrease in all other factors of respiration; in some cases there is decrease in all factors. Excitement tends to give a faster and higher pulse beat, repose the opposite. The conclusions are not very obvious from the tables; with such mixed conditions one can prove too much. One is bound to ask whether in making the classification sufficient care was taken to prevent any suggestion from the organic expressions.

Westphal (5) assumes the truth of the tri-dimensional theory of feeling and a corresponding system of organic expression taken from the rather conflicting results of previous work in Leipzig. He studies the process in a simple form of choice reaction and attempts on the basis of physiological expression to prove the emotional theory of will. Records of breathing and pulse were taken and tables were made showing statistically the number of cases in which there was an increase or decrease in the length and depth of the breath, in the

inspiration-expiration ratio, and in the heart rate during the successive periods of the reaction. He concludes that in the period just preceding the signal to react, strain dominates; after the signal, excitement rises in importance. The feeling of activity up to this period is then composed of strain and excitement. After the act we get a feeling of fulfillment and satisfaction, composed of relaxation and repose. Excitement has the greatest expression-valence. To an outsider there would seem to be nothing but a brief restriction of breathing with the attention to the awaited signal, a release from this afterward and accompanying effects in the pulse.

Kläsi (1) took records of the association times and accompanying psycho-galvanic reactions for a series of words. The tests were repeated with each series three, four or five times with five minute pauses between. It was found that in seventy-two per cent. of the cases a stimulus that gave a galvanic reaction larger than the average in the first test also gave a relatively large reaction in the repeated tests. The author thinks the intellectual side of the association process could not vary in this regular manner and the galvanic response must express the affective condition. If we consider other characteristics of a complex, such as lengthened association time, change in the association with repeated test, etc., we find that the more such signs are present with a stimulus, the greater the probability of an accompanying galvanic reaction which is greater than the average. The more often a test is repeated, the more seldom does a relatively large galvanic reaction correspond to a long association time. Usually a large galvanic reaction is followed by a relatively small one. The interpretation given is that the perseverance of the strong affect may prevent the proper comprehension of the later stimulus and interfere with the association process, which would give a long association time but would fail to arouse associations connected with new affects. The experiments reflect Jung's suggestions.

Roblee and Washburn (2) studied the affective value of different articulate sounds. They used nonsense syllables composed of an initial vowel and a final consonant. The syllables were pronounced with as uniform conditions as possible. The observer was asked to express a judgment as to agreeableness or disagreeableness by using the numbers 1 to 7 as usual. There were fifteen observers. The most agreeable vowels tested in this way were *ah* and *get*; the most disagreeable was *mud*. The most agreeable consonants were *l*, *m* and *n;* the most disagreeable were the gutturals *g* and *k*. There was

most disagreement concerning *fate*, *oi*, *oo* and *zh*. *Ai*, *hat*, *s* and *j* were neutral.

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AFFECTIVE PHENOMENA—DESCRIPTIVE AND THEORETICAL

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Among the general theories on this subject in the literature of the past year that of von der Pfordten (14) contravenes all commonly accepted notions by denying to pleasure and pain the character of feelings. According to him they belong to the psychophysical process of sensation; they are its "vital variable"; and *Unlust* differs from *Schmerz* only in degree. Feeling is central, psychical, related not, like sensation, to the organism, but to the "individuality," and is always attached to a complex of presentations, of which it is the "intensity." Feeling is one, an incessant connected stream in the ego, and of but one kind. It is not feeling, but the presentations on which feeling is projected which are joyous or sad. How these opposite qualities arise through relation to differing intensities of the same thing is not explained; indeed, the whole construction seems vague and arbitrary. Latour's theory (8), worked out in connection with problems of general philosophy, is that emotion, including pleasure and pain, expresses a relation of presentation to "will": emotion is aroused either by the success or apparent increment of will (volition, power or action), or, conversely, by the thwarting of will or the passage from more will to less. Taking into account the facts of illusion and simulation and properly interpreting its terms, this theory describes the general character of our sentiments and emotions fairly well. Whether it explains elementary sense-feelings is more

doubtful. The author aims at mathematical deduction and his treatment is accordingly abstract, reminding us of the discussions of the passions in St. Thomas and Spinoza.

Several writers express in more modern terminology the prevailing tendency to regard the affective life exclusively from the point of view of action. Whereas Latour takes as independently given facts instincts of conservation, of growth and of freedom, these being the foundations for his theory, Rignano (16) finds the basis of affective tendencies in the disposition of every organism to preserve its "physiological invariability," and hence to restore it when it is disturbed. If the enivronment is unyielding, a new optimum of condition may be established by adaptation. From this principle we derive directly a large number of particular tendencies, — needs, longings, attractions, etc. . The principle itself implies the capacity of the elementary states to deposit "specific accumulations," and is hence "mnemonic" in character, like habit in the nervous system. With the development of the central nervous system, specific accumulations in the brain may represent, and even be substituted for, those of purely somatic origin. Other affective tendencies are derived indirectly under the "law of transference"—the substitution of a part for the whole. Add intellect, and the number of affectivities which may be acquired by the indirect way of transference and combination is practically infinite. Ferrari's problem (7) is to find a "seat" for these affective tendencies. Following Mosso and others, he selects the sympathetic system, between which and the cerebro-spinal system he seeks to establish a functional dualism. There is thus an organic opposition between the life of feeling and that of intellect. Among the facts which more obviously favor this hypothesis is the protective character of the expressions of the coarser emotions. The theory of emotion is peripheral,—the emotional mechanism in the sympathetic ganglia is analogous to the action of the sense-organs. A distinction is drawn between the emotion, the consciousness of the emotion and the motor consequences of the consciousness. The hypothesis rests on physiological data admittedly obscure. Whether it would preclude the acquisition of new affectivities by means of the later developed system, as suggested by Rignano, is not quite clear. It is finally applied to such "subconscious" phenomena as elective affinities and other mysterious attractions and repulsions. Ribot (15) formulates the motor theory in general terms: the residua of affective states consist in isolated or associated tendencies. Specific conscious emotions are too fleeting to be organized. When they

pass, their only stable representatives are tendencies, movements. Pure affective consciousness is less a phenomenon than an epiphenomenon.

A case of one of those mysterious antipathies referred to by Ferrari, that of a man with an abnormal dislike for brown, is traced by Tait (18), by the method of free word-associations, to a strongly emotional forgotten experience in the individual's boyhood. Maternal love, in the development of which Rignano finds a strong support for his theory, is treated from the comparative point of view by Mme. de Maday-Hentzelt (10). Her study explodes a number of popular fallacies by pointing out the utilitarian, organic basis of this complex of instincts in animal life and by exhibiting the whole development, peculiarly enriched and modified in the human mother by social conditions, as still going on. Moll (13) finds love, the basis of which is the sexual impulse, physiologically and psychologically distinct from friendship, but admits the ambiguity of the symptoms in certain cases.

Several writers treat of æsthetic experiences. Bergson's now familiar theory of comic laughter (3), already examined in these pages (Vol. IX., p. 354), needs here only to be mentioned. It is in part accepted and in part criticized by Latour (8), who relates laughter, in terms of his own general theory, to "the recognized defeat of the non-ego in its aspiration towards being or fuller being." The most noteworthy contributions in this field are the articles by Döring (4) and Meyer (12) criticizing the *Einfühlungstheorie*. Döring objects to the term *Einfühlung* on linguistic grounds and both writers are agreed that, in the sense given it by Lipps, it expresses only a part of the æsthetic experience and is by no means, as claimed, its sole, or even its most fundamental, principle.

Baldwin (2), difficult and suggestive, as usual, traces the genesis of practical norms in a movement parallel to that which he had previously traced for the "synnomic" judgments of truth. The movement passes through a pre-moral, social, "syntelic" stage effected through the organization of interests. The main points are that objects of cognition are selectively determined by motives of interest, that affective states are revived and recognized, but have no direct confirmation in their simple, ungeneralized form beyond the mind of the individual, and that an "affective general" is progressively organized in a mass of common interests by "ejection." Other processes are required to convert the social common into the moral imperative. A novel feature of the discussion is the comparison of

affective and theoretical implication under the logical categories. Affective universality, it is observed, is reached by other means than implication and inference.

Wallis (20) cites a multitude of illustrations from savage life in support of the thesis that fear in religion is originally the subjective counterpart of the element of the unusual, or apparently uncaused, in the sacrosanct. Leuba (9) points out that though fear is the most conspicuous emotion in primitive religion, it is not the only one. Religion originates in the response, in a particular situation, to a sense of the presence of an invisible being. The emotion, accordingly, may vary with the situation; it may even approach the tender emotion, into which, indeed, fear passes, as religion develops, through the intermediate stages of awe, reverence and sublimity. The place of fear in primitive religion is due to the fact that it is the first of the well-organized emotional responses and biologically at first the most valuable. Segaloff (17) interprets the ecstatic states observed in certain mystical sects of Russia as a relapse to more primitive conditions when concentration of the psychic activity on a single point was valuable in the struggle for existence. The mental character of the religious ecstatics is infantile. But strong emotion, with restricted consciousness, is a powerful incentive to the release of the body's latent energies, and when a community is engaged in the struggle for existence it is important that there should be in it individuals ready to sacrifice themselves for its preservation in ecstatic self-surrender.

A protean variety of symptoms, ranging all the way from unconscious *malaise* to reasoned despair, are included by Tardieu (19) under *ennui*, and scarcely less numerous are its conditions. Its fundamental reason is "an appreciable slowing down of our vital movement." The malady is universal and irremediable; there are only palliatives. The author's pessimistic philosophy—life has neither basis nor goal—colors his descriptions. Dupuis (5) contests the views of Hartenberg and Dugas, the one that timidity is a phenomenon of hyper-emotivity, the other that it consists in an exaggeration of the need of sympathy. Neither view is borne out by the facts, and the first is open to the further objection that it is methodologically questionable to explain a predisposition to a certain class of emotions by the general property of "emotivity." Dupuis's own view is based on Janet's conception of psychasthenia; timidity is inaptitude to bring about the operations necessary to safeguard and enlarge the social ego. Babinski and Dagnan-Bouveret (1) in an

important article contest the theory which ascribes the origin of hysteria to an emotional shock. This theory, they hold, is due to the application of an imperfect method, that of interrogating the subject as to her past history. In opposition to this method of retrospection, the method of "prospection," *i. e.*, observing what follows when conditions that seem favorable to the development of nervous troubles are present or absent, shows no connection between nervous shock and hysteria. The cases cited are numerous and the authors make a skilful reply to objections. Their own conception of hysteria is that it is a psychopathic state exhibiting definite symptoms that can be reproduced by suggestion and abolished by counter-suggestion. The suggestions are sustained by systematized affective states, but emotional shock cannot of itself arouse the phenomena and is even opposed to their development and persistence.

To the above list of miscellaneous character must be added two contributions of historical interest. Ferber (6) criticizes Plato's doctrine of pleasure, which he finds inacceptable on both psychological and ethical grounds. Meier (11) gives an exhaustive study of St. Thomas's doctrine of the passions. His treatment differs from that of other commentators in paying special regard to the sources of the doctrine. He argues against the view which would assimilate it to that of Augustine rather than to that of Aristotle. Aristotle is Thomas's chief source, but he is so variously indebted that the study of him is peculiarly calculated to throw a flood of light on the doctrine of the passions from Aristotle down. Descartes's claim to independence is shown to be illusory; his doctrine of the passions is conditioned by that of Thomas at almost every point.

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ATTENTION—EXPERIMENTAL

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But three experimental articles upon attention for the year 1912 have been found by the reviewer. In the main, old questions are reopened and sometimes attacked in a new way.

Chronologically, the first article is one by Lorenz (2). His apparatus, an exaggerated tachistoscope, showed lines of variable length for an average time of 135 sigma. Sometimes one pair of lines was shown, again, two, three, or four pairs were exposed. The subject was asked to judge in each case which line of each pair was the longer. Later in the experiment more complicated figures were used.

He found that the accuracy of the judgment was dependent upon the number of pairs of lines simultaneously shown (decreasing with the number), upon the degree of similarity existing between the different objects in the visual field and upon the distribution of the attention. He finds that the decrease takes place in practically a

geometrical ratio, and in general the threshold is less when similar objects are used than with dissimilar ones.

The second paper, which deals with our old friend, the relation between attention and breathing, is by Suter (3). Two Lehmann pneumographs with Marey tambours gave records from the abdomen and thorax. Reading words, adding, memory tests and visual and auditory stimuli were the materials offered to attention. Six subjects were used, from each of whom care was taken to obtain normal curves.

As a result of the introspections, he concludes that there is a difference between concentration of attention and the strain of attention. With concentration, there may be no strain sensations. The subjects further differed as to just what ought to be called the strain of attention. Some meant by it attention accompanied by strain sensations, others a condition of strain of such a sort that it becomes observed by attention. He found that these strains produced a special influence on the curve of breathing.

The effects of attention upon the breathing curve may be summarized as follows: (1) The quotient inspiration/expiration is decreased. (2) In form, the inspiration and expiration curves become straightened. (3) The transitions from one to the other become more pointed. (4) The length of the breathing curve becomes shorter with a low degree of attention. (5) There appears also to be a decrease in the height of the respiration curve. (6) In extreme cases of inhibition of breathing, the height is reduced to nothing. The length reached a maximum, the duration of which corresponded with the experience, the quotient showed a minimum of zero and the form corresponded closely to a straight line. This represented the complete checking of the breathing and was possibly the sign of the best attention.

Feilgenhauer's paper (1) is on the rate of change of attention. In these experiments, the subject was in one room and the operator and noisy apparatus were in another. By this method, the investigator endeavored to get rid of the distractions which would otherwise be present. The auditory stimuli were produced by an electric spark in a light-tight box; the visual, by an electric spark in a sound-proof box which had a glass side; and the cutaneous by an especially arranged induction coil. The apparatus was so designed that the stimuli, *e. g.*, two visual stimuli, could be given at any rate of succession, or so that disparate stimuli, such as visual and auditory, could be given with any time interval between them. A mass of over 15,000 results yielded the following conclusions: (1) The smallest

active step of attention is 300 sigma. (2) The limits of the observable changes of attention lie between 262 and 394 sigma. (3) With the different kinds of stimulation there is no great change in these values, Only with a preceding optical stimulus there occurs an increase of 35 sigma due to the noticeable after effect of that kind of stimulation. (4) The shifting of attention from one stimulus to another is a smooth, gliding one if the stimuli belong to the same sense realm. With disparate stimuli it is more irregular and sudden. The smoothness is lacking. (5) The speed of the change of attention cannot be voluntarily accelerated beyond the degree mentioned above, but it can be voluntarily slowed. Nor is it possible to let attention wander with the greatest possible speed. (6) The speed of the change depends upon the personality of the observer. (7) The position of the optical stimulation, whether it was approximately at the primary position, or 35 degrees removed therefrom, had no influence upon the speed of the change of attention. It is independent of the visual angle by which the eye perceives the stimulus. Nor does the direction of the movement have any influence in the case of optical stimuli. (8) Increase in stimulation yields neither a quicker nor a slower rate of change. It remains constant with auditory and tactual stimuli. But a retardation occurs with visual stimuli. (9) Sickness and fatigue cause the rate of change to be slowed down somewhat. (10) Neither the best attitude nor the sharpest focusing of the most expert subject can make the change more rapid than normal for that person. (11) The accuracy of the judgment of the change of attention increases with an increase of the stimulus. (12) The accuracy of judgment is greatest with well defined tactual stimuli, least with optical, while the auditory stand in between. With stimuli in the same sense realm t is greater than with disparate stimuli. (13) The change of the attention given to disparate stimuli ordinarily follows at the same speed as it does with stimuli of the same sense realm. Since with optical stimuli there is a slowing up of about 35 sigma, therefore this same slowing up is also shown with disparate stimuli when the optical stimulus comes first. (14) The individual differences are more evident with disparate stimuli, and the accuracy of judgment shows greater variation.

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ÆSTHETICS

BY ETHEL PUFFER HOWES

An outlook on the accomplishments of the year 1912 (and, in part, of 1911), in the field of psychological æsthetics, discloses some clearly-marked tendencies. Probably the book of the year most interesting for its indication of these is the *Psychologie der Kunst* of Müller-Freienfels (20). He emphasizes the extraordinary manifoldness of elements in the æsthetic experience, and sets himself sturdily against all attempts to compress this manifoldness into a single formula. The various partial views masquerading as complete descriptions he refers rather to the numerous individual differences, amounting to fully defined types, in the enjoyment of art; the major interest and service of the book is in the enumeration, analysis and characterization of these, denoted as, for example, the sensory-visual, imaginative-motor, and so on. The second volume is devoted to an analysis and explanation of the forms of the work of art from the point of view of economy ("maximum of stimulation with the minimum of fatigue"), which aims to take account of all experimental results in the field. The author's opening definition of the æsthetic experience as self-contained, pointing to ends outside itself, and of art as that which in the realm of sight and hearing can be fixed in objective form; his polemic against the expression-theory of art and the *Einfühlung* (Empathy)-theory of æsthetic experience ("what one is for art-creation, the other is for art-enjoyment"), are of secondary interest to the general trend exhibited. This is the emphasis on the interest of individual differences to the psychologist in æsthetics, and the tendency to draw into the æsthetic net all contents of consciousness discoverable as accompanying the enjoyment of art.

That nothing is alien to the analyst in psychological æsthetics is further exemplified in the recent book and other articles of Utitz (25, 26), who indeed remarks that he is interested in a "general psychological characteristic" rather than in a final analysis of psychical structure-relations, and that, in general, æsthetics has far too exclusively busied itself with the pure æsthetic experience. Inasmuch as he sees in the *Funktionsfreuden* only an important accompanying effect of art, not its *Zweck*, and in the function-feelings in general not the constitutive nature of the æsthetic attitude; and as he explicitly notes the "*extra*-æsthetic" enjoyment, this rounding out of psychological material for the æsthetic experience has in it so far no confusion of distinctions. So much can hardly be said of

much of the literature on synæsthesia, and imaginal reactions to various forms of art (8, 19, 28). While not explicitly identifying them, these studies seem to lay emphasis on, and to tend to substitute, enumeration of gross associative factors for analysis of specific æsthetic experiences.[1] Whether tending to obliterate necessary distinctions or not, a widespread interest among psychologists in æsthetics in the accumulation of material in the outlying fields is to be noted. If much of this work seems to the reviewer like the tactics of a besieging army which should lay waste surrounding territory while avoiding the central fortress, it may doubtless be rejoined that such tactics are the necessary preliminary to a decisive engagement.

From the genial inclusiveness of these recent works, a plunge into Hamann's *Æsthetik* (12) is like going into a bracing cold bath. The aim of this little book, which professes to be but a Prolegomena, is the severe and systematic definition of the fundamental concepts of æsthetics, and there is something decidedly tonic in its sharp distinctions and divisions, and clear-cut reasoning, whether one follows them in full agreement or not. The constitutive marks of the æsthetic experience it finds in isolation, concentration and intensivation, the primacy being given to isolation; the argument connects this with a thorough-going interpretation of the concept of the disinterested in the æsthetic experience as it first appears in Kant. Among general works should also be noted the appearance of a second edition, bringing the material up to date, of Meumann's well-known treatise (17), and of an introduction to æsthetics by Lalo (14).

In a field already pretty well exploited, the new volume by Vernon Lee (15) might be characterized as "The Adventures of a Mind with the *Einfühlung*-Theory." The emphasis on the chronological determinations of the author's thought has however less interest for the student than the truly rich and varied chronicle of introspective observations by the collaborators, and by Vernon Lee in particular in the essay on "Æsthetic Responsiveness." Such spontaneous and vivid observations, whether or not couched in psychologically unassailable form, are a treasure-house of material and of suggestions for new departures. On the other hand, the author's explicit recommendations for experiment seem based on a somewhat uneven acquaintance with results already at hand. In professed parallel to a previous article by Vernon Lee on visual forms not intended to convey content, an article by T. A. Meyer (18) deals with the theory

[1] See R. M. Ogden on (27), in April, 1913, BULLETIN.

of *Einfühlung* in its application to such art forms as explicitly present themselves as expression of an inner activity. His conclusion is that complete *Einfühlung*, or Empathy, is the exceptional case, on the very limits of the æsthetic, while the real characteristic of the æsthetic state is freedom. *Einfühlung* can therefore not be adduced as the normal form of the æsthetic experience. Döring (7), also in criticism of *Einfühlung*, finds the original "*harmlos*" signification of *Einfühlung* as personification to have been merely a figure of speech, while Lipps's assumption of it as an all-explaining principle of æsthetic effect is unwarranted. In confirmation of his own "solicitation-theory" he cites Aristotle's principle of Katharsis. The theory of *Einfühlung* (Empathy) is in fact in the German literature of the year nowhere so favorably treated as in the warm, even eloquent appreciation of Basch (1), which may be recommended to the beginner as a clear and sympathetic presentment of the whole matter.

Turning to the treatments of special concepts in the field of æsthetics, we should expect the widest popular interest for Bergson's famous essay, "Laughter," in an excellent translation (2). The comic is something stiff, rigid, automatic, an excrescence on life, which should be kept plastic, consciously adapted to the requirements of every moment. As such conscious adaptation is social, so the automatic, unconscious, unadapted, is unsocial, and to this unsocial quality, laughter is the corrective. The comic is not fully in the æsthetic field, because of this ethical, practical interest. Art, on the other hand, is disinterested; and art, in general, and the drama, in special, contrast to the comic and comedy, give us life unveiled, untrammelled, individual—"offer nature her revenge upon society" (p. 159).[1] In apparent contradiction to this theory is the Freudian (3) attribution of our pleasure in wit to just the freedom it gives from social constraint on the primitive impulses; adding to this our pleasure in the economy of mental effort, and in freedom from the other constraint of logical thought. A reconciliation between these views is sought by Kallen (13) in the identification of the comic with "the frustrated menace in things, personal, social or cosmic, and of laughter with the explosion of relaxation and relief from tension before that menace."

A stimulating essay looking toward the definition of poetic *genres*, by Erskine (9)—would that all students of æsthetics were as clear on the necessity of definitions!—an ingenious reworking of the ever-fertile concept of "the disinterested," by Bullough (5), may serve as further examples of special studies of æsthetic concepts.

[1] See special review in this journal, 1912, 9, 354.

First in scientific importance for the field of psychological æsthetics is undoubtedly the book (22) in which Stumpf gives the results of his ethnological studies for the theory of the origin of music, with valuable criticism of the body of material in the field, and examples of primitive songs. This has already been the subject of an extended review.[1] In a later short paper with v. Hornbostel (23) he presents some special problems which the results already won from the phonographic reproduction of primitive and exotic music suggest to experimental psychology: the psychological possibility of scales of equal steps, like the Siamese; of extraordinarily complicated rhythms; of formulas for melodies which recall the arabesques of space-ornamentation and of the origin of parallel lines of melody in fifths and fourths among savages and Asiatic peoples with whom polyphonic music in our sense is unknown. An extended paper on "Konsonanz und Konkordanz" (24) leads to the redefining of fusion and consonance and the basing of "concordance" on the grouping of tones that are mutually consonant. "Konkordanz nennen wir die Eigenschaft eines Mehrklanges, die ihn zum Konkord stempelt, also seinen Aufbau nach dem Prinzip der Maximalzahl mit dem Grundton konsonierender Töne innerhalb der Octave in der Richtung von unten nach oben und nach der Rangfolge der Consonanzgrade" (p. 339).

We may also note a general work by Britan[2] (4) which speaks to the general reader, but seems not brought up to the point of interest to the student of advancing psychological theory; and an interesting study by McEwen (16) of the principles of shape in musical structure, which issues in a systematic discussion of the problem of phrasing in performance.

In the field of visual art the work probably lying nearest to the special interests of the psychologist is the second and enlarged edition of the well-known book of Cornelius (6), devoted to a detailed and widely-extended application of the basic idea of Hildebrand, of the necessary modifications of visual material to adapt it to our vivid and unified apprehension. In this connection may be noted special articles by Everth (10) and Gordon (11). Weisbach's (27) monumental volumes on Impressionism furnish to the psychologist a mine of æsthetic material, ranging from the prehistoric drawings of the cave-men to the modern painters, for a study of the effect on

[1] This journal, 1912, 9, 200.

[2] For my references to the books of Utitz and Britan I am indebted respectively to the review notices of J. Eichner in the *Zsch. f. Philos. u. phil. Kritik*, 145, 210 ff., and of H. B. Alexander in *J. of Phil., Psychol., etc.*, 1912, 9, 305.

representation of the artist's giving himself over to his individual impression; but "nur das Fernbild ist impressionistisch gestaltbar." For the next step, we may refer to Ogden's paper on "Post-Impressionism" (21).

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SPECIAL REVIEWS

PSYCHOLOGY OF RELIGION

The Meaning of God in Human Experience. A Philosophic Study of Religion. WILLIAM ERNEST HOCKING. New Haven: Yale University Press, 1912. Pp. xxxiv + 586.

No other recent work on the philosophy of religion contains, I believe, as many challenges to contemporary thought as does this looked-for volume by Professor Hocking. It bristles with dissent and paradox, sometimes in the Chestertonian manner, as when we read that "the church . . . is always right in claiming to be infallible. Any church which modestly declines such pretension . . . does thereby stamp itself . . . as fraudulent." But "what the church chiefly has to learn is not to be infallible in regard to *too much!*" The explanation of this paradox is that the book as a whole reasserts the idealistic metaphysic but endeavors to fill the ancient gap between "Idea" and religious experience. The inability of idealism to worship must be remedied, the author thinks, and for a remedy he turns, not to the pragmatic idealism of Royce and others, but to mysticism. From Plato down, idealism has often recognized its affinity with mysticism, but as often as the two have coalesced the specifically religious quality of mysticism has largely evaporated. Hocking's paradox with respect to infallibility is a reflection of his attempt to retain both the absolutist point of view and the particular qualities of religion.

My purpose in what follows is not to review the book as a whole, but to answer a single, limited question: What significance has this work for the psychology of religion? Hocking's desire to make idealism *seem* to be as concrete and religious as it has always *claimed* to be takes him, of course, into the field of psychology. Yet this statement will mislead unless I hasten to add that his point of view is the traditional one of metaphysical idealism: To think anything whatever is to think the Absolute; a "Whole-Idea" is the prius of all particular ideas; the only proof of any reality is the ontological (in some sense); the existence of God is certain because in knowing nature I am not alone. This is the ever-recurring point of view, whatever the immediate topic. But Hocking's effort to concretize idealism is original,

resourceful, and often racy. In distinguished degree he possesses the ability of the great idealists to detect subtle affinities, to dart shafts of light into long ranges of life, even to say the wise word.

Competently acquainted though he is with the data of the psychology of religion, however, he makes little attempt to use or to construct empirical generalizations in this field. Perhaps it is not unfair to say that his theory does not require many data, and that, indeed, whatever facts the psychology of religion might upturn in its researches, his central propositions would remain exactly as they are now and the grounds for them would be neither increased nor diminished! At two points, however, his argument has a psychological character. The first is his effort to rescue religious thought from what he regards as its present retirement into subjectivity. His chapter on "The Destiny of Feeling," in spite of its inadequate appreciation of the motor aspects of feeling, is a fine presentation of the idea-aspect. Feeling is, in part, pressure toward definition of a situation; as soon as the situation takes the form of clear idea the pressure is released. Religious feeling, accordingly, is not a substitute for knowledge, but a preliminary stage of knowledge. No doubt much current religious thought needs this correction. A doubt remains, however, as to the adequacy of Hocking's exposition. Granted that at the terminus of feeling we discover a definite idea that was previously obscure; does it follow that the definition of ideas is the function of feeling?

Again, one might look far before finding a more stimulating brief presentation of the idea-aspect of all valuation than the chapter on "Idea in Organic Union with Feeling." Hocking sums up his position in the proposition that all valuing "is a way of knowing objects with one's whole-idea." Though Urban is not mentioned, the contrast between the two points of view is obvious, and the issue is joined, as it seems to me, upon data that are susceptible of empirical analysis. A brief review cannot undertake to adjudicate this intricate question, but it is in order to ask whether to value is not to discriminate values; to organize them, therefore, and finally to assert some sort of finality or reality. If so, that which Hocking calls knowing with our whole-idea is a fact, whether or not his exposition of the fact is adequate.

The second point at which the interest becomes distinctly psychological is the incorporation of religious mysticism into idealism. To many this will look like another "retirement into subjectivity." Certainly the resort to mysticism in ages of criticism or "enlighten-

ment" must be so interpreted. But Hocking is interested in only a part of mysticism, its idea-side, where he thinks he finds objectivity and universality. Therefore he abstracts not only from all that is pathological or automatic, but also from all that is emotional or even historical. Now, because mysticism is intellectualistic, being an assertion of intuitive knowledge, it can fuse with the intellectualism of idealism. Both, moreover, seek their goal by negation of the finite. Hocking even praises the *via negativa*, which Inge, the most eminent advocate of Christian mysticism, regards as mysticism's chief fault. The consistency here is admirable, but let us see at what cost it is purchased.

The author undertakes to exhibit idealism and worship in continuity with each other. To this end he identifies worship with mystical experience. Apparently this confuses a species with its genus, but it at least awakens hope that we shall reach at last something concretely religious, some experienced content, or some way of meeting a particular situation that will demonstrate an idealistic heritage. What we are actually offered as the specifically mystical is only the form of the experience. This, of course, has universality, just as pure being and pure nothing have. "This is the chief part of the mystic knowledge which cannot be otherwise known, namely, that the mystic experience is possible." Just form, not content! It names itself Substance, and it claims to be self-contained, but it looks for its attributes elsewhere.

Why does Hocking assert so little for the mystical revelation? It is not captious to suppose that he is guarding against being "infallible in regard to *too much*!" He has seen that every specific item of any mystical deliverance is historically mediated just as opinions are. He avoids the pitfall into which several recent defenders of mysticism have fallen of seeking the truth of mysticism by abstracting its common elements. James, for instance, found great significance in the consensus of mystics the world over that they immediately know themselves to be continuous with a larger world, spiritual in nature and good in quality. But this is a dubious defense; it accepts a part of the mystic's revelation upon the mystic's authority, but rejects other parts (the details, such as Brahm, or suffering love) in pure arbitrariness. In the actual experience the details stand on exactly the same level as the generalization that is found in them.

Hocking is the first defender of mysticism, as far as I know, to accept the logical consequences of this situation. He goes back of *all* content to pure form. What this is we can see most simply by

asking what one remembers after coming out of extreme mystical absorption, that is, from a state in which the mental content is reduced to the lowest point consistent with subsequent recall. The answer that we obtain is that one was certainly in an objective world, though the details of it are (now at least) a blur. Perhaps we may say, then, that any experience that we can suppose to have occurred involves consciousness of an objective world. This is my own rather than Hocking's approach to the question, but I think it will indicate the psychological ground for his contention that the mystical experience reveals the general ontological background of all thinking.

The net result, then, of the appeal to mysticism is that individuals experience the real, that the duality of thought and reality is overcome, but that the reality thus revealed is only reality in general, the details of which must be ascertained by ordinary mental labor. This is the outcome of the effort to help idealism to worship. The specific qualities of religious experience remain just as remote from the "Idea" as they do in unadulterated Hegelism. They belong in the sphere of the fallible, as Hocking himself abundantly shows.

All that is really significant in the mystic experience, then, permeates life as a whole. It is present alike in the revealer, and in him who tests the revelation to see whether it be revelation indeed. It is present in all invention, even in the inventiveness whereby an induction arrives at its goal. To call this mysticism, or worship, however, is to use terms in a confusing way. Historically mysticism is an appeal from ordinary experience to a specialized kind of experience, from the man in the street to the specialist. The appeal, if we accept Hocking's position, breaks down by accepting ordinary experience as the final arbiter. It follows that we cannot define religion except by analysis and generalization. And, as to the meaning of God in human experience (as distinguished from the meaning in my experience), we must inspect the mean-*ings* that appear in the history of religion. Upon Hocking's own showing, then, a genetic psychology of religion might be useful in helping him solve his own chosen problem.

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A Psychological Study of Religion. James H. Leuba. New York, Macmillan, 1912. Pp. xiv + 371. $2.00 net.

Students of the psychology of religion have many years been hoping for a book on the subject from the pen of Professor Leuba,

who has contributed so much in the form of articles and monographs to the development of this branch of psychology. The book has at last appeared, the first of a proposed series of three. This fact must be borne in mind in judging the book, lest we criticize the author for leaving so many aspects of the psychology of religion untouched. The subtitle of this volume shows us the limit of its aims. It is a study of the "origin, function, and future" of religion; not an analysis of the religious consciousness. Such an analysis is to be the subject of the second volume as planned; while the third will deal with the dynamics of religious life.

The question of the origin of religion and its relation to magic can be understood only if we know pretty clearly what we mean by religion and what by magic. Religion, according to our author, is one of several types of human behavior, namely a subdivision of what he calls the "anthropopathic" type. It is of the same general nature as the attempt to influence the action of one's fellow—and differs from it only in being directed toward unseen and superhuman beings. Magic, on the other hand, is behavior of quite another type, namely "coercitive." It is based upon the belief that if certain actions are performed certain results must follow, without any intervention from any personal power and "in essential disregard of the quantitative relations implied in the ordinary and in the scientific dealings with the physical world." Leuba thus differs with Frazer in his view both of the relation of magic to religion and of the relation of magic to science. Magic, he insists, is *not* "primitive science"; science grows out of "mechanical behavior" and the observation of quantitative relations between events, and as far back as we can go is clearly distinguishable from magic. And, on the other hand, magic is neither the mother nor the daughter of religion. Religion presupposes the belief in personal powers who may be wrought upon by anthropopathic behavior (prayer, sacrifice, etc.); whereas magic, or at least most magic, is connected with the belief in an impersonal power (*Mana*, *Wokonda*, *Manitou*) which mysteriously permeates things and people and may be utilized in quite impersonal fashion.

Animism is thus accepted as the intellectual part,—*i. e.*, the *belief*,—of the earliest religion. And our author has an interesting chapter on the origin of this belief which should be read by everyone interested in anthropology. The view that he propounds may best be presented in his own summary: "1. Gods grew out of several different ideas of superhuman beings. 2. These beings had independent origins. 3. The attributes of the gods differ according to their

origin. 4. The historical gods are usually mongrel gods, the outcome of the combination of characteristics belonging to superhuman beings of different origins."

Professor Leuba's suggestion (not indeed entirely original with him) that animism had not one but many origins is so obvious—and so persuasive and useful—that it is a pity it was not publicly emphasized and generally accepted long ago. A great deal of good gray matter has been wasted in the effort to determine whether religion originated with dead ancestors *or* with nature forces—as if it could not have originated with both. And once this pluralistic hypothesis is adopted, we are enabled, as Professor Leuba shows, to understand the strange variety of primitive gods, which on the old monistic theory was very baffling.

As we turn from Part II., "The Origin of Religion and of Magic," to Part III., "Religion in its Relation to Morality, Metaphysics and Psychology," we seem to have come upon another book. Especially is this true of Chapter 11—the gist of which was presented by Professor Leuba at the recent meeting of the American Philosophical Association. Anthropology here gives way to theological discussion, and the style itself takes on a change and becomes frankly controversial. And here again Professor Leuba's views cannot be better presented than in his own summary:

"My task in this chapter will be to show: (1) That belief in the gods of religion and, indirectly, certain other fundamental doctrines, rest, as a matter of fact, upon inductions drawn from the "inner" life. (2) That religious experience ("inner experience") belongs entirely to psychology—"entirely" being used in the same sense as when it is claimed that the non-religious portions of conscious life belong entirely to science. (3) That since the gods of religion are empirical gods they belong to science."

To show the extent to which the basis of theological arguments has been removed from the outer world to the inner, our author presents us with nine exceedingly interesting documents, very typical of the present trend of the new theology, and demonstrating plainly that at least for the thinkers of the school here presented "belief in the Christian God rests no longer upon the wonders of the physical universe, nor upon metaphysical arguments, but upon certain inner experiences." This prefaced, he goes on to show that the data upon which this empirical argument for God is based belong entirely to the field with which the psychologist only is competent to deal. And there is no question how the psychologist must deal with them.

If the facts prove the conclusions of the theologians, they must do so either directly, by presenting the very realities in question such as God himself, etc., or indirectly by way of induction. That the experience of the mystic of or the convert is not an immediate presentation of God will be admitted by most theologians and cannot be maintained by any one who understands the difference between direct introspection and interpretation. Can we then prove the existence of God and the truth of the Christian doctrines by an induction from the facts? Not unless it can first be demonstrated that the facts in question are incapable of explanation on purely psychological principles. And as this can never be done, the argument of the theologians based on inner experience falls to the ground. From this the reader must not suppose that Professor Leuba is the foe of every form of religion or that he is holding a brief for naturalism. He is attacking here only one form of theology—the "empirical" variety—and vindicating the right of the psychologist to deal in his own way with all the facts of consciousness. His own philosophy, he assures us, is idealistic rather than naturalistic, and he believes in and hopes for "the Future of Religion"—to which, in fact, he devotes a whole chapter. And yet he is much too frank to leave the upholders of traditional Christianity under the impression that he is at peace with them. He would willingly believe in a spiritual and pantheistic power which men might contemplate and in that sense worship; but for a personal divinity toward whom one acts "anthropopathically" he has no place in his philosophy.

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DISCUSSION

LEFT-HANDEDNESS IN INFANCY

In a paper read at the last meeting of the American Psychological Association in Cleveland, Dec. 31, 1912, I made the statement: "The left-handedness of infancy is commonly enough observed but it is nevertheless quite generally disbelieved,—reasoned away by the very people who observed it." (Compare the abstract in PSYCHOLOGICAL BULLETIN, 1913, 10, 52. I should have made one exception, for Professor George V. N. Dearborn in his *Moto-Sensory-Development* not only reports the left-handedness of an infant, but also recognizes the theoretical significance of this observation. His statements on page 31 were written at the same time when I wrote my similar statements in *Human Behavior*, page 177, neither of us knowing of the other's view in this matter.

Professor Dearborn calls my attention to the following fact which is also very significant. The number of muscle fibers in the sartorius has been counted and found to be as follows:

	Left	Right
New-born (L > R)	120,745	113,304
Adult (R > L)	136,406	142,118

Can any one still believe that the left-sidedness of the infant is merely a "habit" accidentally acquired and later lost again? The left-sidedness of the infant is in every respect of the same nature as the right-sidedness of the adult.

In this connection I should also like to make the following explanation, called forth by certain remarks in the discussion following the reading of my paper. By "infancy" I mean what the word literally means, namely, the period preceding speech. This is the time, varying in different children, of the first six or twelve months. I never made any statement, as some of my critics seemed to believe, about any left-handedness characteristic of "childhood," for I do not believe that there is any.

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THE MENTAL IMAGERY OF THE BLIND

At the last meeting of the American Psychological Association Miss Fernald reported the results of her tests of mental imagery on two blind university students. Her conclusion (PSYHCOLOGICAL BULLETIN, X., 63) was: "So far as these two subjects were concerned, therefore, it appears that a decided positive emphasis on tactual sensory experiences during adult life was not effective in stimulating tactual imagery for the subject who was able to translate these into visual terms, while the subject who had no such resource used tactual imagery with readiness and success." Last year I had occasion to apply the form board test to a number of totally blind children. The results are of interest in connection with those secured by Miss Fernald, although it must be remembered that we used different tests and that my subjects were entirely unpracticed.

In the form board test, the child first explored the board with his hands, examining every recess and handling its corresponding block. He was then given three trials at taking the blocks from a pile and putting them into their recesses. Each trial was timed and a record taken of the number of errors or attempts at fitting blocks into wrong recesses. The results for the shortest of the three trials were as follows:

	Number of Individuals.	Average Age.	Average Time in Seconds.	Average Number of Errors.
Blind from birth	31	13	69	4.3
Vision lost before the age of three	32	15	52	3.8
Vision lost after the age of three	22	14	39	1.4

The table shows that the three groups were not equally successful in performing the test. The averages for those blind from birth were 69 seconds and 4.3 errors; for those who had lost vision before the age of three, 52 seconds and 3.8 errors; and for those who had lost vision after the age of three, 39 seconds and 1.4 errors. In other words, those who had had no visual experience at all showed the least ability, and the longer a subject had retained his vision the more successful he was in the test. From this one may conclude that they were assisted by the experience gained during their seeing life; that is, the success of the second and the third groups was due to something that remained from their visual experience. My conclusions, therefore, are: (1) those who have had visual experience retain their visual imagery and are assisted by it in the interpretation of their tactile

impressions; and (2) tactual imagery, even in those who have no other resource, is not as effective as a combination of tactual and visual imagery. The first agrees with Miss Fernald's conclusion, but the second restricts it to some extent.

R. H. Sylvester.

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Myers, G. C. *A Study in Incidental Memory.* (No. 26 of Archives of Psychology.) New York: The Science Press, 1913. Pp. 108.

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NOTES AND NEWS

Tenth Annual Conference of Experimental Psychologists.[1]—The annual Conference of Experimental Psychologists was held in the psychological laboratory of Fisk Hall, Wesleyan University, from Thursday afternoon to Saturday noon, April 10th to 12th. About

[1] This note has been kindly furnished by Professor W. V. Bingham.

thirty psychologists were present, representing twelve laboratories. The meeting was somewhat smaller, more intimate and informal than usual. The social features included a luncheon tendered by the University, a smoker in the laboratory, and a dinner at the hospitable home of Professor Dodge. The public was permitted to share in one event of the program, a most interesting address by Professor Münsterberg in which he gave an account of his recent investigation of the mind-reading of Beulah Miller.

As this meeting marked the completion of a decade since the first of these conferences was held, it was made the occasion for a survey of progress: in addition to the usual informal reports of current investigations, the directors of several of the leading laboratories gave résumés of what had been accomplished at their institutions during this ten-year period.

One session was devoted to the discussion of tests, their theory, value, and limitations; and one to current general problems, the most interesting of which seemed to be the practical problem as to the attitude the experimentalist should take toward the increasingly insistent appeals for applications of psychology to business, industry, vocational guidance, and so on. At this session also, a lively discussion was precipitated regarding the nature and limits of introspection. The hostility to an identification of psychology with "behaviorism" was surprisingly unanimous, possibly due in part to the inability of Professor Watson to be present to defend his recently announced position.

The equipment of the small Wesleyan laboratory was a continual source of interest and admiration to the visitors. Indeed, several of them expressed the desire that through some means, possibly through the appointment of an American Psychological Association committee on laboratory devices, clear and full published descriptions of such ingenious and valuable inventions as these of Professor Dodge, might be made available in convenient form, for the guidance of all laboratory workers.

The annual conference in the spring of 1914 will be held at Columbia University.

Professor Oswald Külpe has definitely accepted the call to the University of Munich, and will occupy the chair formerly held by Th. Lipps. Means have been provided for the establishment of a psychological laboratory which will be opened in the fall.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

EXPERIMENTAL PATHOLOGY OF THE HIGHER MENTAL PROCESSES

BY F. L. WELLS

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G. G. Fernald (5) publishes the results of a general series of mental tests with an unselected group of reformatory admissions, 100 cases. Most of the paper is devoted to describing the tests and the clinical records of the subjects; the data are fully presented, but only briefly worked out. The tests are denominated: (1) weight discrimination, a series of ten similar weights ranging from 54 to 86 gm. with 4 gm. differences, to be arranged in order; (2) extent of movement, by drawing a line equal to the extent of a movement made five or six times along a given scale; (3) the Holmgren wools for color-blindness; (4) maximum number of taps in 10 seconds, registered by plate, stylus and electric counter; (5) the so-called 3-hole test, one of motor accuracy, similarly registered; (6) a new test, termed achievement capacity, measuring the time the subject will stand on his toes, when told to do so as long as possible (a special recording apparatus is used); (7) a test of speed in the cancellation of a given numeral from a standard blank; (8) a calculation test, counting backwards from 31 by 3's (cf. the familiar "100–7"); (9) the association test of Kent and Rosanoff, evaluated according to the original procedure of these authors; (10) recognition memory, the selection of 10 previously seen picture-post-cards from a group of 20; (11) ethical perception, a series of questions in moral conduct, capable of *yes* or *no* answers; (12) ethical discrimination, a new application of the order of merit method, in which a series of described offences are graded in order of their gravity.

According to the objective quality of performance in these tests, the subjects could be ordered in a range from 1 to 100, and any further subject tested could be assigned to a proper place in this range, in respect to the traits covered by the tests. The object was to effect a clearer separation between responsible and irresponsible groups. As here employed, the tests which seemed to aid in this classification were those of weight discrimination, ethical discrimination, achievement capacity, extent of movement, recognition memory, calculation and cancellation; those which failed to justify themselves were color-vision, tapping, 3-hole, ethical perception and free association. Upon the basis of the tests, three groups were made. The lowest fourth are classified as defective, all of whom could and probably should be segregated. A second quarter are characterized as subnormal, but reacting well to reformatory discipline. The remainder, nearly half, are normal and responsible intellectually. There is much more in the data than the paper brings to view.

Mikulski (7) contributes an unusually clear account of some apprehension and memory experiments. The subjects were 12 normal (educated) and 8 pathological (mostly uneducated) individuals, the latter comprising 3 epileptics, 3 psychopathic personalities, and 2 hysterias, all women. The exposure apparatus used was the pendulum described by Kramer, the exposure time being 15 σ. It was not released by the subject, but by the experimenter after a 1-second "get-ready" signal. The stimuli consisted of cards upon which 3 rows of 3 letters each were typewritten. Only 100 different cards were used, the order being varied, and the letters were arranged to form, so far as possible, nonsense syllables. As noted, two sorts of experiments were performed with this material, in the first of which the subject reported "as soon as clearly perceived" (up to 2 seconds), while in the second set a period of 40 seconds elapsed before the report. Five experiments of 50 stimuli per subject were made of each set on alternate days. The subjects gave the name and position of each letter, and divided their responses into two groups, according as they had been sure of them or not. It was not found practicable to distinguish between certainty of character and certainty of position.

In the apprehension experiments is presented the average number of responses given by each subject, which in turn averages about 3.8 for the normal and 2.7 for the pathological, out of the possible 9. Not all, of course, were correct, the mistakes averaging 15 per cent. in the normal, in the pathological 19 per cent. It is not calculated, but stated that there is no correlation between the total efficiency and

the number of errors. Of the responses in the normal, an average of 90 per cent. was given as certain, of 10 per cent. as uncertain. The pathological subjects change these averages to 94 per cent. and 6 per cent. Of the certain responses, 89 per cent. were correct in the normal subjects, whereas of all responses, only 85 per cent. were so. In the pathological cases, 84 per cent. of certain responses were correct as against 81 per cent. of all responses. The feeling of certainty is thus very slightly more reliable in the normal than in the pathological cases. Among the uncertain responses 44 per cent. were correct in the normal, 33 per cent. in the pathological cases; the former are therefore somewhat more inclined to rate as uncertain, responses that are really correct. A general practice gain in the number of responses is present in both groups of subjects, the relative gain in the pathological subjects being here somewhat greater than in the normal, represented by 34.6 per cent. as against 27.5 per cent. The per cent. of uncertain responses was nearly unchanged by practice in the normal, but decreases by about one half in the pathological group. The uncertain responses become slightly more correct in the normal, no tendency appearing in the pathological group. The later portions of each day's series show some "warming up" gain over the earlier, not so clear in the pathological as in the normal subjects. The per cent. of uncertain responses is here also unchanged in the normal, and again decreases in the pathological.

The *Merkversuche* are similarly treated. The total number of responses averages higher than before, and so does the per cent. of errors, the figures being 4.3 and 17.7 per cent. for the normal, 2.9 and 20.8 per cent. for the pathological group. The per cent. of certain responses is slightly lower in both groups than for the apprehension experiments, the figures being 87.8 per cent. and 93.8 per cent.; the uncertain responses are thus more numerous than above. They are again fewer in the pathological group; *per contra*, these do not have so good a consciousness of the sources of error as the normal. The feeling of certainty loses in value through the pause, through factors that we do not perceive. Among the uncertain responses 46 per cent. were correct in the normal, 38 per cent. in the pathological; in each case correspondingly more than with the apprehension experiments. The practice effect is rather less marked here than in the apprehension experiments; the per cent. of uncertain responses, however, decreases very much with practice in the normal, less markedly in the pathological group. The "warming up" phenomena within the series are but little if at all, in evidence with either group; the ratio of uncer-

tain responses behaves in about the same way as in the apprehension experiments.

Two articles, covering much the same ground, are published by Bischoff (2, 3) regarding a special method for the clinical observation of memory. It is based upon a procedure described at the instance of Bischoff by Vieregge[1] some five years since, concerning the number of heard figures that could be correctly reproduced at once, after one minute, and after one minute with distraction. The series used (and quoted) vary in length up to twelve figures, and a standard rate for enunciating them is given. The digits are not, however, given separately, but in notational sequence, *i. e.*, not 5, 2, 6, 9, etc., but five million two hundred sixty-nine thousand, etc. This way is more difficult, but actual comparison seems to show its greater reliability. The subjects are then less likely to use different methods of grouping the stimuli. The more complex question presents itself of whether one should work down from too difficult series or up from too easy ones. The author takes two points, the largest number always repeated correctly, and the smallest number never repeated correctly, and plots the curve between them. Testing with ten normal subjects, the first of these quantities is found to range between 3 and 6, the second between 6 and 11, out of ten trials for series of lengths up to 11. Somewhere in the range between the two quantities is to be found the point to serve as the standard for memory capacity. If now the series are given beginning with the largest, the effect of practice is not so pronounced, and the tests are more reliable, with smaller variations. This procedure is therefore the one recommended. Attention is called to the desirability of making the tests as expeditiously as possible, and of giving warning signals before the beginning of each series. Visual exposure was used in testing the retention of the stimuli, the number retained at intervals of immediacy, 5 sec., 15 sec., 30 sec. and 60 sec., being 40, 49, 54, 48, 38. A convenient method for distraction during the interval was counting backwards from 200 to the beats of a metronome, but an interval of not less than a minute should be used for such experiments. If a one digit stimulus cannot be correctly reproduced at the given interval, the result is stated in terms of the longest time in which it can be. The other paper, though very brief, reproduces some interesting additional data, discusses further the detailed nature of errors, and gives perhaps the better general orientation in the problem.

Upon this procedure Peters (8) bases one of the most extensive

[1] *Allg. Zsch. f. Psychiat.*, 1908, 65, 207–239.

studies of memory in general paralysis that we have. The only important differences of experimental routine were that the subject always gave at once what was remembered, whether or not it was to be repeated after a pause; and that the counting was discarded as being not a distraction but an interference, repetition of foreign words being substituted. A somewhat exacter method of evaluation is also sought for. Of the 68 cases of general paralysis in the institution on September 30, 1911, 13 were too demented to be available, 4 failed to coöperate, and the results discussed are gathered from the remaining 51.

The experiments in immediate memory the author designates by *A*, those with the one-minute pause by *B*, those with the one-minute pause and distraction by *C*. The general average efficiency of reproduction in the *A* experiments is 3.9 figures, about half of the normal according to Vieregge. Ten patients were unable to reproduce even a single figure after the pause of the *B* experiments. For the remainder the corresponding average is a retention of 2.7 figures, for all, 2.2. In the *C* experiments 22 patients retain nothing, the comparative average of the remainder being 1.7 figures, for all, .96 figure. Between these different capacities there is not sufficient correlation to make them estimable one from another; the *B* and *C* experiments have quite poor records, with good ones in the immediate retention. It was especially the distractible and inattentive cases who contributed to this latter result. Sixty-two per cent. of the cases had been under observation for a year or more; of six groups of cases, the first in memory was the fourth in length of hospital stay. There is little relation between the quality of performance and the length of time in the hospital, manifesting the varying rates at which the disease progresses. For measuring the progress, however, the method seems to have special value, particularly the distraction feature.

The localization of the errors is studied. In the five successive memory series given, the *A* experiments show a consistent increase in the errors from first to last, a manifestation of the well-recognized fatigability in this disorder. It is not the case with the *B* experiments, where there is an alteration of few and many errors, perhaps showing periods of recovery. The *C* experiments show an increase of errors in the later series, but by no means so marked as the *A*. The second in order of the experimental series shows some decrease in errors, which the author attributes to a more or less conscious failure to coöperate in the conditions of distraction. There is also calculated the per-

centage of errors affecting the units, tens, etc., places in the single series. The hundreds and units places suffer the most, the tens, which come at the end of the series, rather less.

Among the different types of errors, the omissions are the more frequent in the *A* experiments, least in the *C*. The "free" errors, *i. e.*, substitutions whose origin cannot be determined, are relatively more frequent in the *B* and *C* than in the *A* experiments, as we would expect. Figures added to the original series are by far the most frequent in the *B* experiments, where they seem to have been produced mainly by *Einstellung* to the longer memory series used in the preceding *A* experiments. The metatheses, partial or total, show a progressive decrease in frequency through the three types of experiment, perhaps in relation to the decreasing length of the experimental series. Among the errors of perseveration, *intra*-iteration (within the single series) and *inter*-iteration (between separate series) are distinguished. The former is more common in the *A* experiments, the latter in the other two. The special liability of these cases to errors of this sort, where pauses are involved, is brought into relation with the well-known difficulty of time orientation—accurate ordering of events—in the disease generally. Some interesting stereotypies of perseveration were noted. They are of two sorts; either made up of figures previously given, or of entirely original content (*Konfabulierend*). These latter are not very different from what is observed under similar circumstances in dementia præcox, but it seems as though such cases have more of a feeling of the nonsense character of their answers, a manifestation of their negativism. The present cases give their answers as though really thought correct. Sometimes the stereotypy affects only certain digits. In much demented cases stereotyped phrases may be mingled with the figures.

To some extent the cases could be classified according to their predilection for certain types of errors. The two principal groups are according to the dominance of errors of omission or total metathesis. The groups are the result of different attention types, fluctuating (distributive) or fixating; an analytic or synthetic memory type; or one with strong or weak tendency to perseveration. While, owing to the protean character of the mental manifestations in general paralysis many such types are exemplified, their psychopathological relations can be better studied in other psychoses, having a more unitary mental picture.

Any experimental study must command attention that follows its cases through a period of six or more years. Such is that by

Levy-Suhl (6) on the "experimental influencing of the train of thought." Starting out from the familiar tendency in various clinical groups to react to irrelevantly heard words in an abnormal, distractible, idea-of-reference manner, he formulates his experimental inquiries as: (1) How do different cases of mental disease react to definite word-stimuli, intentionally uttered to be perceived by them, and especially how do those continuously speaking of their own accord react to these brusque interruptions? (2) Are there in the reactions to such stimuli any characteristics that permit the ordering of the cases into psychological groups, and are pathognomonic for one or another mental disease?

The subjects appear to have been mainly disturbed cases, the procedure consisting of noting for a time the spontaneous utterances of the patient, and then with no preliminaries or instructions to speak one by one the given series of stimulus words; the observed reaction of the patient thereto being precisely described.

An obvious relation exists between this method and the free association test, to a destructive criticism of which a following portion of the paper is devoted. Objections are raised on account of the impossible psychological conditions it demands, its remote or even contradictory relation to the reactions of daily life. The entire fulfilment of the conditions could only discover certain formal principles and rules, but necessarily confuses that which is essential for practical and diagnostic application, and, exactly what the experiments are often for, the features individually characteristic of the personality. There is great reason to distrust the experiment in all these directions, and the conventional classification of the associations is full of uncertainties, incapable of quantitative evaluation. There follow further theoretical objections to different features in the interpretation of the association phenomena; *e. g.*, the fallacy of assuming the constant value of the same stimulus word; the variability of the preassociative starting-point, especially when the association-word itself is ambiguous and the like; some interesting experimental demonstrations of *konstellative Vorstellungserweckung* are quoted.

The subsequent treatment of the matter is sounder than the indications of the above paragraph. The stimulus words used were mostly nouns, especially those likely to have strong emotional associations or to arouse vivid imagery; or more indifferent words, and nonsense neologisms. Sometimes special words were used for special cases. Three types of reaction, *resp.* behavior, in the experimental situation are distinguished and described in detail. The

pathological reactions consist essentially in ignoring the unusual character of the interruption, by either questioning its meaning in some more or less natural way, or by bringing it directly into the flighty talk. The more remote the associative processes, the more certainly pathological. The principle of classifying the responses themselves is very properly according to their degree of personal reference, three distinct groups being made, the last including also "dissociative" (scattered) responses. According to these categories the cases studied divide into four types: (1) normal, as above; (2) showing indifference to the interruption, indifference to the content of the stimulus, whether emotional or nonsense, for the most part neutral, superficial associations, of the manic-flighty type; (3) a "selective hyperprosexia" affected differently by different kinds of stimulus words, and showing a much more personal responsiveness; (4) characterized by tendency to incorporate the stimulus word into the stream of thought, but not logically, and in a more or less scattered way, with occasional neologisms.

The cases, of which there are forty-four, are excellently presented, in order according to their assignment to the four groups. It is impossible to summarize the notes, but they repay study very well indeed. In conclusion, the types are reviewed according to the diagnostic entities into which they fall. If one goes over the case histories, and recasts the table on p. 141 more strictly according to Kraepelinian conceptions (the author follows Ziehen) the paranoid conditions characteristic of group 3 divide about equally between manic-depressive and dementia præcox states. Those of group 4 go to dementia præcox, giving a table as follows:

Group	Manic-Depressive	Dementia Præcox	General Paralysis	Hysteria, Secondary Delirium	Total
I			3	1	4
II	10	1			11
IIa		1		4	5
III	9	7			16
IV		7	1		8

The experiment is, then, one of very distinct clinical significance.

A comparative study of affective factors in the association experiment is reported by Birnbaum (1). The method involved the use of a series of association words consisting of twenty generally indifferent words (*hand*, *house*, *hat*), forty words of general emotional import, both pleasant and unpleasant (*death*, *health*, *riches*), and a few others whose emotional import was confined to the special case.

The words were not given in random order, but with the indicated groups kept separate. Times were measured by a stop-watch, those over 30 seconds were counted as failures, and in any case where it appeared called for the subject was asked if anything special had been thought of. The number of subjects in each group was small, but, besides normal individuals, included hysterias, delusional or paranoic states, with manic-depressive and "psychogenic" depressions, these groups being selected because of the particular affective anomalies they show. The method was to compare the reactions to the *a priori* indifferent stimulus words with the emotional ones, and this also in varying mental situations, as after a discussion of symptoms, or the occurrence of some event of special significance to the subject. These refinements of procedure were carried out only with the abnormal cases. The sources of error in the method are discussed, though they scarcely seem rated at their proper value. With the normal subjects the essential result was that the (*a priori*) emotional stimulus words did not have longer reaction times (by the median) than the indifferent ones. Nor is there any essential difference in the reactions to the pleasant and unpleasant stimulus words. In fact there seemed to be no type difference of any sort between the associations of the different groups; normally, therefore, the affective character of the stimulus word does not regularly insure a special affective value in the reaction.

It was then attempted to see if this phenomenon persisted in hysterical individuals, with their more labile and sensitive emotional processes. Here the median is for the emotional stimulus words slightly longer than for the indifferent ones, but the author is disinclined to explain this difference on affective grounds. Not even the peculiar change in the type of reaction, *i. e.*, to sentences and quotations, is interpreted in this way. Specially emotional reactions do seem to occur more frequently to stimulus words selected with regard to the individual case; but it is expressly noted that the subjects might be obviously much under the domination of particular complexes, to which they reacted with great emotivity, without their having any marked influence upon the character of the associations. The experiments under special conditions (*unter dem Einfluss gefühlsbetonter Vorreize*) were only somewhat more characterized by the bringing out of increased emotional reactions. The difference is, however, again very dependent on the words selected for the individual case. Mention is made of the effect on the associations of special incidents, as unsuccessful attempts to escape, or to obtain release by legal process; also the influence of delusional ideas.

The paranoic conditions were confined to cases without dementia; and as before, the results were not uniform. Occasionally the reactions would be made especially matter-of-fact, as it were for dissimulation. The affective influence of the delusional ideas upon the reactions is again essentially confined to the stimulus words of already given emotional import.

The melancholic depressions are naturally characterized by greatly increased reaction times. The indifferent and emotional stimuli are equally affected; the tendency to longer times in the latter is not marked. Possibly the reactions to pleasant stimulus words are less *gehemmt* than to unpleasant ones, but even this would have no clear psychological meaning. The increased reaction time is not therefore directly dependent on the emotional character of the reactions. Inadequacy, monotony, and inferior lability mark the content of the responses. Specially noteworthy is it that the content of the reactions need not be depressive, even in most deep melancholias; the emotional state does not necessarily betray itself therein. When the tendency to depressive responses is present, it affects the emotional stimulus words more than the indifferent, and the unpleasant ones more than the pleasant. Individually selected stimuli are of relatively little additional affective value. This is seen again in the experiments under special circumstances, where there were no particular alterations, either in respect to reaction time, or content of the response. The whole group of phenomena in these depressions seems to be conditioned by thinking disorder rather than emotionally.

The other depressions considered (compulsive and hysterical) are distinguished from the above by a greater egocentricity of the reaction type, though this might be brought out only in experiments under special circumstance. There is greater lability, and not the same narrowing of the field of thought. There is also more tendency to reactions of a pleasant character, indicating the greater superficiality of the depression. These data may have a certain diagnostic value.

Eastman and Rosanoff (4) contribute the results of association experiments with 253 mainly delinquent, also feeble-minded, children, boys greatly preponderating. The ages ranged almost entirely from 11 to 17 years. The test material was the regular Kent-Rosanoff word-list, and the results are treated in the manner described in the second part of Kent and Rosanoff's original paper. In certain ways the present group is found to differ from the 1,000 normal subjects, as well as from the 247 insane cases of the previous study (though to

these comparisons there enter factors of age irrelevant to the abnormal mental conditions). Thus failures of reaction are here especially frequent, and occur mainly to words representing abstract, complex or uncommon concepts; indicating a characteristic arrest of development as distinct from normal mentality, or acquired mental disorder. "Non-specific" reactions are a little more common in the present than the previous groups, averaging 8.4 per cent. per subject, as against slightly over 6 per cent. The tendency towards "common" reactions, markedly weakened in mental disease, is less markedly weakened here, the average per cent. of individual reactions being about double the normal instead of four times the normal as in the insane. Certain sorts of individual reactions are especially prominent. A number of actual test-records are given, which are always instructive; and finally a statement of results with 15 normal children under eight who furnish records resembling the older feeble-minded, and a similar group over ten, who more resemble normal adults. Attention is thus called to the necessity of studying association types developmentally.

Of entirely coördinate importance with these studies of the association experiments is that of Pfenninger (9) but as the reviewer has already noticed it in these columns,[1] it need be mentioned only that it investigates the effects of repeating the same series of stimulus words with small groups of normal and dementia præcox subjects, for a period of eight days. The results contain a number of very interesting features.

Pfersdorff (10) contributes a study, extremely formal in character, of the types of association to be observed in the speech of the mentally diseased. The material consists of thirteen cases, which are very fully presented, but whose clinical pictures are not brought into any intimate relation with the special problem. They seem to have belonged almost entirely to the manic-depressive and dementia præcox groups. Attention is directed to the general motor aspects of speech, and its relation to other features of motility in the cases; the question of accent is specially discussed. The groupings are made according to these criteria; three are distinguished, the disorders of the first being the result of a primary *Rededrang*, of the second dependent rather upon affective disturbances, while in the third they are less of a motor character and more dependent upon the content of speech. The whole treatment bespeaks a grammatical rather than a psychological viewpoint.

[1] Psychological Bulletin, 1912, 9, 435–438.

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MENTAL HEREDITY AND EUGENICS

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The work of the last few years has brought the physician and the psychologist more closely together than ever before. The questions of mental defect and mental disease have needed study from both standpoints, and the aid mutually rendered has been invaluable. But now another feature of the problem has drawn the two sciences still more closely together. Both physician and psychologist recognize that, in view of the new light that recent study, observations and investigations have thrown upon abnormal mental conditions, both must stand together so as to be better able to spread this information and educate the people up to the reforms necessary.

Eugenics—preventive medicine—having as its aim the saving of the race rather than the individual has come to the fore and there seems to be none of its various fields of activity but has interested some one as its advocate. Solomon (27) has stated in a concise masterly form the chief aims of the eugenics movement of today

and thus carefully displaces the false statements made by poorly informed aggressors. Doll (9) and Barker (2) have covered the chief aims of the Mental Hygiene movement. The value of the work of the International Congress on Hygiene and Demography cannot be overestimated. Through exhibits it has started the immense task of educating the public on this subject. Some of the other work of Barker (3) has been to draw attention to the very practical use of these principles of mental hygiene in dealing with nervous school children. Training does not *make* a child's nervous condition but it heightens or lessens his hereditary predisposition.

The views held by Fortune (13) are very similar. School children need medical and mental examinations, but let them be from the standpoint that children are individuals and not merely parts of a mass. Ipswich examined her school population of 12,000 and found 112 mental defectives in that number, besides a large number of cases just needing watching. Hyslop (18) states clearly that he believes it to be the duty of the home rather than of church, state or medicine to teach mental hygiene. If only this view were more widely held! We might then hope to reach through the home some of the school reforms advocated by Fairbanks (11). Nervous conditions are often intensified by educational methods. He advocated school in the morning, only, for children below the sixth year. From there on, the children would undoubtedly be benefited by an afternoon session largely recreational.

The work of Downing (10) goes even farther and states that with proper care and training in childhood many of our insane would not necessarily have reached that condition. The nervous normal child will get along all right but the abnormally nervous child needs study. This might better have been stated as a supposition than as a fact. We cannot tell as yet whether lack of such training is the determining factor for insanity. The fact that the children were "abnormally nervous" to begin with is rather an important indicant of a latent neuroticism which might just as well break out as remain hidden to be handed on to another generation. Wallin (29) strikes the keynote. We must try to keep alive all children once they are born but what we want is "better babies, better born." Prevention of procreation by the unfit seems at present the only measure that will bring us toward the desired ideal.

This has naturally brought the question: "Who are the unfit?" The complete answer cannot come except through many years of hard work. The relative influence of heredity and environment

cannot be settled offhand. Wright (31) discusses quite generally the tendency of present-day biological opinions and then takes up more in detail the possible influence of environment upon the germ plasm and the social significance of such a possibility. The state of mind of the scientific world as to the possibility of such a germ-plasm change is shown nicely by Adami (1). In spite of the popular theory that the child is not affected by the acts of his parent, present scientific facts show that changes may be going on which are too minute to be detected but which may nevertheless exert an influence. Lundborg (23) gives a practical plan for centers in each country to study the conditions of its races and proposes that the material thus collected by any country be made accessible to all others. We must have such data before any perfected plan can be made for the disposition of the undesirable elements.

In view of this fact it is interesting to note that simultaneously there have appeared in various centers in this country and abroad a number of similar investigations upon the heredity of the various types of the unfit. The work of Cotton (6) in this country and of La Griffe (21) in France shows that insanity is hereditary. The work of Cotton is not yet finished but the case histories published are very significant. Field-workers have been trained to make these investigations and such a plan seems satisfactory. As yet we are unable to see the possibility of a full application of the Mendelian law to the inheritance of mental traits. La Griffe's work has been similar, although his investigations regarding each of the main types of insanity have been made and are reported separately. He finds that heredity is usually an important factor in the etiology of mental diseases. The taint usually comes from one side of the family only and may be a neurotic condition intensified by social factors. The human race has been preserved from a larger number of insane by the frequency of celibacy and sterile marriages among them and by the large number of children dying in infancy.

The work of Davenport and Weeks (8) shows that epilepsy, too, is transmissible. Their theory is that epilepsy is due to the absence of a protoplasmic factor determining complete nervous development. Kreiss (20), working on the heredity of tremor, and Frey (14), on ataxia, find they are both inherited and are likely to be found in families containing other forms of degeneracy.

Probably the largest work that has been done on the heredity of feeble-mindedness is Goddard's (15). Hereditary defect has been found in 143 out of 480 descendants of a defective, illegitimate son of

a normal man and an unknown defective girl. From the later marriage of the same man to a normal woman there have been traced 486 descendants, all normal. Chouchoud (5) gives us a brief report of observations made by Col. Ewens on a number of microcephalic defectives living in northwestern India. They are evidently of defective descent and kept alive—parasites on society—by well-meant alms. Unfortunately the report is not accompanied by detailed descriptions of the individuals studied. But no matter whether we can ascribe 75 per cent. or all of such abnormal condition to heredity, the question at the base of all such investigation remains fundamentally the same: What caused the defect in the first place? The theory has been advanced that mental defectives are a strain of the race which has never developed the ability to see the proper relation of cause and effect. They see no need for restraining their desires so that they may not conflict with the rights of others. But does this really settle the matter? Is it not possible that the reason they did not learn to adjust themselves to society is that they were defective from the beginning? Something must have caused their primary difference.

All such investigations have led the scientific world to believe more and more that action must be taken. The burden of supporting these people must not rest any more heavily upon the normal race. In time it should be removed altogether. But what can be done? The institutions available cannot supply room for a quarter of them. Taylor (28), Fernald (12), Mears (25), Barr (4), and Hart (16) have taken the stand that since we cannot segregate them all and since that would be unnecessarily expensive anyway, the only thing to do is to sterilize them. With procreation stopped the matter would be practically under control in a generation. Of course, this plan has its adversaries, too, but a rather capable defense against them is the work of Hurty (17). From studying several hundred cases of criminals that had been asexualized he found the results of the operation had been good. The work of McDonald (24), too, is a plea for the asexualization of all those who carry the "taint," be it of epilepsy, feeble-mindedness or insanity. To this end he urges the education of the public and preventive legislation. Savage (26), on the other hand, tends to emphasize personal rather than racial good. He states that many insane may recover and marry without danger to their mate or their children. Right here in such cases one sees the danger of asexualization unless we have full and certain knowledge of the irremediability of the subject's condition. Such knowledge is coming, however, and until it does come there is plenty to be done with those cases about whose inferior condition there can be no doubt.

Whetham (30), Lankester (22), and Kellicott (19) in their books have outlined very clearly the situation as it confronts all men at present. Man, more heavily endowed with mental powers than any other creature, has made himself master of many of nature's weapons for eliminating the unfit of every type, mental and physical. The responsibility that comes with his ability to fight nature, disease and his environment is the necessity of providing his own means of promoting the welfare of the human race.

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CRIMINOLOGY AND DELINQUENCY

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To *review* the literature in this field in the space available is impossible; instead we have grouped the references to indicate the main trend of interest and fact to be found therein and will present them more or less *en masse*. Everything cited has some direct bearing on the problem of the criminal and the delinquent among whom, it must be remembered, there are many sub-normal, many insane, not a few neuropathic patients, and numerous ones that are border-line cases yet to be understood and classified. Papers on the psychology of sex must also be included.[1]

Of chief significance to the reviewer is the fact that everywhere there has come to be so confident a demand for the application of

[1] Literature reviewed by S. I. Franz under the title of Experimental Psychopathology, PSYCHOL. BULL., 1912, 9, 145, need not be included here.

experimental psychology to problems of the social offender. Moreover, the idea prevalent a few years ago that anyone at large can give a mental test is being abandoned. Even Goddard (23) has confessed that lack of uniformity in giving the Binet tests (3) is unwise and he is trying to further standardize their methods at Vineland (22).

The idea of a laboratory in connection with the Juvenile Courts is taking a real hold upon the faith of our citizens both here and in Europe. The July *Survey* (52) reports a typical instance of such a laboratory in Seattle, Washington, with which the Judge coöperates heartily. Vaney (53) urges compulsory education laws for the abnormal child and statistics continue to pour in on the proportion of defectives, etc., among the juvenile offenders. Among adult offenders, too, the study of the criminal follows apace.

In the last two years a laboratory of social hygiene has been established at the New York State Reformatory at Bedford Hills for the extensive and intensive study of the criminal woman. The psychological tests and psychiatric examinations of the Belgium government since 1910 have been published (33) and a commission has been appointed in France that is to make plans to start a like laboratory there. Some of the results of these and similar studies are as follows: Robertson (43) finds the two characteristics most to be emphasized after studying two thousand male criminals at Elmira are lack of self-control and absence of fixed purpose; Quirós (42) has been translated and states clearly and briefly the contributions of psychology to criminology; Gross' work (24) has also been made available in English; Auden (2) finds that among 119 cases of congenital mentally deficient criminals 59.6 per cent. were arrested for murder or attempted murder; Menzerath (33) concludes after extensive experiments that unless methods can be refined but little can be learned of the criminals' interests or guilt from word association tests; Wulffen (56) gives a portrayal of the mental characteristics, methods and motives of thieves, incendiaries, etc.; G. G. Fernald's (15) tests of the boys in the Massachusetts Reformatory well deserves Whipple's statement that it is "perhaps, the most valuable psychological study of the criminal that has yet been made," his achievement capacity test being of especial interest; his report, and the monograph of Healy and G. M. Fernald (26) should be read without fail by everyone interested in any form of delinquency or crime; Nitsche and Wilmanns' work (40) is an historical psychological treatment pertinent to prison reform; Mercier (34) classifies crimes,

indicates the influence of insanity on crime and outlines a method of dealing with the criminal insane that seems workable; Kinberg (30) submits one of Sweden's contributions to such a research in a suggestive statistical study wherein may be found such data as that the abnormal criminal bears a frequency of 200 to 1 in murder, 26 to 1 in fraud, etc., that 75 per cent. of recidivists are insane or otherwise abnormal, and that second crimes might easily have been avoided were proper mental and neural examinations only made requisite after the first offence; Saleilles' (44) book on punishment has been translated and Maxwell (32) points out that psychologically persons who may commit the same crime are so unlike as to be too differently affected by the same punishment to make it wise to retain the idea that all punishments should be the same for an identical crime; Crother's (7) article is a short but expert résumé of the way morphine affects one's conduct; he has analyzed carefully the resultant mental states into paralysis of the "ethical brain" with strong egoism, etc.; Schuppius (45) indicates the mental characteristics of vagabonds; Breckinridge (4) presents a careful delineation of the causes of juvenile delinquency which is based upon a ten years' study of 14,000 children; Major (31) finds 80 per cent. of the children who came under the care of the Berlin Child Welfare Society to be in some respect defective; the annual reports or the Seattle Juvenile Court for 1911 and 1912 (17) are especially interesting; of value too are articles by Wallin (54), Näcke (39) and Stadelmann (46); a Bibliography and critical review of the recent literature on the Binet tests may be found in the *Journal of Education*, Vol. III., No. 2; Stelzner (51) records those offences most commonly committed by psychopathic constitutions and states the causes to be uncontrollability of instincts, increased emotionalism, weakness of will and high suggestibility; Peters' report (41) of the papers read at the Berlin Psychological Congress includes one on psychology as applied to jurisprudence and defectives.

A book like Franz's (16) is one of the type of which the next few years ought to produce more in other fields of applied psychology. It is an excellent presentation of those mental tests which are possible of application and useful in the examination of the insane. Most of our psychological tests are too technical and involve too great introspective ability and training to be applicable to our problem of the criminal and delinquent. We all need woefully a method no less scientific and experimental, but less involved introspectively, together with standards for all tests based not on university students but upon

normal individuals with the same training and opportunities as those to be studied. Watson's paper (55) on psychology as the behaviorist views it, may seem a bit radical but it in truth contains the outline of the kind of psychology we shall find most useful.

Huey (29) points out that what we most need are tests that reveal the various dead lines of intelligence for the various occupations from laborer to physician, etc., and that there should be tests that isolate degrees of control of movement, capacity for synthesis, play interests, etc., as well as "self-estimation" and "self-relationships."

A fair and most interesting résumé of tests as applied to the defective and the insane is that of Dana (8) who it seems with Cattell was the first to draw up a scheme of psychological tests for use in psychiatry in America. Results of laboratory tests are noted, of association tests and psychoanalysis, and of general intelligence.

Abnormal psychology with respect to problems of sex in their application to the delinquent and the criminal has at least its share of contributions. Ellis' book (10) on the *Psychology of Sex* is from every angle of first importance. His *Task of Social Hygiene* (11) is valuable too. Moll (36) outlines the prevailing methods of treatment and pleads for psychopedagogical methods to substitute normal images for perverse ones and his book (37) on the pathological sex life of the child is the very best there is. Of interest too are articles by Morichau-Beauchant (38), Ferenczi (14), Glueck (18), and Stekel (49, 50). In the latter paper Freud and Krafft-Ebing and others are upheld in their contention for a symbolic relation between the thing stolen and the thing sexually desired but unattainable.

Of the causes of crime Cornell (6) writes that it is "utterly impossible often to apportion exactly between home environment, inherent mental peculiarities and the uneducated mind." This fact needs to be kept very clearly in mind by the eugenics worker. The leader of such research in America is Charles B. Davenport whose book on eugenics (9) is of real value in the analysis of mental traits and the methods and facts of their inheritance in the criminal and the degenerate. All the Eugenics Record Office publications (13) ought to be read. The writer has found Cotton's (13, 8) especially worth while. *The Kallikak Family* (21) too ought not to be overlooked in the study of heredity.

The more thoughtful and penetrating men who have worked seriously with the problems of crime either among children or adults are all voicing, with slightly different emphasis each from his own angle, the same conclusion regarding the subjective condition of

crime. Brown (5) feels that in bad handling, in neglect or overstimulation of nervous weakness and habits, is to be found the beginning of juvenile crime. Ellwood's (12) excellent review of Lombroso's theory sets forth the view that the cause of crime is biologically in the individual; that, if normal, under no circumstances is crime possible, but that if an atavistic condition or psychic-epilepsy is present, crime is the result of trying circumstances, and the trying circumstances may be only society's demand for normal restraint. Stekel (48) urges that pseudo-epileptic attacks and criminal acts function interchangeably for each other. Cornell (6) finds the degenerate always displays an emotional condition that is too strongly or too constantly manifest. Upon such a basis it is less difficult to explain crimes that are otherwise entirely unreasonable and inexplicable. The Seattle report for 1912 urges against indiscriminate probation on the basis that many children are neither physically nor mentally fitted not to be unduly affected by the ordinary exigencies of life. Another thorough and helpful analysis along this line is that of Glueck (19). He finds most of the psychoses of criminals to be "psychogenetic disorders" which, though they may simulate any of the known psychoses, develop in consequence of some strong emotional experience and do not presuppose the usual insane predispositions and history. They are old offenders whose whole life has been an uninterrupted chain of conflict with the law. Their irritability, heightened subjectivity, fluctuation of mood, inability to form correct judgments concerning unpleasant occurrences about them, their inefficiency, lead them to commit crimes as the simplest way to adjust themselves to their environment. If they are forced into prison where crime is no longer possible, life becomes too complex and difficult of adjustment and they become highly unmanageable and insane. Huey (28), too, feels that beyond the stage of feeble-mindedness intelligence can be best measured in terms of feelings, instincts, emotions, "in control and direction of these" and "in widening of social consciousness and social relationships"; "arrest at these levels leaves the youth in the zone of psychoneuroses and criminology." He refers to Meyer's work on dementia precox (35).

Huey (28) and Healy (27) contend for intensive studies of the individual as the most valuable method of solving the problem of crime. Again, much of the best and most strictly experimental psychological work is an effort to establish correlations between various grades of mental capacity and stability and large numbers of individual reactions to groups of tests. The discussion as to the

existence of a general mental fact essential to the performance of any specific test is interesting and important. Hart and Spearman (25) claim that quite different intellectual performances correlate because of this general factor. Abelson (1) feels that "all tests alike show themselves to be most untrustworthy when used alone," but become "remarkably trustworthy in pools of 10 to 12"; that "the essential nature of intellectual deficiency seems to be a lowering of that class of performances which is characterized by the need of clear consciousness"; "that a large number of tests need to be given not to gage a number of different factors in ability, but to obtain multiple evidence of this one factor, the general level." Simpson's work (47) on correlation of mental abilities represents another attitude on this subject and merits special consideration. It seems likely that the better work of the next few years will have to do chiefly with the possibility and results of such correlations as these.

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APHASIA

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A survey of the last two years' contributions to the aphasia problem finds a most suggestive starting point in Heilbronner's (26) critique of the "*Aphasieforschung*," from the pronouncement of Broca's findings through a period of fifty years (1861–1911). Heilbronner recognizes two basic problems: one purely diagnostic,—do certain symptoms or symptom-complexes indicate certain brain lesions?—the other more comprehensive, can legitimate inferences of brain function be drawn from the parallelism of certain symptoms with certain brain lesions? He considers that the fundamental propositions of Broca and Wernicke have withstood all controversy and all proof; that the use of the Wernicke and Lichtheim schemata make possible full and systematic statements of cases, and that the neglect of this method has done much to retard progress; and finally that future progress depends upon localization investigations, and statement of facts from the viewpoint of Meynert and Wernicke. In a later article (27) reporting a case of alexia, in which many symptoms occurred which were unreconcilable with the concept of pure alexia, Heilbronner recognizes the difficulty in drawing a sharp demarkation between the conduction and the cortical aphasias, the difficulty in separating pure sensorial functioning from that of recognition and recollection, in short the difficulty in establishing clinically, or in localizing, pure types.

In the first article the opinion is expressed that Pierre Marie has failed to prove his proposition that "the third left frontal convolution plays no special rôle in the function of language," as well as his localization of anarthria in the lenticular zone. His further statement that Marie believes the essence of aphasia to be a dementia called forth a reply from Marie (35), in which he explains that this false interpretation of his theory arose from an error of Déjerine. Marie's (36) original statement is: "With aphasics there is, in general, a marked diminution of the intellectual capacity." Déjerine's ver-

sion was: "With aphasics there is a marked diminution of the general intellectual capacity." Marie's concept is that the defect, which is the kernel of the aphasia problem, is one of intellectual capacity for spoken language, which must be considered not as a sensorial but as an intellectual deficit. In this essay he takes occasion to state that in a large number of cases studied since his first publication he has found not one that fails to substantiate his published conclusions.

Those who wish a clear statement of the classical types of aphasia correlated with brain localizations will find such admirably given in Hammond's article (24). Saunby (46), in a paper presenting two new cases, traces briefly the historical development of aphasia theories from the first crude findings of Gall and Spurzheim to the revolutionizing theories of Pierre Marie. The opening chapter of Brissot's (12) book is also historical, tracing the theories of aphasia and the general psychophysiology of language as well.

Dagnan-Bouveret's (17) article is a critical discussion of theories, pointing out the difficulties, psychological, clinical, and anatomical, which beset the localization theories. It states Bergson's psychological objections to the idea that each word calls up an image which when blended with the sensory impression results in understanding of the word. Bergson points out that this cannot be so with connectives, and that a word's individuality is not constant, but is determined entirely by its setting. He also calls attention to the fact that words are lost in regular order: proper nouns, common nouns, verbs; and are recovered in reverse order. This seems incompatible with the theory of localization of images, but not with that of general enfeeblement of function. The author, then, in a discussion of the problem of apraxia denies that motor images are essential to the execution of a volitional movement, and therefore to the production of spoken language. The sole necessity is the consciousness of the end to be attained, which consciousness is largely a state of tension, of desire. The clinical and anatomical objections are quoted in extenso from Marie.

Bing's (7) discussion particularly emphasizes the latest controversies, presenting the arguments for and against Marie's doctrine, and treating in detail the dynamic theories of von Monakow, Bernheim and Goldstein. It also contains an analysis of apraxia in its latest conception, with directions for clinical examination.

Goldstein (22), in his exposition of central aphasia, emphasizes, like Marie, the intellectual deficit. He holds that for the under-

standing of speech two mental responses to stimulation are necessary, one sensory, consisting of the perception of the word as such, and one ideational, consisting of the idea which the word represents. The latter response is dependent upon the integrity of a central language field. He believes that intact speech-areas guarantee only accurate repetition; that other forms of speech require in addition a normally functioning central association area. Word-blindness and inability to speak he believes yield to one explanation. Defects of reading and writing he considers secondary in character, depending upon a primary lack of word understanding. The author holds out no hope of fine brain localizations, considering that most psychic happenings have no isolated brain localization, but are localized in and through one another, that all mental experiences are more or less identical, different kinds of combination being formed from the same elements.

Pelz (43) also recognizes the value of psychological interpretation, and concludes that the symptom-complex of transcortical aphasia may occur without localized lesion, purely as a functional defect of higher centers.

Stertz (48) presents two cases of subcortical sensory aphasia, explaining them on a dynamic theory. He notes that the symptoms vary so greatly during the course of a case that the subcortical complex may become cortical, or the reverse may occur.

In direct opposition to these dynamic theories stand such studies as that of Mills and Martin (39). These authors have demonstrated their confidence in the classical localization theories in the most practical way. They hold that certain groups of symptoms pointing to cortical lesions indicate operative treatment, and prove their thesis by reporting the successful treatment of a case by the removal of a tumor, which was localized from the symptoms. They also describe a type which combines transient aphasic symptoms with indications of specific disease. Such cases improve under treatment with salvarsan and mercury.

Bernheim (5) reports a case of motor aphasia and agraphia, with Jacksonian epilepsy, of syphilitic origin, which recovered rapidly under treatment with mercury. He explains the case by his own dynamic theory, as he does a second case (6) in which autopsy revealed complete destruction of speech-areas in a woman who had regained her speech after its temporary loss. The woman had demented progressively and at the same time gradually regained her speech.

Many case reports both of clinical and anatomical findings have

appeared, some supporting and some opposing the classical doctrines. Berger (2): a case of total aphasia with typical lesions, and a case (4) of total deafness for words and sounds, resulting from lesions of both first temporal gyri; Saunby (46): two cases of pure subcortical motor aphasia. Karpas and Casamajor (32): a case of isolated alexia, with right homonomous hemianopsia, supporting Déjerine's and Liepmann's theories. Blosen (9): a case in which involvement of both temporal lobes had caused no word-deafness, and a discussion of word-deafness (8) in connection with a reported case. He notes that the intensity of the trouble depends partly upon the complexity of the language, that there is no difference in the perception of different parts of speech, that the deafness pertains to no definite word or letter, and that it is less evident when familiar words are used. Archambault (1): two cases, in one complete destruction of Broca's area and right hemiplegia with no aphasia; in the other a lesion of the lenticular zone accompanied by marked and permanent motor aphasia. Berger (3): a case of agraphia without cortical lesion. Bouchaud (10): a case of dysarthria with word-blindness, hemianopsia, agraphia and amnesic aphasia—no word deafness. Autopsy showed softening of the left tempero-occipital lobe and both lenticular nuclei. Campbell (13): a case of aphasia in which agraphia was the principal symptom, revealed on autopsy a tumor separating the first and second left frontal gyri. Pfeifer (44): clinical and anatomical findings in a reported case support classical localization theories.

Three articles discuss the relationship between right- and left-handedness and the localization of speech centers. Mendel (38) reports a case of left hemiplegia and subcortical motor aphasia, caused by a lesion of the right hemisphere in a *right-handed* person. He cites similar cases in the literature and also cases of right hemiplegia with aphasia in left-handed persons. He treats such cases as exceptions to the general rule of localization. The question of the effect on the sensory centers of training of the non-dexterous hand is raised, and Oppenheim's case is quoted—that in which a right-handed woman who lost the use of the right hand by injury, trained the left hand and, years later, developed a left hemiplegia accompanied by aphasia. This question is also discussed by Sträussler (49) who concludes that such training has little effect. Lewandowsky (34) describes a case of crossed aphasia and apraxia; reversed functioning of both hemispheres.

Another group of articles present aphasia as occurring in connec-

tion with some other infirmity,—arteriosclerosis, nephritis, hysteria and insanity. Sir Wm. Osler (41) reports two cases of transient motor aphasia in cases of high blood pressure. He states the possibility of such occurrence in persons not suffering from arterial disease. Hesnard (25) describes a case of transient motor aphasia due to intense and restrained emotional excitement. Brissot (12), on the basis of 52 cases, discusses the relation of aphasia to dementia, concluding that the dementia results from causes distinct from those producing the aphasia.

Congenital aphasia has been noticed in four articles. Tait (51) reports a case of the motor form in a child of five, Hinschelwood (28) adds two more to the list of hereditary congenital cases, McCall (40) describes one case of word-blindness and one of word-deafness, and Town (52) gives an historic summary of the literature on the subject and presents two cases of mixed type.

The problem of apraxia is so closely related to aphasia that we report a group of articles dealing with its various phases. Coriat contributes three papers. One deals with its psychopathology (15), one with its relation to psychiatry (16), and one with clinical methods for its diagnosis (14). In the first article he describes in detail the anomalies of movement which may be called apraxic according to the latest acceptation of the term. He points out that such symptoms occurring in aphasics are probably often due to apraxia rather than to an intellectual deficit, as claimed by Marie. In the majority of cases he finds the corpus callosum or the left parietal lobe involved, and these are the eupraxic centers of his second article (16); in this he enumerates the psychoses in which apraxia appears. Dearborn (18) considers that to omit the cerebellum from the discussion of apraxia is to "dehamletize" the text, that without this center voluntary movement has no principle of action. The so-called eupraxic centers in the frontal lobe are controlled from the cerebellum, and it is only by interrupting connecting pathways that lesions of the corpus callosum become involved in apraxia. The notion of a definite eupraxic center he thinks untenable on account of the great individuality of voluntary movements. We are reminded of this statement by the analysis of Rose's (45) case in which reëducation brought out the fact that apraxia affects certain discrete movements, not muscle groups. Schapiro (47) critically reviews the whole question, and in his case considers defects in writing letters apraxic because they can be produced by the left hand and not by the right, and also because the more rapid the writing the better the performance.

Vix (53) also considers the relation of apraxia and agraphia in a given case, concluding that they are unrelated, while Franke (20), in another, considers such relation as possible.

Case reports are contributed by d'Hollander (30) and by Kroll (33). Kroll concludes from autopsy findings in three cases of motor apraxia that left apraxia was caused by isolating the right supramarginal gyrus from the left hemisphere, and double apraxia by isolating the left supramarginal gyrus from the left motor centers.

Jones (31) discusses the relation of apraxia to dementia præcox and finds that it occurs in that and many other psychoses. Mabille (37) presents a remarkably fine clinical picture of a case which he interprets as dementia præcox with apraxia. As the volitional movements in this case were, after great delay, performed adequately, we doubt whether they can be subsumed under the idea of apraxia.

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SPECIAL REVIEWS

The Psychology of Insanity. BERNARD HART. New York: G. P. Putnam's Sons, 1912. Pp. ix + 176.

In reading this little book one must keep in mind the qualifications noted by the author in the Introduction that it "lays no claim to be a comprehensive treatise upon the psychology of insanity" and that "no attempt has been made to cover the whole field." The title is, in fact, too inclusive and does not properly designate the contents of the book, which is mostly a treatment of Freudian contributions to the understanding of certain mental abnormalities. The Freudian standpoint is usually well described, but the effort at simplicity leads at times to more exact statements than the facts warrant. Thus, we are told, "a similar mechanism (of repressed complexes, etc.) probably accounts for the condition known as *spes phthisica*, the astonishing cheerfulness and optimism which frequently characterizes the last stages of pulmonary consumption." There is no more reason for the belief that the mechanism cited produces by itself the condition of cheerfulness in tuberculosis than the cheerfulness and expansiveness of the general paralytic. Although by far the larger part of the book deals with mental abnormalities from the standpoint of Freud, Hart concludes that the sexual hypothesis has not been satisfactorily established and that mental abnormalities "may involve factors connected with any of the fundamental instinctive forces of the mind provided these factors are of sufficient emotional intensity."

S. I. F.

Modern Treatment of Nervous and Mental Diseases. Edited by W. A. WHITE and S. E. JELLIFFE. Philadelphia: Lea and Febiger, 1913. Vol. 1. Pp. 867.

Although the title of this work indicates that it deals exclusively with the treatment of mental diseases, the contents are more general and, with few exceptions, the individual articles include discussions of the symptoms and course of the diseases as well as their treatment. Some of the articles, in fact, deal with more general matters, such as that of White on eugenics and mental heredity in nervous and mental diseases, that of Colvin on education, and that of Havelock Ellis on sexual problems, their nervous and mental relations, and that of

Healy on delinquency and crime in relation to mental defect or disorder. There is also a chapter on immigration and the mixture of races in relation to the mental health of the nation by Salmon. The book is most timely in its dealing with the problems of eugenics, heredity, delinquency and education, and psychologists will find in it more than the title indicates.

The chapter on education, which is mostly psychological, leaves one with the feeling of incompleteness since the relation of the general subject to the insane is scarcely dealt with. In view of the increasing realization of the importance of occupation, amusement, and various forms of exercise in the treatment of many insane the passing remarks in the various chapters do not appear to cover the subject adequately, and the omission of the matter from the chapter on education is particularly noticeable. The chapters on psychiatry in its military relations and immigration are of general interest, not particularly therapeutic, and deal largely with statistical matters. The individual chapters deal with their subjects in different manners, some, *e. g.*, that of Southard on the symptomatic psychoses, giving little general information of the mental conditions, others, *e. g.*, those of Jones on the neuroses and psychoneuroses and of Meyer on paranoic and paranoid states dealing with symptomatology as well as with treatment. In every chapter, however, psychological matters are discussed either directly in relation to symptoms or in their bearings upon treatment and the mental factor is uppermost throughout the whole book.

S. I. F.

Freud's Theories of the Neuroses. E. Hitschmann. (Trans. by C. R. Payne.) New York: Jour. of Nerv. and Ment. Dis. Pub. Co., 1913. Pp. x + 154.

This monograph, with its introduction, ten chapters giving a review of Freud's publications, and a bibliography of the writings of Freud, and, incompletely, of the Freudian school, is an excellent general presentation of the Freudian psychological and therapeutic standpoints. It should be in the hands of all who are interested in normal or pathological psychology or in mental therapeutics. Since the book is of the nature of a résumé of Freud's teachings, an adequate brief summary cannot be given here, but it may be stated that the five chapters on sexual instinct, the unconscious, the dream, the psychoanalytic method of investigation and treatment, and the application of psychoanalysis, are of more general psychological interest.

The author attempts to answer some of the critics who have objected to the sexual explanation, but falls short of explaining why this aspect rather than that of life-preservation or the instincts of fear or pugnaciousness should be the basis of so many daily, normal mental processes. Analysis equally often brings to light fundamental conditions like those of pain or hunger, and, logically, these may equally well be considered the basis of later mental conflicts. It is admitted that a public psychoanalysis is impossible and that "the method" has had no "systematic and complete exposition." The acquirement of the technique of "the method" by "personal contact with Freud" is suggested as the one possible means of becoming proficient. A scientist is led to wonder if the lack of a systematic exposition of the method is due to an inability to describe it and thus make it available for general use. He may also wonder if the apparent necessity of seeking the *fons et origo* to learn "the method" may not involve the acquirement of a *feeling* or *attitude* rather than *knowledge*. If the method of psychoanalysis has the innumerable advantages and the superior merit which is claimed for it, and if "individual details torn from their context lose the greatest power to convince," the complete reproduction of one or more analyses, even with the enormous space necessary for this, is a scientific demand which should be met. The pretence that this would "bring the physician into conflict with his duty of discretion" is an evasion of the question, since there is not only the generally accepted method of presenting case reports with changes of names, dates, etc., but also the possibility of selection of suitable cases. If opposition be due to the failure to publish cases in full, Freud and his school must consider themselves to blame for it, for science demands the whole truth. If, on the other hand, Freudianism be a cult, we must be content with the revelations and writings which are given us. If it be science, we are well within our right to demand minutely detailed observations, full description of methods and logical thinking. It is chiefly because of the failure in these regards that, scientifically, the subject has not been better received. The reviewer does not believe that in this matter there are many "who will not allow themselves to be convinced," and does believe that the taking of sexual confidences out of their setting and assuming them to be the sole or the only important content is a sufficiently questionable method to bring doubt to the minds of all but true believers. Many who are professionally interested have been awaiting a clear and full exposition of the methods and results of psychoanalysis, which the present work does not give. Many have

remained open-minded, but when they have expressed doubts and made critical inquiries they have been accused of blind antagonism or of failure to read and understand. Abuse of this nature is not proof. Freud and his followers should realize that the burden of proof rests upon them. Hitschmann apparently admits this and, furthermore, concedes that the Freudian publications regarding method or observations have not met the scientific requirement of completeness.

Notwithstanding the above general criticism of the Freudian lack of completeness the present work is a step in advance in that it brings together the general conclusions of the school, and it may be recommended to those who endeavor to understand a matter which has hitherto been misunderstood or misapprehended because of lack of information.

S. I. F.

Grundriss der Heilpädagogik. T. HELLER. 2te Aufl. Leipzig: W. Engelmann, 1912. Pp. xi + 676.

The second edition of this valuable work indicates the advances that have been made in the subject since the publication of the first edition nine years ago. Two thirds of the book deals with the description and treatment of the feeble-minded and the remaining third with the description and methods of treatment of other nervous conditions in childhood. The chapters cover juvenile insanity and other mental disorders as well as feeble-mindedness, and special attention is paid to hysteria and nervousness. Only an extensive review would do justice to the numerous excellencies of the book, but it may be said that the treatment of the topics is sane and conservative and so plain that any one who is interested, even though not a specialist, may understand.

S. I. F.

Le langage et la verbomanie, essai de psychologie morbide. OSSIP-LOURIÉ. Paris: Felix Alcan, 1912. Pp. 275.

This book is an entertaining, but not strictly scientific, presentation of an analysis of a special type of character, rather than the description of a form of mental disease. Verbomania, like logorrhœa, is not a distinct clinical entity but rather a symptom, the principal character of which is a pathological and irresistible tendency to talk and to discourse, often without knowledge and without attempts at accuracy.

The author believes the symptom may be found in both sexes,

but its greater frequency among women is expressed by him in the words of Erasmus: "Quand l'est de la langue qu'il faut jouer, même sept hommes ne valent pas une femme." The differences in characters of the French, English, Germans, Italians and Russians in this respect are discussed. A chapter is devoted to the prophylaxis and treatment of the condition, the main suggestion for the former being training in accurate thinking and expression, and for the latter special training by periods of silence and thought. Some of the case histories cited in the book are suggestive as problems for psychoanalysis, but the Freudian character of the symptom is not dealt with.

S. I. F.

General Paresis. E. KRAEPELIN. (Trans. by J. W. Moore.) New York: Jour. of Nerv. and Ment. Dis. Pub. Co., 1913. Pp. 200.

This translation of part of Kraepelin's large work on psychiatry will be found useful by psychologists and others who are interested in the insane. It contains discussions of symptomatology, diagnosis and treatment, and gives a clear exposition of the question of paresis at the present time. The translation is well done, and it makes available to those who have not the time or inclination to acquire a German psychiatric vocabulary one of the most important chapters in Kraepelin's system, and enables them to become acquainted with the most recent and important facts regarding the varied mental abnormalities which are found in this disease.

S. I. F.

The Kallikak Family: A Study in the Heredity of Feeble-mindedness. H. H. GODDARD. New York: The Macmillan Co., 1912. Pp. xv + 121.

This study should be read by all who are interested in eugenics and in the general subject of inheritance. It gives the record of five generations of descendants of one man, in two lines, respectively through a normal woman and feeble-minded woman. The comparative records are of greater interest and value than other previously reported records of individual families because the comparison of descendants in two lines is possible. The arrangement of the charts is not entirely satisfactory for study, some being distributed over two, three or even four pages, but for popular interest the combination of a normal and an abnormal chart on one page is very effective. It is to be hoped that this study may lead to the publication in similarly accessible form of studies of other families which are now scattered

in the magazines dealing with eugenics, psychiatry and feeble-mindedness.

S. I. F.

Traitement des Neurasthéniques. P. HARTENBERG. Paris: F. Alcan, 1912. Pp. 346.

This work deals principally with the treatment of neurasthenia, and is a companion volume to the author's psychology of neurasthenia. Neurasthenia is defined as an exaggeration of fatiguability of the nervous system, which may be accompanied by a number of pronounced mental symptoms, such as phobias and obsessions, but does not include the latter. The treatment in most cases is simple and in many cure can be effected within two weeks. In this respect the author is more hopeful than most writers on the subject. The book contains little of interest to the psychologist.

S. I. F.

Handbook of Mental Examination Methods. SHEPHERD IVORY FRANZ. New York: Jour. of Nerv. and Ment. Dis. Pub. Co., 1912. Pp. ix + 163.

This handbook forms Number 10 of the well-known Nervous and Mental Disease Mongraph Series. From the preface one learns that an endeavor has been made to select methods which not only seem to test certain mental processes, but which at the same time are easy to perform and are sufficiently accurate for certain kinds of research as well as for routine clinical purposes. The subject matter of each chapter is presented in a uniform manner which makes reference to a particular phase quite easy, even without the index which is provided. In each chapter there is a general discussion of the subject dealt with, which gives the reader a sense of orientation and a degree of preparation for the understanding of the tests which immediately follow. The volume will prove a valuable tool not only to the class especially interested, the neurologist and psychiatrist, but also to the general practitioner who attempts to keep pace with the strides of progress in this field of medicine.

F. M. BARNES, JR.

BOOKS RECEIVED DURING MAY

SCHUMANN, F. *Bericht über den V. Kongress für experimentelle Psychologie in Berlin vom 16. bis 20. April 1912.* Leipzig: Barth, 1912. Pp. xxv + 324. Mk. 11.

KIPIANI, V. *Ambidextrie. Étude expérimentale et critique.* (Trav. de la Faculté Int. de Pédol., No. 1.) Paris: Alcan, 1912. Pp. 103.

EASTMAN, M. *Enjoyment of Poetry.* New York: Scribner's, 1913. Pp. xi + 224.

FRAZER, J. G. *The Belief in Immortality and the Worship of the Dead.* Vol. I. London: Macmillan, 1913. Pp. xxi + 495. $3.50.

HOBEN, A. *The Minister and the Boy.* Chicago: The University of Chicago Press, 1913. Pp. vii + 171. $1.10.

MCCOMAS, H. C. *The Psychology of Religious Sects.* New York: Fleming H. Revell Co., 1912. Pp. 235. $1.25.

RUSSELL, J. E. *A First Course in Philosophy.* New York: Holt, 1913. Pp. v + 302.

ROYCE, J. *The Problem of Christianity.* 2 vols. New York: Macmillan, 1913. Pp. xlvi + 425. $3.50.

PECK, R. B. *The Perceptions of Robert Bowman Peck.* London: E. Mathews, 1913. Pp. 48.

BÜHLER, K. *Die Gestaltwahrnehmungen. Experimentelle Untersuchungen zur psychologischen und ästhetischen Analyse der Raum- und Zeitanschauung.* Stuttgart: Spemann, 1913. Pp. viii + 297. Mk. 7.50.

HUNTER, W. S. *The Delayed Reaction in Animals and Children.* (No. 6 of Behavior Monographs.) New York: Henry Holt & Co., 1913. Pp. 86.

BECHTEREW, W. *La psychologie objective.* Paris: Alcan, 1913. Pp. iii + 478.

MAJOR, D. R. *The Elements of Psychology.* Columbus, O.: R. G. Adams and Co., 1913. Pp. xiii + 413.

GRAY, C. T. *Variations in the Grades of High School Pupils.* Baltimore: Warwick & York, 1913. Pp. 120. $1.25.

RÉVÉSZ, G. *Zur Grundlegung der Tonpsychologie.* Leipzig: Veit & Comp., 1913. Pp. viii + 148. M. 4.

NOTES AND NEWS

PROFESSOR JOHN B. WATSON and MR. K. S. LASHLEY, of the Johns Hopkins University, sailed on the 19th of April for the Dry Tortugas to remain until the latter part of June. They will complete the work on the homing of the noddy and sooty terns, upon which Professor Watson has been engaged for several years under the auspices of the Carnegie Institution.

PROFESSOR RAYMOND DODGE has been granted leave of absence for the coming year, without university salary, in order to assume the position of experimental psychologist for the Nutrition Laboratory of the Carnegie Institution. Professor Dodge will be located in Boston.

W. C. RUEDIGER, professor of educational psychology, and acting dean of the Teachers College at the George Washington University since the death of Dean Hough last September, has been appointed dean.

C. E. FERREE read a paper before the American Philosophical Society of Philadelphia on Friday, April 4, entitled: The Problem of Lighting in Its Relation to the Eye. Relative to the progress that is being made by the committee that was appointed by the American Medical Association for the investigation of this problem, the following extract is taken from the report made on March 8, by the Secretary of the Committee, acting under the instruction of the Chairman. "The most promising method thus far suggested for a test as to possible eye injury is the one brought forward by Prof. Ferree, of Bryn Mawr College. The work for the present year, therefore, consists of further experiment by him with this method at Bryn Mawr College in conjunction with the ophthalmologists resident in Philadelphia, and members of the committee."

THE present number of the BULLETIN, dealing with Psychopathology, has been prepared under the editorial care of Professor Shepherd Ivory Franz.

THE following items are taken from the press:

THE French Academy of Moral and Political Science has elected M. Pierre Janet, professor of experimental psychology at the Collège de France, to the chair left vacant by the death of M. Fouillée.

MRS. CHRISTINE LADD FRANKLIN, of New York City, has recently given three lectures on "Color Vision" at Columbia, Harvard and Clark Universities.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

VISUAL SPACE

BY PROFESSOR G. M. STRATTON

University of California

Ostler (7) gives considerable attention to space-perception by the eye, although he is primarily interested in the philosophical problem whether the physical world is to be conceived "idealistically" or "realistically"; and if realistically, after the manner of what particular kind of realism. Let it be said at once and to give the proper setting of his doctrine, that he is a realist,—a moderate realist, opposed both to naïve realism which holds the world to be what it appears to our senses to be, and to transcendental realism which deprives the world of all its sensuous qualities. He develops his thought with a certain attention to scholasticism, not setting himself wholly in opposition to it, but hoping to remove something of the mystery, not to say contradiction, of the Thomistic tenets. In Ostler's book we have, then, one more interesting evidence of the vitality of St. Thomas's influence even in the presence of modern laboratory research.

Ostler holds that what is immediately "given" in vision is colored extension; and that while this extension *may* appear as a plane surface such an appearance is not necessary. At times he speaks of visual experience as immediately tri-dimensional; but again, the position is taken that the third dimension is due to our use of the causal principle excited by the sudden disappearance and reappearance of certain moving objects (*e. g.*, the moon in the sky), which we interpret as "behind" other objects (the clouds, the range of hills). The vague tri-dimensional extent so given comes to be divided into particular objects, not because of color-distinctions, but because of

certain group-*movements* in the field. The immediate data of vision develop, farther, into a system of objects existent outside the visual field, outside the perceived time, with distance felt to lie between eye and object. That ever-present part of the field, which I call my body, becomes still more differentiated by its responsiveness to my will and by its peculiar tactual and other sensations.

Yet tactual and visual space, for Ostler, are not wholly different, though having much that is different. He reviews many of the cases of surgical relief from early blindness, and concludes that the two regions of experience, touch and sight, have in common a purely geometric aspect, just as they have in common a numerical, and (he might have added) a temporal aspect.

The relation of vision to the retinal image is interestingly considered by Ostler. The *psyche* is present in the retinal image, without quite surrendering her non-spatial character; and by her power she reorganizes this small, mosaic-like, and dual image into a continuous and unitary scene having the size which experience and reason demand. In explaining the inner organization of the visual scene out of materials furnished by the retinal image, he inclines from the theory of local signs, in either its Lotzean or Wundtian form, and toward the theory offered by Lipps. How the perceptive picture is upright though the retinal image is inverted,—upon this he holds that the experimental evidence is conclusive against those who maintain that the inversion of the image is necessary, but he would modify the explanation once offered by the present reviewer, and lay more stress upon the direction of eye-movements and upon a direct connection between the retinal elements and the up-down relations in the visual field.

Poincaré (8), in an article of interest to psychologists, enters upon questions already touched in reporting Ostler's work,—the question of the number of dimensions in "immediate" visual space and of the connection of visual with tactual and muscular space. Poincaré would show the reasons why "real" space must be declared to have three, and no more nor less than three, dimensions, viewing the matter mainly from the high ground of a purely qualitative geometry, as contrasted with metric and projective geometry, each of which has a quantitative side. The very fundamental proposition of such a qualitative geometry—*analysis situs*—is, he holds, that space is a continuum of three dimensions. But when we come to examine the continuum given us by touch or by sight, we find it to be, not geometric space, not a mathematical continuum, where each

point is absolutely distinct and indivisible, but a physical continuum, where each point is flanked by other points indistinguishable from it. The continuum given us by touch differs from space, moreover, in several further respects: it has but two dimensions; the same point on the skin does not always correspond to the same point of space, since the skin shifts its place; and, finally, the distance between points on the skin varies with the various modifications of the form of the body.

And similarly, holds Poincaré, of vision. True, the continuum which the eye affords us is superior to that of touch. For while the retina alone gives us a continuum with two dimensions, like itself, yet a third dimension is readily admitted, with convergence, in binocular vision; and furthermore the retina moves as a whole, a "solid," without the deformation to which the skin is always liable. Even visual space is not true space, however: for the same point on the retina, even with the same degree of convergence, does not always correspond to the same point of space; the third dimension in visual space seems alien to the other two dimensions; and the geometry of the blind is the same as our geometry.

It is only by movements and the resultant series of muscular sensations, that tactual and visual "space" become one, and we arrive at a physical continuum of three dimensions. He seems not to make it clear how this construction from data of the three senses, which is still but a "physical" continuum, is finally transformed into the true space of the geometer. He determines the number of dimensions of a space by the character of the continuum needed to partition that space; and argues that three dimensions, while not indispensable for the statement of physical laws, yet permits a far simpler statement than does any other assumption. According to Poincaré, we have the power of intuition of spaces with more, as well as less, than three dimensions; it is the world of actual experience which leads us to exercise this intuition more readily in the one form of space than in the others.

Passing to a less general and speculative region, and yet not wholly apart, we catch the close of a controversy upon the character of the space-perception of those deprived of sight. Upon the character of the so-called distance-sense of the blind, Kunz (4) and Meumann (in a reply, at white heat, appended to Kunz's statement) are almost ready for blows, chiefly about a choice of words. The contestants seem agreed as to the core of the matter, that the blind become aware of distant objects by hearing and temperature as well

as by touch, and that the response need not always be a perception, btu may be merely a reflex.

We find a continued and penetrating interest in the visual perception of motion. Under a general heading bearing his name Schumann (10) proposes to publish a number of articles by his students, where he has guided the writer's thought and has supplied additional matter. The first of such a series is by Lasersohn (5), who reviews the experimental work and theories of Exner, Stern, and Linke, upon motion as "immediately" seen. Lasersohn holds that Exner's work is insufficient to prove the existence of specific sensations of movement, although their existence is quite possible. Of the three factors which Stern would make responsible for a specific visual sensation of movement, two—the after-image streak, and the eye-movements—are stricken out by Lasersohn, leaving but one, the change in the stimulus itself. Linke's theory is regarded by our author with a scorn which inclusion among those he names "chiefest" would hardly lead one to expect. Linke's explanation is, for Lasersohn, a pure "construction," unsupported by experiment or by the observation of others; indeed, our author offers what he believes to be its experimental refutation.

Wertheimer (11) reports an elaborate series of experiments upon the apparent movement produced by the successive display of luminous areas at a considerable distance apart. He concludes that the motion here observed is due neither to eye-movements nor to the gradual subsidence of the light-sensation. Nor is it necessary, in order to perceive motion under these circumstances, to regard the initial and the terminal object as but different aspects of one and the same thing; for the motion of either or both may be felt as belonging to a separate object. Indeed the motion may be seen when one of the successive displays is not perceived at all, or when both of them seem at rest. He finds difficulty in regarding visual motion as a *Gestaltsqualität* or as a mere movement of attention, although the direction of the attention has an important influence upon the phenomenon. In attempting to put something in the place of these shattered explanations, Wertheimer translates into physiological terms some of the more salient of his positive observations as given above. With Lasersohn, he holds that the physiological process is clearly not in the retina itself.

Wohlgemuth (12), also dealing with visual motion, namely with the after-effect of looking at a banded field in movement, gives an admirable survey of previous work upon this topic. He has

checked the observations of all the authors mentioned in his historical survey (which, however, is not without omissions), and then supplements their work by a very wide range of experiments of his own. From his additions to the knowledge of the subject the following may be selected: the after-effect of movement is independent of the quality of the light employed, and moreover occurs with alternating colors when there is no difference of brightness; it occurs with the dark-adapted, as well as with the light-adapted, eye; its duration diminishes as the seat of stimulation is farther from the fovea; no after-effect is noticeable if the whole field is stimulated by the moving bands; after the observable after-effect has ceased, there is a demonstrable residue of effect; no analogous phenomenon is found in the sense of touch. Wohlgemuth is led to reject each and every theory of others,—physical, physiological, and psychological,—although he remains in sympathy with that part of Exner's explanation which involves a "motion center." He himself lays stress upon the similarity between the present phenomena and those of "the rebound-effect observed in spinal reaction . . . attributed to inhibition and fatigue," and looks to pathology for some decisive word as to the truth of his proposal.

Dufour (1, 2), as in the preceding year, publishes as though they were novel, observations in binocular vision that for the most part have long been known.

In closing, but a few words are necessary upon a trio of articles that deal with instruments concerned with visual space. Gertz (3) presents a detailed exposition of the physics of binocular instruments considered more especially from the standpoint of the geometric theory of collinear representation. Quidor (9) describes a new form of binocular microscope with a *single* objective, and yet so designed that by a system of prisms it is adjustable to the interocular distance and gives, so the author claims, a true binocular relief, still vivid when the enlargement runs as high as 400 diameters. Noguès (6) has devised a mechanism for increasing the rate of exposing the cinematographic film, and has succeeded in taking photographs of running, flight, etc., at a frequency of 180 to the second. In projecting these views by the usual means, the rate can now be decreased and the movement studied, while still preserving the appearance of continuous motion. This "retarded" motion, at about one-twentieth of the rate of its actual occurrence, makes possible, it is claimed, the observation of many an obscure detail.

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TACTUAL AND KINÆSTHETIC SPACE

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The main interest in this field during the past year seems to have been in the subject of cutaneous localization. Ponzo (5) reports a series of experiments on the localization of intercostal points. The method of experimental procedure was in general that of the author's preceding researches, the method of Weber, in which the experimenter stimulates a chosen point on the skin, and the subject, with eyes closed, indicates with a small rod the point stimulated. The points chosen were in the fifth, sixth, seventh, and eighth intercostal spaces on both right and left sides of the body. For each of the three subjects there were fifty tests, distributed over ten points on each of the regions tested. The results show that a majority of the errors of localization lie in the direction of the intercostal space. This is true not only of the localization of pressure but also of pain sensation,

and not only for localization with the right hand, but also with the left. The author interprets the results as showing a tendency to localize a cutaneous sensation along the line of the sensory nerve. Of the two directions, distal and proximal, the preferred direction is usually distal, *i. e.*, toward the periphery of the nerve, and therefore in accordance with the "law of eccentric projection." The same is probably true of localization on the limbs, but here there are other complicating factors.

The second study of cutaneous localization is that of Franz (3), who is especially interested in investigating the relation between accuracy of localization and fineness of two-point discrimination. The method of experimenting was essentially that of Ponzo, except that the subject localized the point stimulated with the forefinger instead of with a rod or pencil. The points chosen for localization were sixty in number, distributed over almost the entire body. There were five subjects, all women (artists' models), on all five of whom the complete series of localization tests was made. Tests for the determination of the two-point threshold on various regions of the body were made on three subjects. The results confirm earlier results of Ponzo[1] that (1) the average error of localization is less than the two-point threshold, and (2) seems to bear no direct relation to the latter. The author finds further (3) that light touch stimuli are localized more accurately than more intense stimuli; (4) that "the errors of localization are not constant in direction for different parts of the body, or on the same part for different subjects, or on corresponding parts for the same subject at different times"; (5) that "no practice effects were discovered"; and (6) that "stimuli to a part were sometimes localized on an opposing part, *e. g.*, near the axilla there were localizations on the chest where the arm was stimulated, and vice versa." It will be noted that (4) above is in direct disagreement with the tendency noted by Ponzo to locate an intercostal point in the direction of the intercostal space. This divergence may be due to the fact that Franz groups together the localizations of all points on a given region of the body, so that the localization errors for the eight points on the chest are averaged together in the tables. This averaging would cover up any tendency to intercostal localization if such existed.

In regard to result (5) above, it should be noted that Franz's experiments were not especially adapted to bring out any possible effect of practice. The negative result is, however, corroborated by

[1] *Arch. ital. de biol.*, 1911, 55, 1–14; reported in this BULLETIN, 1912, 9, 256.

Ponzo (6) in a series of tests designed to study the effect of practice on cutaneous localization. The method is essentially that of previous work. The points stimulated by the experimenter and localized by the subject were ten previously determined touch-spots on the volar surface of the forearm. The author finds that practice continued through ten sittings on as many successive days has no effect either in reducing the amount or in changing the direction of error. Cutaneous localization thus differs markedly from the two-point threshold, which has been shown by other experimenters to be lowered by practice. The author's explanation of this divergence is purely theoretical, and is too involved to be given in a brief review.

Chinaglia (2) describes in this article work already reported[2] on the subjective filling-out of hollow forms placed on the skin.

Barucci (1) reports the beginning of an investigation of the relation between the tactile spatial threshold and the distribution of pressure spots in the skin. This "preliminary note" deals with the failure of the author to discover any true pressure-spots. The volar surfaces of the forearm, palm and fingers were explored by means of hair stimuli. The results were as follows: (1) "In no one of the three subjects was ever found a point whose excitation provoked constantly a sensation of pure pressure." (2) Every point of the skin tested presented a great variation in response to stimuli of equal nature and equal intensity. (3) Practice diminished the percentage of painful sensations, and also diminished the stimulus threshold for pressure. Kiesow (4) criticizes these experiments severely, but it seems to the reviewer justifiably. His main points are: first, the general comment that the existence of touch-spots has been too well established by various expert investigators to be overthrown by a single series of tests; and, second, detailed criticism of Barucci's experimental procedure. The most important points in regard to the latter are: that the surfaces chosen by the experimenter are poor ones for the discovery of touch-spots, since these are here very thickly distributed; and that her hair stimuli were too strong to give a sensation of pressure unmixed with pain, and were, moreover, wrongly measured, since their strength is given in terms of absolute pressure (*e. g.*, 4 gr.) instead of in terms of gr./mm. radius. The quality of sensation, whether pressure or pain or both, depends not only on the intensity, but also on the area of the stimulus.

[2] Cf. this BULLETIN, 1912, 9, 256.

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SPACE ILLUSIONS

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Gramss (9) gives a short and simple account for popular use of the geometrical-optical illusions. Etchart's (5) monograph is a treatise on the general topic of illusion from the standpoint of the psychology of perception. The treatment is theoretical and conventional. An interesting and suggestive classification is given. Fauser (6) gives a general account of illusion from the same standpoint but with reference to the interests of psychiatry. The Wundtian doctrines of association and apperception furnish the keynote to the treatment. Klette's (10) work is of interest to theoretical æsthetics. Rosenberg's (11) article belongs primarily to the field of abnormal psychology. He presents a good clinical study of a defect occurring in senility which he terms chiragnosia; it consists of a defect of orientation toward the halves of the body, and it is similar to dyschiria of hysterical origin, though differing from it in a number of symptoms. The condition is due to a defect of conception involving kinæsthetic and visual memories of the parts affected.

Filehne (7) maintains that the differences of apparent size of heavenly bodies is due to the varying distances at which they are projected. This surface of projection is ellipsoidal and the ratio of the two axes is 3.5 : 1. By computing the varying distances of projection for the various angular units of elevation, he found that the greatest change, both absolutely and relatively, occurred within

12–16 degrees of elevation. As a consequence, this elevation should exhibit the maximum of illusion. Bull (3), while observing a rotating wheel, noted that certain sections of the spokes stood out clearly at the moment of eye closure. The section of clear vision depends upon the individual, the eye used, the position of the eye in the head, and the direction of rotation. By photographic means he proved that the phenomenon is due to an enforced eye movement occurring during winking. Given a stereogram of a double pyramid, one appearing in depth and the other in relief, Chauveau (4) finds that either half may be made prepotent so that it will invert the 3d dimensional character of the other. The more disparate figure or that drawn with the heavier lines was found to be the dominating one.

Adams (1) and Schilder (13) deal with the autokinetic phenomenon. Adams has worked over the experimental field with quantitative methods, verifying many of the older conclusions. A good historical review of the literature is given. He found that the illusion occurred universally, 50 subjects being tested, that the form of the light exercised a marked effect upon the direction of the illusion, and that movements in the 3d dimension were present. As a principle of explanation, he favors the conception of ocular strain and tension. Schilder contends that the origin of the illusion is to be found in retinal processes while such factors as strain, etc., account rather for the direction and velocity of the movements after it is aroused. His paper deals with these primary motives, principally with what he terms a "wave" phenomenon. This consists of a series of wave movements running back and forth along a line of light after a long continued fixation under normal perceptual conditions. By a variety of tests this wave phenomenon is proved to be retinally conditioned.

Smith, et al. (12), with a new method and the use of point-limited distances instead of lines, confirmed their conclusions of a former paper reviewed last year. As to affective character of responses, they found that judgments of equality and pronounced inequality are pleasant, while doubtful judgments are unpleasnat. Valentine (14) concludes work previously reviewed on the vertical-horizontal illusion. An astigmatism of 1.5 D. or less does not influence the illusion. On the basis of his whole work, he concludes in favor of an innate retinal basis. The discrepancy due to this factor is somewhat overcome during experience in the interest of perceptive norms. Increase of the illusion due to practice is a result of educating the eye back to its pristine innocence of relying upon the immediate

sense data. Filehne (8) notes a new areal illusion of which the Müller-Lyer figure is but a special or limiting case. Suppose one cuts a series of slices of equal thickness from a sphere or cone, and compares the common circular area of any two adjacent slices. The two will appear unequal and the illusion will be greatest for those slices taken nearest to the circumference of a sphere. If two such slices are turned until viewed from the edge, the two circular areas will become ellipsoidal in form and finally be lines, *i. e.*, the outline of the slices viewed from the edge may be regarded as a variant of the M-L. figure. In both the areal and linear figures, the illusion varies directly with the cosine of the angular opening, a fact which has significance only from the point of view of the author's theory, *viz.*, that all such illusions are due to motives derived from judging volumes. With such forms, one unconsciously judges volume in terms of height *times* a mean between the two unequal bases. Benussi's (2) work is quite important from the standpoint of both method and results. He presented the Müller-Lyer and the Zöllner figures stroboscopically and hence any aspect could be varied while being observed. In the M-L. figure, the arrowhead lines were perceived in motion varying either in length or angular opening. This stroboscopic motion varies the degree of the illusion and hence induces a secondary motion of some part of the figure. The presence or absence of this induced, non-stroboscopic, movement is an index of the presence or absence of the illusory effect. When the stroboscopic movements are regarded as an isolated event, abstracted from their relation to the other parts of the figure, the illusion is not present. The illusion occurs with these figures only when they are perceived as spatial units. In other words, central apperceptive conditions are a *sine qua non* to the presence of these illusions. In this connection, he asserts that the M-L. illusion may not only disappear with practice, but that practice with a certain perceptive attitude will increase it in amount.

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PSYCHOLOGY OF TESTIMONY AND REPORT[1]

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It may be recalled that the article by Varendonck, reviewed a year ago, presented an interesting case in which false accusation was brought against an innocent man by the testimony of a group of children under the pressure of intense suggestion. A markedly similar case is now reported by Marbe (5). Some German school girls accused their teacher (a man) of serious sexual offenses against several of their number, including those who gave testimony. The testimony given by these girls was very detailed and decidedly incriminating, but the teacher was eventually freed, and in part by the aid of expert testimony given by Professor Marbe, which convinced the jury of the unreliability of the declarations given by young girls upon a matter of this kind and under the peculiar circumstances that surrounded the case. The testimony of the psychological expert

[1] I have been aided in the preparation of material for this summary by Mr. F. S. Kleinman, of Cornell University, to whom my thanks are due. On account of unavoidable delay in securing the volume in question, the summaries for references 2 and 3 must be deferred until another year.

was also strengthened by the fact that the declarations made by all but two of the girls became self-contradictory in the course of the several examinations to which they were subjected, while the testimony of the two girls that persisted unaltered through the examinations was conclusively reversed by the results of a medical examination of these girls. The case, then, has psychological interest in three ways: first, it affords one more striking demonstration of the influence of rumor and suggestion upon belief and report; secondly, it adds one more to the increasing number of cases where the psychological investigation of testimony has borne practical fruit in the courtroom; and thirdly, it demonstrates what an extraordinary influence the discussion of a sexual situation may exert upon the judgment and opinions of adolescent girls.

The case reported by Mehl (6) is a similar instance of accusation of sexual offense, brought in this instance by a 13-year old girl against a boarder in her mother's family. The accused deniedhaving made improper advances to the girl and was ultimately freed because certain of the events which she declared to have transpired proved to have been impossible. Thus, for instance, she testified that he had locked the door of the room, whereas there was no key in the lock and the lock was so out of order as not to operate when a key was provided. In this case the girl's testimony had some elements of fact, but that portion of her accusation which was morally and legally serious was shown to be the work of her imagination, and it was subsequently found that she was mentally deficient.

Another case in which Professor Marbe (4) figured as an expert witness, was that which followed a serious railway accident near Müllheim. The psychologist was here asked to testify as to the probable effect upon the mental status of the engineer of the wrecked train of drinking a given amount of alcohol and also as to the possibility that the fireman and the guard could have executed the proper motions for stopping the train with the emergency brake, if they had acted promptly when the train passed certain preliminary danger-signals without slowing down.

A general survey of the value of testimony that was originally presented by Ladamc before the Congress of French Alienists and Neurologists, at Amiens, August, 1911 (see *Revue de Psychiatrie*, 1911, p. 332), has been summarized by Näcke (8). The chief conclusions, already familiar to those who have followed work in this field, are: (1) Error is a constant factor in testimony, so that even perfectly honest testimony deserves less credence than is commonly

given it. (2) Errors are much less frequent in spontaneous testimony (narrative) than under interrogation. (3) The value of testimony depends on the question as well as upon the answer, so that the two must always be considered together, as a whole. (4) Any question that carries a suggestion should be avoided; in especial, children have a very slight resistance to suggestion. (5) Testimony descriptive of an individual's appearance has only a limited reliability; that descriptive of colors is practically worthless.

Dauber (1) worked on the theme of community of mental processes and its relation to testimony. He presents first a review of the general principles already developed from previous experimental work, *e. g.*, from preferential reactions like the tendency of a group of individuals to pick the same card, to name the same color, or the same number, and cites the well-known distortions introduced into census-statistics of age by the decided increase of frequencies at numbers ending in 0 and 5. Numerous examples are cited from the literature and from court proceedings to show the prevalence of serious errors in various kinds of estimations and in identifications. Thus, to cite one case, in England a man was arrested and convicted on the testimony of ten persons who recognized him as the rascal who had cheated them. On a subsequent retrial, six more persons identified him. But still later the real criminal was found, and the sixteen witnesses, when confronted with both men, withdrew their evidence against the first. Dauber's own experimental work includes the questioning of 109 children and adults at Würzburg concerning familiar things in that city, *e. g.*, "What is in the middle of the market-place?" To this question, for instance, 27 of 38 boys in one class gave the *same wrong* answer. And in general, for these questions as a whole, Dauber secured 2,244 right answers and 1,379 wrong answers. Particular emphasis is laid on the circumstance that these wrong answers tended to be the same wrong answers: 1,248 of them were what might be called "group errors." The point is, then, that the same errors tend to repeat themselves in the testimony of different witnesses. Others of his experiments, chiefly with school children, were directed toward proving that a variation in an habitual sequence of events or in an habitual setting is particularly likely to pass unnoticed. Thus, even although he announced that the windows of the classroom would not be opened as usual at 10 o'clock and they were not opened, 52 per cent. of the class afterward declared that they had been opened. In sum, the practical significance of Dauber's experiments is to lessen still further

the confidence that one has been wont to feel in assertions which are made in identical manner by numerous witnesses. For some types of material at least, *e. g.*, estimates of time, not only are false answers more common than right answers, but the most common answer is more likely wrong than right.

Menzerath (7) attempts a critical appraisement of the value of the association-reaction method in criminal procedure. Can we convict a person of guilt, or knowledge of guilt, against his will, simply, infallibly and unequivocally? Or can we prove his innocence? His answer is negative: the association method cannot convict a criminal, nor prove innocence with certainty (as Gross has maintained), nor has the method practical value for case analysis in its present status. In fact, he believes that the method is inferior in promise to that of the psychogalvanic reflex. Not, however, that the situation is entirely hopeless. Only that the difficulties are so great that no one but an experienced psychologist can use the method with success. He wishes that for further investigation every large prison might be fitted with a laboratory or that at least psychologists might be admitted to them for research. With regard to the method, Menzerath notes that three symptoms have been used to diagnose the presence of a concealed complex: (*a*) "material" symptoms (direct revelation in the associated word of the supposed situation), (*b*) qualitative symptoms, like assonance, failure to react, repetition of stimulus word, perseveration, etc., and (*c*) quantitative symptoms, chiefly lengthened time. Another method of disclosing symptoms is afforded by the retrial of the series, wherein, as Jung has pointed out, the disturbed reproductions (altered reactions and words recalled only with difficulty) belong chiefly to the hidden complexes. Menzerath himself has refined the method, first by limiting the number of reactions to 20 in one day (which he believes necessary to avoid fatigue), and secondly, by requiring the subjects to indicate on the final retrial the degree of certainty that they feel of the correctness of their repetitions of the associated responses. When this is done, if the subject is doubtful of his report, or is convinced mistakenly that it does not coincide with his first response or if the old response has completely vanished from memory, then, in any one of these conditions we have a "disturbance" that affords an additional complex-symptom. This author also insists that the use of the stopwatch with auditory presentation is not free from objection and should be replaced by visual presentation with a Hipp or d'Arsonval chronoscope. Finally, he raises the question of "complex-sensi-

tivity" and is convinced that in certain mental conditions (of which chronic alcoholism and traumatic neuroses are instances), the subject can by no means be investigated successfully by the association method, because his "sensitivity" is so reduced that the complex will not be revealed by any of the usual complex-symptoms. And, in general, the method will on this account probably fail at just the point where it is most needed—in the examination of cunning and polished rogues. However, the moral imbecile, it is worth adding, has a high complex-sensitivity and is thus amenable to the method.

That the future may see modern invention brought to the support of human frailties in testimony is suggested by Schneichert's brief comment (10) on the use of the kinematograph in conjunction with riot and plundering at Ay, France, where the court convicted numerous persons on the evidence afforded by the moving films.

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SUGGESTION

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The psychological literature of the year shows a general tendency to employ the word suggestion in a fairly restricted sense. However, certain writers still insist on using the term in such an inclusive sense that it ceases to have any definite meaning. Thus Bernheim (2) asserts, "Toute idée, toute image psychique est une suggestion" (p. 269). He observes the distinction between auto- and hetero-suggestion but uses these terms in an uncommon manner. All mental phenomena are classified according as their physical causes are internal or external. By internal he means chemical and physiological changes taking place in the organism itself, including also such processes as circulation of blood in the cortex. By external he means all physical stimuli such as sound waves, etc. All mental processes resulting from internal stimulations are classed as auto-suggestions; all those resulting from external stimulations are classed as hetero-suggestions. An example of auto-suggestion would be the physiological condition of hunger "suggesting" food. An example of hetero-suggestion would be the stimulation from a light "suggesting" fire. It should be observed that the author is not H. Bernheim, who has written so extensively and so efficiently upon the subject of suggestion.

The title of the article by Lotz (4) indicates exactly the nature of the material presented. Suggestion is conceived of as the transmission of a conviction from one person to another or to others. The success of the suggestion depends upon the intensity of the conviction of the first person, and upon the existent inclination of the second person to do the thing suggested, and also upon the manner of the presentation. The paper was written for teachers or parents and emphasizes precautions that must be followed if suggestion is to be effectively employed in education. The style of the author is pleasing and his advice is most stimulating and helpful.

Chatley (3) contends that the "Boxer Rebellion" was a great craze to destroy the foreigner or at least to drive him out of China. This craze is asserted to be the working of social suggestion in which the agencies for producing the extreme degree of suggestibility were ceremonial rites, chants, and epigrams. Anesthesia and analgesia were produced and were interpreted as invulnerability produced by

the spirits of their ancestors. Boys were most subject to the contagion and the state into which they were brought was not unlike profound hypnosis.

In the Vassar Laboratory a series of experiments was carried out upon thirty-five college women upon "the effect of verbal suggestion on judgments of the affective value of colors (5)." The method of conducting the experiment is very briefly described. "The suggestion took the form of favorable or unfavorable adjectives pronounced by the experimenter as the color was shown. For example, when a given color was shown in the series with unpleasant suggestions it would be accompanied by the adjective 'faded'; when the same color was shown in a series with pleasant suggestions, its accompanying adjective would be 'delicate'; another color would be termed 'warm' in the series with pleasant suggestions, and 'crude' in that with unpleasant suggestions." The average of the results for each individual indicates that the suggestions were fairly successful with nineteen of the subjects; but with the other sixteen the results were negligible or negative. No statement is made as to the variability of the individual results, of the prestige of the experimenter (or experimenters?) as judges of affective value of colors, nor of the standardization of the conditions under which the experiments were conducted. If it were not for the uniform skill with which experiments are carried out in this laboratory, a suspicion would be aroused because of the failure to discover the working of suggestion with such a large proportion of the observers.

Adams (1) found the illusions of autokinetic sensations, produced by fixating a bright light, peculiarly susceptible to suggestion. Apparently all subjects were subject to the suggestions but not in equal degrees. This method might well lend itself to testing personal differences in suggestibility.

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TESTS

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Space permits nothing more than a brief statement of the main lines which the investigation of tests has taken during the past year. The extent of the bibliography indicates the large amount of activity in this field and the diversity of journals in which articles on this subject appear indicates the extent to which interest in tests has spread. The greatest interest continues to be excited by the Binet-Simon test series. Town (6) has published a full translation of Binet's 1911 revision and the accompanying article. Block and Preiss (7), Chotzen (11), Huey (23), Kuhlmann (27), Saffiotti (37), Sullivan (45, 46), Terman and Childs (47), Wallin (50, 52) and J. and R. Weintrob (54) have published new results obtained by the application of the scale. In many cases the results are manipulated so as to throw light upon the reliability of the series. Kuhlmann (26) has published a modified scale on the basis of such investigations. Critical or explanatory articles are contributed by Goddard (2, 19, 20), Bobertag (8, 9), Schmitt (38), Town (49), and Wallin (53).

The Binet-Simon Scale has also stimulated a good many attempts to standardize tests or series of tests in a systematic way. Squire (41) and Terman and Childs (47) have worked with groups of tests; Goddard (1, 21) with the form board and the size-weight illusion; and Pyle (36) offers some tentative standards. New tests have been described and to some extent standardized by Ash (4), Fernald (14), Gray (22), Johnson and Gregg (25), Meumann (30) and Münsterberg (31).

The description and discussion of tests for special purposes are contributed by Ayers (5), Franz (17), Lobsien (28), Münsterberg (31), Metzler (33), Potts (35) and Thorndike (48), and results in numerical form are presented by Fernald (15), Simpson (39), Wallin (51) and J. and R. Weintrob (54). Critical discussions of the Courtis tests are presented by Otis and Davidson (34) and by Courtis (12), of the Hillegas-Thorndike scale by Johnson (24), and of tests in general by Myers (32). School grades are urged as the basis for college entrance by Smith (40) and the unreliability of grading in English and mathematics is brought out by Starch and Elliott (42, 43).

The most widespread attitude toward tests is constructively

critical. There is a belief that tests are good for something but that careful testing of the tests themselves is necessary in order to determine the limits and conditions of their usefulness.

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FOUR AMERICAN ARTICLES ON INTROSPECTION

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The articles by Titchener (3 and 4) are to be followed by more on the same topic: Dodge (1) also refers to future studies in this field: Dunlap's article (2) is considered final in itself.

Each of the men uses the term "introspection" in a different sense, and their conclusions are naturally different as to the place of "introspection" in psychology. Dodge argues that inner perceptions are creative, and give only one indication of the mental reality. Titchener argues that analytic descriptive observation of experience is the essential method of psychology. Dunlap asserts that awareness of awareness does not exist. A résumé of each article follows.

Dodge remarks the general neglect of an examination of introspection: Müller's recent work is a good exception.

Current psychology is apt to assume a dualism, and to asserr that only the material obtained by introspection is material fot psychology, all else being merely physiological or physical. Psychology might be defined on this basis, of course, but we should then recognize the existence of another, broader sicence, "a science of the conditions of human experience, conduct, and personality" (p. 217), which would draw its facts from pathology, neurology, and behavior of animals as well as from introspection.

There is no doubt of the possibility of introspection, in the sense

of observation of mental fact; we cannot question that the mind does perceive itself. Introspection is of great importance for a science of human experience, and "the precise phenomena which it mediates are given in no other way" (p. 215). But introspection is itself a mental fact, and must therefore be capable of psychological analysis and investigation, and its adequacy must be criticized. "Additional facilities in introspection would doubtless, as Kant suggests, turn humanity into a race of hypochondriacs" (p. 220).

Historically there have been two chief theories of introspection: (1) introspective realism, the theory that knowledge of one's own mental life is immediate and adequate; (2) introspective phenomenalism, the theory that "the inner life like the outer gives us only phenomena" (p. 219). This theory originated with Tetens and Kant; it has never become generally accepted; but Dodge considers it the correct one.

Every perception is an active, elaborative process, and involves an "apperceptive system." Man has an inner sense as well as an outer sense; and the perceptive process of the inner sense involves the same sort of apperceptive elaboration as does the perceptive process of the outer sense, but with peculiar apperceptive systems of its own.

The facts of psychology "differ from the physical facts entirely in their noetic setting, not in the stuff" (p. 221). The stuff is always integrated with one or another of the systematic groupings of experience. For the science of psychology there is an abstraction from the spatial attributes of the stuff.

The self-perception of introspection does not imply any "division of the self into observed and observing, different from that which occurs in every moment of attentive observation" (p. 222).

Training is necessary to the practice of introspection as to that of any other method of science. The result of such training is that the apperceptive systems of the observer create a practically ineradicable bias, and predetermine the result of the observation.

If the observed consciousness is itself the product of an elaborative observation, then the pristine non-conscious data, and also the process of elaboration, must both escape our introspective observation. And if a certain apperceptive system is necessary to the perception of any given element of consciousness, then it may well be that some actual elements must escape any introspection now possible. And "if consciousness itself, for the sake of argument, should be regarded as a process of integration, could the process itself ever get integrated in terms of its resultants?" (p. 224).

The fields of the subconscious or uncleared give some empirical basis for believing the scope of introspection is actually thus very limited.

"Simple sensations" are hypostatized "abstract qualities of consciousness" (p. 225). Introspection can never disclose "the stuff out of which consciousness is made," nor the total of "the apperceptive masses on which any given moment of awareness depends," nor "the causal relations of any fact of consciousness," nor "the psychical dispositions, psychophysical or physiological residua, engrams, or whatever we may for convenience call them" (p. 226). And there is reason to think that these are not even of the same nature as the consciousness that is observed.

"On these considerations the methodological dogma that all mental reality is subjectively observable and conversely that the subjectively observable alone is mental reality seems to me utterly unjustifiable. Moreover, analogy of the successful empirical sciences is opposed to it" (p. 227). We should use introspection as only one of the indicators of mental reality, and realize that knowledge of the mental reality itself must be reached by construction which uses other data also. The construction must however be that of science, not that of metaphysics.

Titchener (3) shows that psychologists now generally agree that introspection "is the one distinctively psychological method, and all data must, if they are to become psychological, be interpreted in the light of introspection" (p. 433). There would be a logical possibility, however, of some psychology without any introspection.

There are gross differences in the meaning of the term: to some it means a moralizing absorption in considering the value of one's experiences, and is justly considered morbid: to others it means a rationalizing interpretation of one's experience in terms of some philosophical system, and is considered incapable of producing agreement as to the facts of consciousness. The impersonal, critical, natural-science method of introspection is still often confused with these.

It is true that contradictory results have been produced by introspection in recent psychological work; but every science shows similar facts; and there is no sound reason for thinking unity of result cannot be attained in psychology. It is impossible to experiment without theories, but it is perfectly possible to alter theories to fit observed fact.

Introspection implies self-consciousness in one sense, but not at all in the sense sometimes assumed, that the mind in some way

gets outside itself, and is then aware of itself as observer and as observed and also of the relation of observation between the two. Introspection is an interrogation of experience, issuing ultimately from conscious purpose, and implying self-consciousness "only in the sense and to the degree in which all scientific observation, that of physics and chemistry included, implies self-consciousness" (p. 440).

Introspection is not necessarily a conscious process: the state of observing tends to become mechanized: it may exist as an occasional conscious process, but as such it is yet little known.

Non-introspective characterizations of mind are made also, from many different points of view, *e. g.*, of biology, and of every-day converse. Introspection is simply the observation from the point of view of descriptive psychology. As such it requires experiments and trained observers.

We cannot ask of introspection that it should give a system of psychology, for a system always involves explanatory principles which are not themselves to be found among the data of the science.

In his second article Titchener (4) starts from a consideration of introspection as a generic term: different methods are required according to the experiences to be observed, the purpose of the experiment, and the instruction, even when the various subjective conditions have been standardized. These methods must, however, be all alike in accepting the point of view of descriptive psychology, and therefore in looking for data and not for explanations. They are also alike in having essentially the same character as the inspection methods—observation and experiment—employed in the natural sciences. Introspection is perhaps simply the old method used with a new mental attitude. It is probably wise to retain the name, at any rate. Failure to appreciate that the attitude *is* different may lead to the "stimulus error," the falsification of the actual psychological data to fit some theory taken from another science. The observer must also be trained: a "phenomenology" which depends on naïve, common-sense accounts cannot be adequate for science.

The full method of introspection involves apperception or appraisement of processes or states, and also a record of the apperception. A schema of introspection given by Müller is paraphrased and provisionally accepted by Titchener. The apperception may be simultaneous with the process observed (direct introspection), or it may be of a memory-image of the process (indirect introspection). Classification may perhaps, however, be better made according to the character of the description: (1) immediate description, of an immediate process; or (2) mediate description, on the basis of present

apperception of a memory image of the process, or on the basis of a remembered apperception which was simultaneous with the process, or on a mixture of these. Müller's next distinction is important: the consciousness observed is *controlled* if it arises under the influence of introspective intent and becomes the object of special attention; it is *free* if it is neither influenced nor evoked in this way; but the distinction between free and controlled is not always sharp. This distinction is not to be confused with that between real and artificial, nor with that between spontaneous and voluntary.

Descriptive psychology assumes that consciousness, as the object of introspection, is describable in the terms of a complete analysis, that is, in terms of elementary processes and their attributes. Description is impossible without analysis. It is unfair to blame analytic psychology for the fact that its analysis fails to do justice to the value-aspect of consciousness, which confessedly transcends description. Consciousness is essentially something temporal: the objects of introspection are content-processes; it is a mistake to regard the objects as contents *and* processes. "We cannot observe an experiencing; we are not called upon, in psychology, to observe an experienced; what we observe is experience" (p. 498). "We cannot observe any product of logical abstraction" (p. 498), and therefore we cannot observe "relation" or "change" or "causation," though these terms *apply to* the data of psychology. "Psychological description can deal only with content-processes under their empirically distinguishable attributes" (p. 498). There is constant danger of surreptitious addition of logic-meanings, as coördinate with the data of pure description. Analysis cannot give a system of psychology, but its work must precede any system.

Titchener then gives a statement of the form of the introspection method used in recent study of thought by Marbe, Watt, Ach, Messer, Bühler, and workers in the Cornell laboratory. A definitely regulated method is evidently not yet attained in this field, but apparently might be reached in general accordance with Müller's formula.

Dunlap (**2**) notes that it has long been generally agreed that introspection, in the sense of consciousness scrutinizing itself, does occur. But "it is now high time that we should question, more seriously than has been done before, the existence of 'introspection' in the traditional sense" (p. 404). The theories of James and of Stout may be taken as typical of the current theories, and are more explicit than most.

James considered a state of mind to be a knower that know$_s$

some object. Later this knower may itself become the object of a new knower; and the object of the first knower then becomes also one of the objects of the new knower. Only relatively enduring states can later become objects, so some brief conscious processes necessarily escape introspection.

This theory is criticized for giving no adequate treatment of the *knowing*. The only secure fact is that a succession of objects is known by one knower. James admits that states of mind all take one point of view; and this point of view constitutes the real I or subject. One might indeed say: Thoughts and things form two quite distinct classes of objects one can know; and knowing *thoughts* is what we call introspection. But this implies a representation-theory rejected now by most psychologists, and finally discarded even by James.

Stout considered that a mental state is not necessarily an object of consciousness, but that it may become so. In itself it is merely the awareness, the *knowing* of some object. A sensation, *e. g.*, is the awareness of a sensible quality; but it may become, secondarily, an object for another awareness.

This theory is criticized as giving no adequate account of the *knower*. "Knowing there certainly is," says Dunlap, "known, the knowing certainly is not. . . . I am never aware of an awareness." "There is no meaning in the term awareness which is not expressed in the statement 'I am aware of a color (or what-not)'" (p. 410).

The mistake of thinking introspection possible is probably caused by the fact that vague kinesthetic and coenesthetic sensations accompany the consciousness of some "external" object, as for instance sound. These may later become clear, and consciousness of them is then considered to be consciousness of the process of observing the sound. The objective self is taken to be the subject.

"There is, as a matter of fact, not the slightest evidence for the reality of 'introspection' as the observation of 'consciousness.' Hence we must, in default of some such evidence, cease the empty assumption of such a process" (p. 412).

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SPECIAL REVIEWS

The Science of Human Behavior; Biological and Psychological Foundations. MAURICE PARMELEE. New York: Macmillan, 1913. Pp. 443. $2.00.

Dr. August Hoch is fond of remarking—with more justice than we like to acknowledge—that there are three stages in the acceptance of truth. First we say "nothing in it"; "foolishness"; "totally irrational." Then we admit that "it is all right, but somebody else has said it before." Finally we see the idea in proper perspective with the related ideas that led up to it. No one could observe the title of this book without being reminded of the apostatical notions set forth by Watson one day last February, themselves very close to the views often expounded a scant corridor's length away—who was it that told of the physiologist and the frog?

Dr. Parmelee's book is a compilation so far as its data are concerned, but it represents a behavioristic standpoint strongly entrenched on the phylogenetic aspect. It is interesting to notice how, despite these main dynamic trends, the author devotes several initial chapters to the "morphological evolution in the course of which were evolved the structural forms that determine behavior"; and insistently recurs to the dependence of function on structure. He traces a continuity in the behavior of matter from the inorganic to the organic, from the tropism through the reflex, to the instinctive and thence to the intelligent behavior, the criterion of the last being essentially its dependence upon the experience acquired by the individual. There naturally follows a survey of the effects of mental interaction of individuals in producing the phenomena of social evolution.

Even on cursory examination, most people could tell with certainty that its weak point would be in the chapters that bear the word *consciousness* in their titles. One somehow gets the impression that their inclusion was governed by vestigial scruples of intellectual conscience, rather than an immediate sense of their scientific necessity. We leave their comments on imageless thought, the subconscious (good so far as it goes), the rather unprecise distinction between feelings of displeasure and sensations of pain, with the not too critical attitude towards the James-Lange theory of emotions—to the tender mercies of analytical psychology and psychoanalysis.

Apparently the book grew out of lectures; one would judge so from its frequent and quite conscious repetition and summary, as well as from the didactic flavor of such remarks as on p. 271 where the cranium expands "leaving room for the larger brain," or on p. 107 where certain stems "grow upward because they are negatively geotropic." On account of its admirably simple phraseology it is well suited to the general reader, though this is accomplished at the sacrifice of nearly all stylistic quality, the idiom at times verging on colloquialism.

The essential issue raised by the book, and perhaps also the essential issue between Watson and any effective opposition, concerns the precise definition of behavior. A most excellent feature of Dr. Parmelee's volume is the constant striving for accurate formulations. The danger in the term *behavior* lies in restricting its meaning to those activities which can now be described in physical or physiological terms. The author clearly points out that this sort of behavior is continuous with behavior that can now be described only in mental terms. But if the behaviorist is to recognize *mental* behavior as a part of his scheme, the corresponding duty of the psychologist is to understand the dynamic advantage of behaviorism. We do not progress in this latter direction as we should. *Ein Nichtverstehen ist oft ein Nichtverstehenwollen;* a process that in this instance goes deep down to the roots of that discontent that leads us to ask such questions as "What is the matter with experimental psychology?"—and get no answer. Well was it said that while specialists are naturally the best judges of technical developments in their particular fields, they are often very inferior judges of its general relations, and the desirable reforms in its purposes. The little criticism of our science on pp. 77–79 is quite wholesome, and will be appreciated by everyone who must reconcile the subject matter of contemporary psychology with the demands of practical life. We must have no shrinking from the more actual and vital questions towards which the dynamic, behavioristic *Fragestellung* is the straightest path. The "matter with experimental psychology" is that it does not meet these issues openly, but often dodges behind a too convenient shelter of scientific idealism into a burrow of trivial inquiries, and that to any one who is sensible of this,

> There is no proof in the bread we eat
> or rest in the toil we ply.

F. L. Wells

McLean Hospital

Psychology and Industrial Efficiency. HUGO MÜNSTERBERG. Boston: Houghton Mifflin Company, 1913. Pp. 321.

This volume on *Psychology and Industrial Efficiency* is to be classed with three of the author's previous works: *Psychology and the Teacher*, *On the Witness Stand*, and *Psychotherapy*. These four volumes constitute the author's contributions to applied psychology. His last contribution is perhaps the most cautious in statement but the most valuable in content.

The book is divided into three parts: The Best Possible Man, The Best Possible Work, The Best Possible Effect. The first part is the largest and the one of most interest to psychologists. This section deals with methods for testing personal fitness for particular occupations. The task of "psychotechnics" is to ascertain the nature of the mental qualities required in each subdivision of economic activity and to apply methods by which these mental qualities can be tested. "This experimental investigation may proceed according to either of two different principles. One way is to take the mental process which is demanded by the industrial work as an undivided whole. . . . The other way is to resolve the mental process into its components and to test every single elementary function in its isolated form" (p. 59). In devising tests to secure the best possible men for street car motormen, the total mental reaction required to avoid accidents was taken as an undivided whole. An experimental condition of a very simple form was devised of such a nature that it "aroused in all the motormen the feeling that the mental function which they were going through during the experiment had the greatest possible similarity with their experience on the front platform of the electric car" (p. 68). The experiment can be carried out in ten minutes and "the results show a far-reaching correspondence between efficiency in the experiment and efficiency in the actual service" (p. 75).

In testing for efficiency at the switchboard of a telephone system, instead of reproducing a situation demanding mental responses similar to those of the regular service, the necessary mental qualities were analyzed into their elements. Accordingly, well known tests were given with reference to the eight different psychophysical functions demanded in the service. In this way thirty young women were tested who had just been employed as regular operators. After three months actual service their records at the switchboard were compared with their standing with the psychophysical tests. A very high correlation was found to exist. "As soon as methods are fully perfected it would seem not at all impossible that by a short experi-

ment of a few minutes thousands of applicants might be saved long months of study and training which are completely wasted" (p. 110).

Professor Münsterberg insists that his tests are not ideal but merely tentative and suggestive; that they are not and can not be standardized for general application; that they demand criticism and improvement which can be adequate only if the task is undertaken by many experienced workers. But the significant point of it all is that simple tests have been devised and applied in certain typical economic situations and that there is a positive correlation between the standing in the tests and the standing in the practical work. If later investigations prove that this correlation is high, the work will be epoch-making in applied psychology.

The book is written in a pleasing, non-technical style; summarizes well previous contributions from literature—especially from German literature—and will result in increased interests in applied psychology.

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Experimental Psychology and Pedagogy. R. SCHULZE. Translated by R. Pintner. New York: Macmillan, 1912. Pp. xxiv + 364.

The translator of Schulze's book on *Experimental Psychology and Pedagogy* has done a real service in making this book accessible to English and American readers. The book itself is of very unequal value, but has much material which can be made use of, particularly by advanced classes in educational psychology. The experiments of which this book is an outgrowth were, as the translator notes, carried out in the Psychologica Insltitute of the Leipzic Teachers' Association, an institute founded and supported by an association of elementary school teachers. This fact, in itself, is of much interest and might well serve as an example to teachers in this country.

The first chapter discusses the method of Measurements in Physics, Biology, Psychology, and Education, and is a very satisfactory chapter. It is customary in this country and in England to describe the relation of the distributions in the case of measurements of biological and anthropological variations by saying that they are usually approximations to the curve of error or to the so-called "normal" distributions, at the same time recognizing that the distributions are approximations, for the most part. Schulze takes the opposite method and describes all these empirical curves as asymmetrical. There are certain advantages in such a treatment, but it loses considerable force, from the pedagogical standpoint.

The following chapters are on the Measurement of Sensation, Perceptions and Ideas, Feelings, The Will, Consciousness and Attention, Assimilation, Memory, Apperception, Speech, and Physical and Mental Work. They include a great many of the stock experiments of the ordinary course in experimental psychology, many of which have but remote bearing on education; and there is much description of the ordinary laboratory apparatus. This makes the book a rather barren discipline in many of its parts from the standpoint of those interested chiefly in the educational bearings of the experiments, and is for this reason a serious disadvantage in its use in American classes in educational psychology.

The last chapter is on Psychical Correlation, and reviews several experiments of particular interest. As is frequently the case with German writers, the acquaintance of the author with American investigation and literature is very limited. In speaking in this last chapter of studies on correlation between school subjects of instruction, he says: "The only experiments in these lines known to the author are those carried out by Spearman in America"! The value of the translation would therefore be enhanced if references to American and English work had been included, or if at least a bibliography had been added. There are some passages in the book which would pass without comment in the German, but which sound odd in their English setting. The following quotation, for example, appears in the last chapter: "Hold fast to your endeavor to use experimental psychology for pedagogical purposes. Hold fast to Wundt's scientific principles, as to the possibilities and limits of experimental psychology. That will be the best guarantee that your scientific work will not be barren of results."

A few points in the make-up of the book justify criticism. The author's name does not appear on the outside front cover of the book, but that of the translator is given in its stead, the title being "Experimental Psychology and Pedagogy," Rudolf Pintner. The back of the book is properly labelled. The academic degrees and position of the translator are given on the title page; those of the author are not stated. In the translator's preface no indication is given as to whether the translation is made with the author's knowledge and consent. Courtesy would seem to demand more care in these respects on the part of the translator and publisher.

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Allgemeine Psychologie nach kritischer Methode. PAUL NATORP. Erstes Buch. Tübingen: Mohr (Paul Siebeck), 1912. Pp. xii + 352.

This work is meant to take the place of the *Einleitung in die Psychologie nach kritischer Methode*, published in 1888, and is a much fuller working-out of the subject than is contained in the earlier volume. It is in no sense an empirical psychology, but rather a logic of psychology. It is concerned with the "Object and Method of Psychology," its principles and presuppositions, and is to be followed by another volume on the "General Phenomenology of Consciousness."

In contrast with the natural and cultural sciences, says Natorp, and in contrast with their objective foundation in logic, ethics, æsthetics and the philosophy of religion, there always remains the problem of subjectivity or of consciousness, and this problem is the problem of psychology.

It becomes clearer through an analysis of the meaning of consciousness. According to Natorp, three factors are essential to consciousness: (1) the content ("Inhalt"), (2) the I ("Ich"), and the awareness ("Bewusstheit"). The content is anything of which there is consciousness, whether object, feeling, purpose or whatever it may be; it is that which is immediately given. The I is that to which the content is given, that which is conscious of the content. It is not to be regarded as a substance or as a vehicle of consciousness, nor is it an activity of any sort; it is simply a term correlative to the content. It expresses the highest unity of consciousness and can never become conscious of itself as its own content. It is therefore never an object or a fact or a phenomenon, or an existence in the sense that objects, facts, etc., belong to the content of consciousness. It is called the final centre of reference ("Beziehungszentrum") for all content. If it be said that no such I can be found, the answer is that it cannot be found, because it is not content; but it is implied as that unity within which all content falls. The awareness is simply the relation between the I and the content, the content as given to the I. It may be expressed as a separating and uniting in one ("zugleich auseinanderhalten und vereinigen"); it is a relation characteristic of consciousness, something final which cannot be reduced to anything else.

It must not however be supposed that an investigation of the I can become a problem for psychology. It is not itself a problem, but it is the ground of the psychological problem ("Problemgrund"),

the principle through which psychology is distinguished from the other sciences. Psychology is concerned with the content of consciousness just as much as the other sciences are, but in a different way. The objective sciences are concerned with the content with respect to the unity of law and system, and quite irrespective of its relation to the I, while psychology deals with it so far as and in the form in which it is given to the I. It is furthermore not necessary in order to make room for psychology to duplicate the content, to set up beside sensation an activity of becoming conscious of the sensation. The same content can belong to a system of law and also be related to the I. Psychology does not therefore have a different subject matter from the other sciences, but its reference is different.

Still it may be said that no matter how far the content is objectified by the objective sciences, it always falls within the I, and therefore, if the objectifications were complete, there would be nothing left for subjective science. If the objectifications were complete, if knowledge were perfect, then psychology would be unnecessary. But this is not the case. Knowledge is always in the form of an A and an X, of something known or given and something to be known or determined. Objective science goes the road of fuller and fuller objectification, of greater and greater unity, and in doing so it leaves behind it lesser unities and less perfect objectifications. If the road were to be travelled in the opposite direction, the goal would be that of the original elements of knowledge unobjectified and undetermined. Such a goal cannot be attained any more than the opposite goal of perfect objectification can be reached. Subjective and objective are therefore relative terms, but in proceeding objectively the lesser objectifications, the more original elements, are left behind. And it is in the determining of these more originally given factors that psychology finds its place without being absorbed in objective science.

Procedure in psychology will be thus entirely different ("grundverschieden") from that of the objective sciences. And not only is its procedure different, but it presupposes those sciences. To determine the subjective directly is not possible, because any application of concepts to it would be an objectification of it and hence inadequate to the immediately given content. The immediately given can only be gotten at indirectly, via the objective. "Objective science proceeds entirely constructively, it creates the unities of conception, the instruments of understanding, the con-

cepts. It gives the undetermined its determination, and thereby appearance its object. . . . If then the real creative work of knowledge falls to objective science, one must still remember that that which is created is not a creation out of nothing, but entirely out of the given. So there arises a wholly new and unique problem of reconstructing in thought the original given out of the constructions of science" (p. 195). Objective science is then constructive and psychology reconstructive. From the objectifications of science the original factors which entered into the objectifications are reconstructed in psychology as they were prior (not necessarily temporally prior) to the actual objectifications, as not yet determined but capable of determination. Psychology thus determines the subjective on the basis of the objective.

The reconstructive method reveals original factors such as concept ("Begriff"), presentation ("Vorstellung"), sensation ("Empfindung"), desire ("Streben"), as also the being-relation ("Seinsbezug") and the ought-relation ("Sollensbezug"), etc. But a reconstruction of these factors is not worked out in detail in the present volume. Two provinces of psychology are distinguished: (1) the factors of consciousness are considered according to their different kinds ("Bewusstseinsbestand seiner Art nach"), and (2) according to the unities of experience ("Erlebniseinheiten"); that is, in the first province the original factors are reconstructed as content, while in the second as acts.

The work is especially interesting as showing what psychology is from the point of view of the critical philosophy. It makes it clearer on the one hand that critical idealism is not merely an idealism of consciousness, but rather of "the unity of consciousness . . . which in the unity of law constitutes the unity of the object." But on the other hand, while admitting that critical idealism is primarily objective, it shows that there is a place for subjective science. This is done without resorting to any form of dualism. The monism of experience is strictly adhered to, and the seeming duality of the objective and the subjective is shown to be due to the two directions which knowledge may take.

The last two chapters are devoted to a critical examination of the theories of Wundt, Lipps, Husserl, Dilthey, Münsterberg and Bergson. There is also a chapter on the correlativity of the subjective and the objective in the history of modern philosophy, as well as a historical introduction and a chapter of answers to objections to the reconstructive psychology.

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DISCUSSION

PSYCHOLOGY AND THE BEHAVIORIST

Professor Watson's vigorous paper in the March number of the *Psychological Review*[1] raises the question of the relation of psychology to the study of behavior. Watson's conclusion is that psychology should throw off the "yoke of consciousness (p. 160), and of introspective method" becoming instead a "science of behavior"; that it should "never use the terms consciousness, mental states, mind, imagery" (p. 166) but should study instead the adjustment of "organisms, human and animal alike, to their environment."

For this conception of psychology Watson argues on two main grounds of which the first is rather naïvely personal. Professor Cattell once defined psychology as "what the psychologist is interested in *qua* psychologist"[2] and Watson seems to hold the same opinion. He is a psychologist; he finds himself concerned with problems of animal behavior which have little or nothing to do with consciousness; *ergo* psychology is a science of behavior, not of consciousness. The obvious answer to this argument takes the form of a question. Why, one wonders, does not Watson call himself a biologist or a behaviorist and pursue the tranquil tenor of his way, no longer "embarrassed" by the question "what is the bearing of animal work on human psychology?"

Watson's second criticism of introspective psychology cannot so summarily be dismissed. He is at pains to emphasize the diverse results of introspection, the differences of expert opinion on the "attributes of sensation," the nature of feeling, the number of color sensations, and the content of "recondite thought processes"; and he concludes (p. 176) that "human psychology has enmeshed itself in a series of speculative questions" and that "in the pursuit of answers to the questions it has become further and further divorced from contact with problems which vitally concern human interest."

The important truth embedded in this criticism I shall later admit and indeed emphasize. For the moment, I must record my conviction that Watson is unjustified in arguing from the divergence in introspective results that a psychology of organic adjustments should forthwith displace psychology as science of consciousness. The truth is that "speculative questions," as Watson calls them,

[1] "Psychology as the Behaviorist Views it," *Psychol. Rev.*, 20, 158 ff.

[2] "The Conceptions and Methods of Psychology." *Proceedings of the St. Louis Congress of Arts and Sciences*, Vol. V., p. 596.

play an important rôle in the progress of any science. The defence of introspective structural analysis rests, however, on a far more practical consideration. "Psychic elements," though never isolated, are unlike biophores and electrons in being immediately observed and not inferred conceptual elements; it follows that drill in the structural analysis of consciousness, practice in discovering (within the bewildering complex of experience) sensational, affective, and relational elements, offers valuable training to young students in the "objective" observation of self. The experience of hundreds of students trained in our ordinary psychology courses attests the truth of this statement.

Yet in spite of my radical disagreement with Watson's main thesis I hold that he justly arraigns the undue abstractness of the conception of psychology as study of the mental state, or process. Psychologists will be open to the attack of those concerned with problems of life, so long as they insist on treating their science as the study of that abstraction the psychic content, or mental state. Let psychologists, however, once admit that their subject matter is the conscious self and they will naturally regard this self as a behaving self, that is, as a self related to environment.[1] Such a conception has a two-fold advantage: on the one hand, it defines the relation of psychology to the study of behavior in the biological sense. Either the "self" is (as Angell has supposed)[2] the psychological organism, and adjustments to environments are its activities; or the self is purely psychical but so closely related to its body that the study of the nature and genesis of instinctive and acquired adjustments is essential to the adequate classification and explanation of conscious experiences.[3]

The definition of psychology as science of related (or behaving) selves implies, of course, a conception of behavior which, unlike Watson's, is sociological and biological and not merely mechanical. Unquestionably Watson is correct in holding, first, that if stimulus is physical and measurable, then behavior can be studied as relation of response to stimulation without recourse to introspection; and second, that the study of animal behavior is restricted to this method so that the inference of animal consciousness has little or no bearing on problems of behavior. We may readily grant to Watson also that "the educator, the physician, the priest, and the business man could

[1] I refer, with apology, to my amended definition in the last edition (1912) of my *A First Book in Psychology:* "Psychology is science of the conscious self in relation to its environment."

[2] PSYCHOL. REV., March, 1907.

[3] Cf. "Psychology as Science of Self," *Journal of Philosophy*, 5, 1908, pp. 18 ff.

utilize in a practical way" the data which may be obtained from such purely "objective" study of habit formation, of reaction to visual or to auditory stimulus, and even of memorizing.

But Professor Watson, in his eagerness to make investigations on animals and human beings strictly comparable in their results, shuts his eyes to the patent fact that introspection is itself a method of studying behavior—unimportant, as he has shown, in some cases, but essential in others, and of possible significance in all. Watson himself admits (p. 173) that "the more complex forms of behavior such as imagination, judgment, reasoning and conception" can "at present" be studied only introspectively. He does not name instinct and emotions; but it is evident that his "objective method" of equating response to stimulus must be ineffective in the study, say, of the instinct of fear, where the response is sometimes running away and sometimes rigid stillness and where the stimulus may vary qualitatively between a loud sound and a black object. Surely, however, educator, jurist, and physician are concerned with instinctive and emotional reactions; the lawyer, for example, seeks to assign the motive for a crime and the physician attempts to discover his nervous patient's "suppressed" fear. If psychology is ever to take the "position at the base of the social sciences" which, according to McDougall,[1] and many others, it ought to occupy, this end will be compassed through the introspective study of consciousness—notably of thought, in its social aspects, of emotion and of will. Such a study of human beings in their emotional reactions to different situations, in their vanities and their humiliations, in their sympathies and their antipathies, in their ambitions—in a word, in their practical social relations—is possible, neither by Watson's "objective" method nor by the abstract, structural psychology which he rightly condemns.

I cannot refrain from dwelling, in conclusion, on a comparison which must have struck more than one reader of Watson's paper. It surely is noteworthy that Watson should have reached a conclusion so sharply opposed to that of his co-worker, Yerkes, in the study of animal behavior. Where Watson urges us to eliminate "states of consciousness as proper objects of investigation" (p. 177), Yerkes teaches that consciousness "is the subject matter of psychology"[2] and that psychology "approaches its materials from an entirely different point of view than that of biology" (*ibid.*, p. 21). It seems at first sight odd that Watson should be so embarrassed by the effort

[1] *Social Psychology*, p. 2.

[2] *Introduction to Psychology*, p. 12.

to study animal behavior and yet to remain a psychologist, while Yerkes so quietly carries on, *pari passu*, work in introspective psychology and observation of the adjustments to environment of dancing mice and earthworms. But the difference may readily be explained by the fact that Yerkes regards psychology not as a science of states of consciousness or of psychic contents but as the psychology of the self (*ibid.*, p. 17). "Every one of us must start," he says (p. 15), "in his study of consciousness by observing the self. . . . Provisionally at least," he adds, "we may profitably think of the material of our science as whatever comes within the stream of consciousness of a self-observing being" (p. 17).[1] Professor Yerkes's position seems to me, in truth, to bear out my contention that the over-abstraction of our common conception of psychology has drawn upon us such a protest as that of Watson.

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BOOKS RECEIVED DURING JUNE

SACKETT, W. S. *The Canada Porcupine: A Study of the Learning Process.* (No. 7 of Behavior Monographs.) New York: Henry Holt and Co., 1913. Pp. 84.

WOODS, F. W. *The Influence of Monarchs.* New York: The Macmillan Company, 1913. Pp. xiii + 422. $2.00 net.

THORNDIKE, E. L. *The Original Nature of Man.* New York: Teachers College, Columbia University, 1913. Pp. xii + 327.

MARTIN, E. *Psychologie de la volonté.* Paris: Alcan, 1913. Pp. iv + 176.

PETERS, W. *Die Beziehung der Psychologie zur Medizin und die Vorbildung der Mediziner.* Würzburg: Curt Kabitzsch, 1913. Pp. 33.

KOREN, J. *Summaries of Laws Relating to the Commitment and Care of the Insane in the United States.* New York: The Nat. Com. for Mental Hygiene, 1913. Pp. 297.

NOTES AND NEWS

GARDNER C. BASSET, Ph.D. of the Johns Hopkins University in Psychology (1913), has been appointed Research Assistant in the Eugenics Record Office of the Station for Experimental Evolution at Cold Spring Harbor, and will continue the work on the intelligence of inbred white rats begun at the Johns Hopkins.

[1] Cf. pp. 13–14.

JOHN L. ULRICH, Ph.D. of the Johns Hopkins University in Psychology (1913), has been appointed Instructor in Physiological Psychology in the Catholic University of America (Washington, D. C.).

WITH the close of its sixth volume the *Zeitschrift für Religionspsychologie* is temporarily suspended. A successor to this periodical is contemplated, under somewhat changed form and content.

ACCORDING to the announcements of a preliminary circular, the fifth international congress of philosophy will be held in London from August 31 to September 7, 1915.

THE following items are taken from the press:

THE second convention of the Società Italiana di Psicologia was held in Rome during the last week in March. The following questions were discussed: "The Classification of Mental States, Mental Phenomena, and the Nervous System," and "The Psychological Problems of Psychotherapy."

ONE of the Sheldon traveling fellowships (Harvard) has been awarded to Richard Maurice Elliott for research in psychology, particularly in the psychophysics of handwriting, at Berlin and in the various psychological laboratories of Germany.

THE Librairie Marcel Rivière announces the publication of a new magazine, *Revue des Sciences Psychologiques*, under the editorial guidance of MM. J. Tastevin and P.-L. Couchaud. The review will appear every three months, each number being composed of 90 pages.

DR. G. M. WHIPPLE, assistant professor of educational psychology, has been appointed as the delegate of Cornell University to the Fourth International Congress on School Hygiene, to be held at Buffalo on August 25–30 next.

THE International Association of Medical Psychology and Psychotherapy will hold its annual meeting at Vienna on September 18 and 19, immediately before the opening of the Congress of German Men of Science and Physicians.

MR. LUTHER E. WIDEN, of the University of Iowa, will accompany Mr. Villjalmar Stefansson on his expedition to the Arctic and will make psychological measurements on the Esquimaux.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

RECENT LITERATURE ON THE BEHAVIOR OF THE LOWER INVERTEBRATES

BY PROFESSOR A. S. PEARSE

University of Wisconsin

Protozoa.—Woodruff (35) has kept one race of Paramœcium for more than 2,700 "generations" without conjugation. At first he believed that this long period without the occurrence of sexual processes was due to the fact that he varied the composition of the medium in which the protozoans were kept. Recently he has propagated individuals from his original strain in a medium of unvarying composition (0.025 per cent. beef extract), and at a constant temperature, for more than ten months; there was no evidence of loss of vitality or decrease in the rate of fission, though there were small fluctuations which he ascribes to internal causes. Woodruff concludes that "the protoplasm of a single cell has the potentiality to reproduce by division indefinitely—under favorable environmental conditions—and therefore conjugation, or fertilization, is not a necessary phenomenon for the continued life of protoplasm." In the same paper experiments are described in which the ability of Paramœcium to withstand various chemicals in solution was tested. "There is a marked parallelism between the order of the toxicity of many cations toward Paramœcium and the ionic potentials of the ions. . . . Subjection to small amounts of alcohol increases the susceptibility of the organisms to copper sulphate." Excretion products have a depressing effect on the rate of reproduction and are the chief cause of the usual succession of protozoan species in hay infusions (34). Each species is killed by the accumulation of its own metabolic wastes.

Jennings (17) shows that there is assortive mating for conjugation in Paramœcium. Individuals of different species do not conjugate with each other, nor do races of different sizes in the same species. The descendants of conjugants are more variable than those of the non-conjugants. A very interesting account of the behavior of Paramœcia during the process of getting in position for conjugation is given. A pair usually adhere first by their anterior ends, though they may assume other positions and then adjust themselves. Both the anterior end and the region about the mouth are more adhesive than other parts of the body.

Gruber (15) has made a very careful study of various activities of mutilated specimens of *Amœba proteus* with the particular object of comparing the behavior of nucleated portions with that of enucleate fragments. Pieces without a nucleus remained active for a longer or shorter time and were able to form a pulsating vacuole which functioned in the usual way, but never showed powers of regeneration, and ultimately died in all cases. Nucleated fragments cast out material from the nucleus; the writer believes that this was to maintain a definite proportion between the amount of nuclear and cytoplasmic material.

The galvanotropism of Gonium, as reported by Moore and Goodspeed (24) presents several points of interest. A colony of these flagellates, when subjected to a constant electric current, orients itself with the anterior flagellated surface toward the cathode and continues to swim toward that pole. When the current is allowed to act several minutes galvanotropism "reverses and finally disappears." Apparently an excess of H or of OH ions in the medium causes the galvanotropic response to change from cathodal to anodal. There is no reversing "motor reflex" as in Paramœcium and some other ciliates, but turning is accomplished by movement in a half circle, the flagellated surface always moving ahead. Individual cells and fragments of colonies behave in the same manner; and therefore "the reversal of the colony may be due to the reversals of its constituent cells." Moore maintains that "since the flagella of Gonium are situated all on one side, the reversal of the current cannot bring about a reversal of the colony by a differential beating of the flagella as in Volvox."

Wieweger (33) has studied the behavior of ciliates toward various chemicals and gives a very complete review of the literature. He distinguishes trophotaxis or anataxis to nutritive substances, areotaxis, hydrotaxis, alkaliotaxis and oxytaxis (sensitiveness to alkalies

and acids). He points out that Paramœcium manifests kata- or ana-taxis, according to the degree of concentration in the medium, and asserts that such reactions are independent of the osmotic pressure. The sensibility to chemical substances is constant, but "anaoxytaxis" is variable. Stimulation by acids is due to the passage of + H ions into the protoplasm. It is maintained that Jennings committed an error when he asserted that infusorians usually respond to all kinds of stimulation by a single general reaction (Did Jennings do this?) and many of the motor reactions of Colpidium and other species are said to be more complex than has been supposed. Positive reaction to acids is not reversed by the addition of alkalies but made very weak. Galvano- and chemo-taxis depend upon the chemical reaction of the medium. The salts of alkali and alkali-earth metals alter the sensibility of Paramœcia by diminishing usual orienting reactions.

In her paper (21) on the life history of the two ciliates, *Spathidium spathula* and *Actinobolus radians*, Miss Moody discusses the behavior of these interesting protozoans. Spathidium eats nothing but the ciliate Colpoda, and is said to use the trichocysts about its mouth in paralyzing its prey. Actinobolus is a peculiar ciliate with long radiating tentacles which are used in capturing food. It eats nothing but the infusorian Halteria, which is passed to the mouth opening by the tentacles and ingested. The writer points out that both these animals select one particular sort of food, and asserts that "it is evident . . . that the trial-error explanation is inadequate" in attempting to explain their feeding behavior. Neither eats anything but its regular food, even when hungry. The reviewer does not see why the behavior does not fall under the class of reactions that Jennings called "trial and error." The writer says in regard to Spathidium (p. 355): "As the animal swims rapidly through the water, rotating on its long axis, the anterior end of the body, which is extremely flexible, is in constant motion, bending upward, downward and from side to side as though feeling its way. Owing to this constant change of position, this region continually presents new aspects." Actinobolus (p. 371), "with partly retracted tentacles, rotating on its long axis, swims occasionally near the surface of the water, coming to rest from time to time with the mouth downward, on the bottom of the culture dish, moored by means of the oral tentacles." "I have seen no further elongation of the tentacles at the approach of Halteria" (p. 572).

Sokolow (31) has made an experimental study of the physiology

of *Stenophora juli* Frantz and twenty-one other gregarines. He groups the movements of these protozoans under six classes which differ in the presence or absence of myonemes, gelatinous substance, locomotion, etc. Considerable evidence is offered to support the writer's hypothesis that locomotion is brought about largely by secretion of gelatinous substance rather than through the contraction of myonemes, as Crawley and others have supposed. Gregarines are active in alkaline media, secrete gelatinous substance, and may carry on locomotion in which myonemes are not concerned. They may move either with the anterior or posterior end in advance. In acid media they are "active without locomotion" and secrete little gelatinous substance. The jelly is not only necessary for locomotion, but protects the gregarines; various solutions show injurious effects which are in general proportional to the power such solutions have of dissolving the jelly.

In his monograph on the Acinetaria, Collin (9) has a chapter on the physiology of these interesting protozoans. Food is captured on the ends of the tentacles and taken into the body by suction, absorption, or actual ingestion. Suction is brought about by peristaltic waves that pass down the tentacles, the ectoplasm being the active layer. Digestion is remarkable because vacuoles are rarely formed; the food usually becomes a part of the endoplasm at once. Suctorians may exhibit ciliary or even amœboid movements in early stages of their development, but adults are usually sessile or sedentary. Some are able to swim like nematode worms, during certain stages. The tentacles make two kinds of movements, flexions, contractions and extensions, which are controlled by the contractility of the ectoplasm and by the general turgescence of the whole tentacle.

Cœlenterata.—Pax (25) gives an interesting review of the recent literature on the behavior of actinians and discusses its relation to psychology.

Platyhelmia.—Boring (5) placed planarians singly in a crystallization dish with water and illuminated one side of the body of each individual continuously by switching on or off six lights which surrounded the dish. He states that "planarians, if subjected to continued, intensive, directive light, continue turning away from the source of light. If they are immediately placed in non-directive light after being in directive light, they turn consistently in the direction from which the light first came." The writer believes such behavior indicates that the worms become "light-adapted" on one

side during exposure to directive light. This, to the reviewer, seems to be a new way of saying that the exposed side becomes fatigued. After continued illumination planarians show a tendency to reverse for a time, but this condition disappears if stimulation is long continued. Boring believes such reversals are due to compensatory muscular movements made in order to secure relief from continued turning. This explanation may be true, but does not appear to be wholly adequate. Planarians often reverse under strong stimulation when such "relief" would not be necessary, and if reversal does not bring relief from unfavorable stimulation they pass on to other "trials" such as twisting, protruding the proboscis, etc.

Annelida.—Yerkes (36) gives an interesting account of his experiments planned to test the intelligence of the earthworm, *Allolobophora fœtida*. His paper deals with the behavior of one worm that was under observation for an entire year. This individual was tested daily in a simple T-shaped labyrinth having one entrance and two exits. One exit led into a tube of moist blotting paper; a strip of sandpaper stretched across the floor of the other, and the worm received an electric shock if it went across this. The worm soon avoided the sandpaper followed by electrical stimulation and escaped from the free exit more quickly after several trials, but never gave "perfect" records day after day. When the free exit and that containing the sandpaper and electrodes were interchanged, the worm persistently turned in the direction it had formerly used for exit, but after a time formed a new habit to suit the altered conditions—and even gave evidence that it associated the tactual sensation received from the sandpaper surface with the electrical shock which usually followed.

At this point four and one half segments were cut away from the anterior end of the worm. When tested forty hours after the operation it showed a tendency to climb and to use its posterior end in testing its surroundings, but also gave evidence that it retained the habit previously formed. The "brain" was not essential in order to "remember" the direction of turning or to "recognize" the exit tube. The responses at this time were markedly stereotyped. After a month of testing the worm was allowed to rest for four weeks, and the original habit had then degenerated. Yerkes believes this retrogression was due to the growth of a new brain which had established connections with the ventral nervous system. By renewing the training for two weeks the worm was brought back to the route it had been accustomed to use before its anterior end was amputated, though it had a tendency to turn in the opposite direction.

Jordan (18) observed the reactions of earthworms that were attempting to pull leaves into their burrows. He maintains there is no evidence of "intelligence" (Darwin) or of "reflex adjustment" (Hanel). These animals grasp a leaf anywhere. If it will not pass into the hole they release their hold and try again and again until they hit upon a favorable position. In the majority of cases the leaf finally enters the hole point first. Earthworms do not feel around the edge of a leaf to find its point, as Hanel supposed. Jordan gives evidence to show that they hold leaves through the sucking action of the pharynx; the blood being forced into the lips to make a firm disc which is applied to their surfaces. The observations show that the reactions of earthworms in dragging leaves to their burrows are wholly in accord with the method of trial as described by Jennings.

Lillie and Just (19) report some interesting observations on the breeding habits of a heteronereis (*Nereis limbata*) at Woods Hole, Mass. Mature worms swim at the surface of the ocean at night during the "dark of the moon." The males appear first and always exceed the females in number. When a female appears she is immediately surrounded by several males which shed sperm. She soon begins to lay eggs. The males shed sperm regularly when stimulated chemically by some substance (probably the egg secretion which is known to agglutinate the spermatozoa) given off by the female into the water. A female will not lay eggs unless the water around her contains sperm. Both eggs and sperm shedding are reflexes which may be regulated by the application or withdrawal of the appropriate stimuli.

Lund (20) records observations made in Montego Bay, Jamaica, on certain luminous animals, and confirms Galloway's assertion that the emission of light by some marine worms is effective in bringing the sexes together. When illuminated by a small incandescent globe certain Cirratulidæ "swam toward the source of stimulation, at the same time becoming brilliantly luminous."

Echinodermata.—Cole (7) tested ten starfishes (*Asterias forbesi*) in aquaria illuminated by light from above, to ascertain whether they had a tendency to crawl with a particular ray or rays in advance. Each individual was given fifty successive trials. The writer concludes that starfishes have a "physiological anterior" which is indicated structurally by the madreporite. He also observed that, though a starfish manifests an "impulse" to crawl with a certain region of the body in advance in successive trials, there is a tendency for this impulse to shift or rotate around the body in one direction or

the other. The "physiological anterior" of starfishes corresponds structurally to the well-marked anterior end of the bilateral sea-urchins, and its position is perhaps due to mechanical causes, *e. g.*, the presence of the madreporite, stone canal, etc. In another paper Cole (8) records the results of certain experiments in which starfishes were tested after the radial nerves of the oral systems had been cut. He concludes that his experiments "seem to demonstrate, in so far as they go, the failure of the establishment of coördination or 'unified impulses' in the starfish by direct pull of one part upon another when the nervous connection between these parts has been severed."

Mollusca.—Bauer (3) has investigated the reactions of the scallop, *Pecten jacobæus* L. The food of this mollusc consists of microscopic plants, and a plentiful supply is insured by the reactions to light. Pecten orients its body with the hinge toward the light so that swimming movements carry it into shallow water and into illuminated areas. Small quick-moving shadows cause Pecten to withdraw its tentacles; but a large shadow or a small slow-moving shadow cause no such response. The writer believes these reactions are adaptive, withdrawal of the tentacles being to protect them from small predaceous fishes, and that the diverse responses to different shadows depend upon an adjustment controlled by the peripheral nerve net. A small shadow that does not move quickly will cause a Pecten to stretch the tentacles and eyes on the nearest side toward it. This enables him to ascertain the proximity of a starfish—his worst enemy—and to swim away. Small foreign objects are eliminated from the exposed fleshy surfaces by local squirting reflexes. Touch and chemical sense work together to protect the scallop from his enemies. Starfish extract always causes active swimming movements. Pecten maintains a definite relation to its environment in that it rests on the right valve and performs a characteristic righting reaction if placed on the left. This reaction is apparently under the control of both the eyes and the statocyst, for it takes place in total darkness or after the cerebro-visceral commissure has been cut.

Grave (14) reports that the statocysts of certain Pinnidæ appear to be degenerating. Such organs are lacking in most of these molluscs, and when present, they are compound or show other abnormalities. Furthermore, Pinnas which have had their statocysts removed show no change in their behavior. The writer therefore concludes that "the otocyst of the Pinnidæ is undergoing degeneration, and is at present of no functional value."

Piéron (26, 27) has investigated the light reactions of the pond snail, *Limnæa stagnalis*, with particular reference of the effect of previous stimulation on such responses, and he attempts to make general application of his results in revising Ebbinghaus's law of memory. In his first paper he describes the results of experiments in which snails were subjected to shadows of a definite duration at regular intervals. The number of shadows required to bring the snail to a condition when it did not withdraw its tentacles was thus determined. Subsequent experiments showed that the training had some effect, *i. e.*, the snail ceased to respond more quickly when tested a second time. In his second paper the writer attempted to determine the interval between periodic shadows which would make snails cease to respond most quickly, and found it to be from ten to twenty seconds.

Polimanti (30) studied the movements of certain pteropods and heteropods in detail, and describes experiments which elucidate the functions of various parts of the nervous system in these animals. If one statocyst is destroyed, an animal rotates toward the uninjured side; if both are destroyed, power of orientation is mostly lost and this condition is even more pronounced if the eyes are also removed. Injury to the cerebral ganglia causes an increase in general irritability. The pedal ganglion coördinates muscular movements and controls locomotion.

Crustacea.—Allee (1) has investigated the reactions of aquatic isopods, chiefly *Asellus communis* Say, to currents, with particular reference to physiological states. He asserts that "while it is as yet impossible to control with certainty all the minor details of the reaction, yet sufficiently complete control has been maintained to show that in the rheotactic response with these animals there is no necessity for any 'factor foreign to organics' in order to explain the changes in physiological states." Though the same species of Asellus was tested from both ponds and streams, the reactions of the individuals from the two habitats were quite different. Isopods from ponds were usually indifferent to currents or showed a weak positive rheotaxis; those from streams gave definite positive reactions as a rule. After carefully testing the environmental factors that might be responsible for such differences, Allee concludes that the amount of oxygen present in the water is not the most potent factor. Immersion in water with a high oxygen content will soon cause pond isopods to become positively rheotactic to a marked degree; water with a small amount of oxygen brings stream isopods

to a condition resembling that of their pond relatives under natural conditions. Chloretone, potassium cyanide, low temperature or a sudden increase to a high temperature, carbon dioxide, and starvation all decrease positive rheotaxis (like low oxygen content; caffein has the opposite effect, like high oxygen content). The degree to which Asellus shows positive rheotaxis depends upon the metabolic state. All the conditions that cause a decrease in this reaction are known to depress the rate of animal metabolism.

"Taxonomic differences are inheritable characteristics of the species, and are not dependent upon external conditions, while the behavior characteristics studied are almost independent of heredity." Shelford's term "mores" is used to express the physiological differences between isopods from streams or ponds—*i. e.*, there are stream or pond mores which have a characteristic type of behavior, irrespective of the differences or identities of species. "The general conclusion to be drawn from this series of experiments is that in the isopod, *Asellus communis*, the rheotactic reaction is dependent upon the metabolic state of the animal for its degree of positiveness and that the natural or experimental conditions which affect the metabolic state of the animal change its rheotactic response. That is to say, the rheotactic reaction is here an expression of the metabolic condition (physiological state) of the isopod and may be controlled by those factors known to control animal metabolism."

Polimanti (28) discusses the association of the anomuran, *Dromia vulgaris*, with the sponge, *Suberites domuncula*. Like many other crustaceans of the family Dromiidæ, the crustacean carries a sponge on its back for concealment. He affirms that such a covering does not come on the crustacean's back by accident, but is placed there by the individual that bears it. Dromias placed in an aquarium with two Octopi remained uninjured for more than a month when they had a covering of sponge, but were devoured in a day or two when they were without such protection. Polimanti believes that Dromia's decorating reactions show evidence of associative memory.

Stevens (32) has done a very good piece of work in testing the chromotropism and decorating activities of the spider crab, *Oregonia gracilis*. His experiments were performed in aquaria and in a simple maze that floated in the ocean at Friday Harbor, Washington. Crabs that were placed for 24 to 36 hours in aquaria covered by blue, green, yellow, or red screens established a positive chromotropism for the colors thus used. For example, a crab kept under red glass and subsequently placed in a box where a choice was permitted between

red and another color, went toward the red in the majority of its reactions. In placing objects on their carapaces the crabs did not select colors which matched the background on which they rested, nor did they use colors that corresponded to color screens under which they had previously been exposed. Blinded crabs which did not respond to photic stimulation attached objects to their backs like normal individuals. There is no evidence that decorating reactions are brought about by anything but tactual stimulation, and, though it is still possible that visual and tactual stimulation might work together, there is no experimental evidence to show that vision is at all concerned.

Bauer (2) has investigated the effect of light on the chromatophores of shrimps. Though light has a direct effect on the general reactions of shrimps and influences the metabolism to some extent, there is no true photosynthesis with fat as its end product, as some have maintained. However, fat is deposited more rapidly in the skin under the influence of light. The chromatophores act as a light screen for the subdermal tissues, and are regulated in part by photic stimulation through the eyes.

Moore (22) found that *Daphnia pulex* was negatively phototropic to ultra-violet light, *i. e.*, to wave-lengths shorter than 3,341 Å. μ. Negative phototropism induced by such stimulation was reversed when small quantities of carbon dioxide or hydrochloric acid were added to the water containing the crustaceans.

In another paper Moore (23) describes the effects of certain chemicals on photic reactions. When strychnine was added to water containing crustaceans, the usual positive reaction to light disappeared for some time, and one species, *Diaptomus bakeri* (?), became negative. Caffeine "caused a positive collection; atropine brought about a marked tendency to form a negative collection but in a much less degree than strychnine. It may be of significance that in vertebrates caffeine acts as an excitant only for the higher centers and strychnine for the lower, while atropine occupies a position midway between the two." Agents which usually cause Diaptomus to become positive will reverse negative phototropism induced by strychnine. In addition to acids, camphor, which is an antidote for strychnine in vertebrates, will cause such reversal. "While negative phototropism in Diaptomus can be reversed by acids and camphor, positive phototropism brought about by chemical means cannot be reversed by strychnine."

Fasten (12) has investigated the behavior of *Lernæopoda edwardsi*,

a parasitic copepod which attaches itself to the gills of the brook-trout. Apparently this crustacean is accurately adjusted to its host, for it will not fix itself to the nearly related rainbow- or German-brown-trout. During its short free swimming existence (about two days) it swims actively with a "darting spiral motion," which enables it to cover a great amount of space and thus increases its chances of finding a host. The copepod "is so strongly attracted by intense light that during the day it frequents the upper regions of the water, though it is normally positively geotropic"; in light of low intensity it is indifferent and is found at the bottoms of the ponds where it lives. Both these positions are advantageous, for the brook-trout feeds near the surface during the day and descends into deeper waters at night. It is interesting to compare the behavior of this parasitic copepod with that of its free swimming pelagic relatives, which generally migrate upward at night and downward during the day. In attaching itself to the gill of the trout, Lernæopoda inserts its mouth parts into the flesh, rasps a cavity with its second maxillæ, and then injects the attachment filament at the front of the head.

Esterly (11) has made a very thorough study of the distribution and diurnal migrations of nineteen species of marine copepods occurring near San Diego. Most of these crustaceans make vertical migrations so that "the epiplankton is more populous at night, the mesoplankton during the day. . . . The data available from the records of this station do not show that the abundance of any of the species is related to temperature or salinity." Ten species were taken at the surface in large enough numbers for judging as to when they reach their maximum abundance. Three are most numerous between 6 and 8 P.M., five between 8 and 10 P.M., one between 10 and 12 P.M., and one between midnight and 6 A.M. Many species leave the surface before the light increases in intensity; several never come to the surface. Esterly believes that light is the chief factor that induces the periodic diurnal movements of the copepods he studied, though he admits that its action will not account for downward migration and some other features of the behavior.

Franz (13) summarizes several of his recent papers, and reaffirms his belief that the so-called phototropic reactions of animals are not generally similar to those of plants. He believes that the photic responses of animals as determined by laboratory experiments are mostly due to attempts to escape (*Fluchtbewegungen*). Those organisms which are seeking an open space are positively phototactic; those that are attempting to hide are negative. Franz will not admit

that light plays an important part in the daily migrations of plankton organisms, and even asserts that more individuals are captured at night because they cannot see the net and escape (!). He maintains that animals do not react to light as such, but because it is a sign of a means of escape. The argument is well presented and supported by careful evidence, but there are, of course, serious objections to Franz's broader generalizations.

Hess (16) opposes Loeb's theory that there is essential identity in the photic reactions of plants and animals. He tested *Artemia salina* in a black tube with a light at either end. One of the lights was fixed and the other movable. By varying the intensity and colors of the two lights he was able to study Artemia's sensitiveness. Another method was used in studying chromotropic responses. A cubical aquarium was divided into four compartments and illuminated from one side by light which came through a spectrum. One compartment was thus illuminated mostly by red light, another by orange and yellow, etc. A long cylindrical light was placed on the opposite side of the aquarium so that it could be moved back and forth in such a way as to neutralize the effects of the spectral light. The point at which the negatively phototropic Artemias turned from one of the sources of light gave indication of their brightness sensations. The writer concludes that the brightness values of the colors thus measured were about the same as those in a color-blind human being.

Lund (20) states he observed an ostracod in the ocean at Jamaica that gave off a drop of luminous secretion when a light was flashed upon it.

Chidester (6) gives an extensive review of the literature on the bionomics of the common crayfish, and supplements this with rather brief accounts of some original observations. He believes young crayfishes have more acute "visual sensitivity" for moving objects than adults. As a result of field studies at night with an acetylene lamp, it was determined that adults would retreat from a strong light, but approached one of low intensity. When freshly cut meat and somewhat dry meat were put in an aquarium crayfishes turned toward the former, thus indicating ability to discriminate chemical substances at a distance in the water. From extensive observations of crayfishes in nature and in aquaria where conditions were made as much like their usual habitats as possible, Chidester concludes that these animals are most active at nightfall and daybreak, though "sexual feeling" may lessen the usual tendency to hide during the day. "Hibernation was well marked," some individuals remaining

sealed up in their burrows for as long as six weeks during the winter.

Bohn (4) tested the effect on lobster larvæ of the addition of a small amount of acid or alkali to sea water. He watched the larvæ several days and found that, though both acids and alkalies were "sensibilisators," their effects were not apparent after a few hours.

Embody (10) gives a careful account of the general ecology of four species of amphipods studied at Ithaca, New York, and other places. He embodies in his paper many interesting facts concerning food, breeding, resistance to maximum and minimum temperatures, enemies, etc. The observations will be of value to anyone who wishes to carry on experimental work with amphipods.

Polimanti (29) gives the results of extended observations on various marine animals in the aquaria at the Naples Zoölogical Station. His paper gives many notes on the activities and habits of animals that will be of use to one who intends to investigate the behavior of marine organisms. Various cœlenterates, echinoderms, annelids, crustaceans, molluscs, tunicates, fishes, and reptiles are discussed. All the animals considered show periods of rest (when there is little danger from enemies) and activity (when food is captured). In many cases these show no correlation with diurnal rhythms, though in general the greatest activity is at night. Temperature and light are the chief factors which control periods of quiet or activity. Active animals often have a shorter life than those which are more sluggish. The writer affirms his belief that phosphorescence often acts as a protective device. An animal when stimulated gives a flash of light which startles its enemy.

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RECENT LITERATURE ON THE BEHAVIOR OF THE HIGHER INVERTEBRATES

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Tropisms

Phototropism.—According to W. D. Hunter (16), up to 1912 only two experiments testing the effect of the Roentgen rays upon insects had been published: one by Forel and Dufour upon an ant, *Formica sanguinea*, and the other by Axenfelt upon the house fly. Forel and Dufour decide that the ant was not affected in any way by the rays; but Axenfelt insists that the house fly perceives these rays and responds to them in the same manner that it does to light. Recently three investigators, Hunter (16) and Morgan and Runner (21), have tested the effects of the Roentgen rays upon insects. Hunter tested a tick (*Calandra oryzea*) and Morgan and Runner the cigarette beetle (*Lasioderma serricorni* Fabr.). Hunter's interests were embryological and Morgan's largely psychological. The former decided that the Roentgen rays do not produce sterility, and the latter concluded that these rays have no effect upon any stage of the life of the cigarette beetle.

The experiments of W. P. Gee (13) seem to show that the scale insect, *Lecanium quercifex* Fitch, exhibits marked positive reaction to a 16 c.p. lamp.

In his investigations on the fire-fly, Mast (19) found that the male responds to the glow of the female by turning about and moving directly towards it. He considers this an unconscious mechanical reflex; but since the animal continues to move towards the female even after the flash has disappeared, he concludes that the orientation is not a tropism in the sense of Loeb. To quote him:

"Here we have a case in which it is clearly demonstrated that light does not act continuously in the process of orientation, as is demanded by Loeb's theories; a case in which it is clearly demonstrated that the continuous action of the stimulating agent is not necessary to keep the organism oriented."

Newell (22) records that both the male and the female rice weevils fly readily towards the light. This tendency is more pronounced on dark nights.

Riley (26) relates that dragon-fly nymphs normally swim rapidly away from the light; but that this reaction may be inhibited by contact. These reactions are not always precise, and Riley thinks that they are probably not purely mechanical, but that pleasure and pain play a part.

According to Lucy W. Smith (28), *Perla immarginata* Say is attracted at night by artificial lights.

C. H. Turner (32) has experimentally demonstrated that brightness stimulates the mason wasp, *Trypoxylon albotarsus*, to activity, and that darkness, or a dim light, induces passivity. The flights are pronouncedly random and there is no fixed relation between the direction of movement and the rays of light; hence Turner thinks this is not a tropism.

The field observations of H. B. Weiss (37) lead him to conclude that different species of mosquitoes exhibit dissimilar reactions towards light. Some are apparently equally positively and negatively phototropic, others respond only to one stimulus, and yet others are unequally positively and negatively phototropic. He groups thirteen species of mosquitoes according to the above classification.

Geotropism.—Having observed that the scale insect, *Lecanium quercifex* Fitch, when placed on a vertical piece of cork, climbs upward, Gee (13) concludes that it is negatively geotropic.

Thigmotropism.—Gee (13) reports that the scale insect, *Lecanium quercifex* Fitch, is positively thigmotactic. A young nymph, which had been turned on its back and upon the feet of which had been placed an unhatched egg, continued to juggle the egg for almost 30 hours, and the larva that hatched from the egg had trouble in freeing itself from the clutch of the juggler.

Wodsedalek (45), by means of carefully conducted experiments, has demonstrated that the most pronounced feature in the behavior of the Ephemeridæ nymphs, *Heptagenia interpunctata* Say, is a strong positive thigmotaxis. This it is which causes several specimens to

mass together in an aquarium, and which causes unattached forms to swim towards any stone placed in the aquarium. A temperature of 45° C. temporarily reverses this thigmotropism.

According to Weiss (38), about the middle of September the gravid females of the mosquito *Culex pipiens* become positively thigmotactic and seek dark places. After becoming acclimated to the dark quarters, the positive thigmotropism so completely replaces the negative phototropism that a strong light may be flashed upon them without producing any effect.

Sensations

Recently Regen (25) has conducted some experiments on the hearing of *Liogryllus campestris*.

Mating Instincts

Newell (22) has described the mating habits of the rice weevil, Phil and Nellie Rau (24) those of the mantis, Wodsedalek (44) those of *Trogoderma tarsale* Melsh and Lucy W. Smith (28) those of *Perla immarginata* Say.

C. H. Turner (31) has published a photograph of two copulating *Ammophilas*.

Mathewson and Crosby (18) observed three cases of the hymenopterous insects *Caraphractus cinctus* Walker copulating beneath the surface of the water.

As described by Mast (19), the mating of fire-flies is intensely interesting. At twilight both males and females appear. The females climb blades of grass and rest thereon, but the males fly about at from one to two meters above the earth, glowing at fairly regular intervals. If a male glows within five or six meters of a female, she usually responds with a flash of light. The male then turns towards her and glows again, to which glow the female responds in kind. After his intermittent glow has been responded to a few times, the male alights near the female and rushes about in an excited manner, glowing repeatedly and being responded to each time by a glow from the female. Sooner or later the antennæ of the insects come in contact and they mate. Neither vision nor smell, but this luminescence, brings the insects together. The female will glow in response to any intermittent flash, even to artificial light; but the male responds to no glow except that of a female.

Nest Building and Maternal Instincts

Hungerford and Williams (15) describe the nests and, in some cases, the maternal habits of the following Hymenoptera: *Pogonomyrmex occidentalis* Cress., *Chlorion cæruleum* Drury, *Trypoxylon texense* Sauss., *Crabro interruptus* St. Farg., *Odynerus annulatus* Say, *Loxostege sticticalis*, *Odynerus geminus* Cress., *Polistes variatus* Cress., *Halictus occidentalis*, *Anthidium maculifrons* Smith, *Dianthidium concinnum*, *Megachile* sp. (?), *Melitoma grisella* Ckll. & Porter, *Anthophora occidentalis* Cress.

In a short article one cannot do justice to Comstock's paper (6) on the evolution of spider webs. Probably the production of silk by spiders was not primarily for the weaving of webs. All spiders use more or less silk in caring for their eggs, and this was probably its primary use. Spiders living in tunnels strengthen them by means of silk. The most important step towards real web-building was the acquiring of the habit of spinning a drag-line. The first drag-line may have been a thread a spider was using in constructing a cocoon; later, however, a special kind of silk was evolved for this purpose. "The step from drag-line to web is not a great one. A spider spinning a thread wherever it goes would make a web if by chance it moved about in a limited space, as in some nook or corner. In such a web insects would be trapped, and thus might arise the habit of building webs for the purpose of trapping insects. The simplest webs made by spiders are irregular webs formed of the same kind of silk as the drag-line." The web of Pholcus is of this type. Then come the webs of the sheet-weavers, which are constructed of dry silk—the kind out of which drag-lines are made—but which have a definite form. Slightly higher than these is the web of certain Agelenidæ which is constructed of dry silk, is regular in shape and has a funnel-shaped retreat. All such webs simply impede the progress of insects, giving the spider a better opportunity to catch them. In many families of spiders glands for secreting a viscid silk have been evolved. The simplest webs of spiders producing viscid silk are those of the Theridiidæ, which are almost as simple as the webs of Pholcus; but the spider throws around the captive a viscid fluid. Other spiders use this viscid fluid to construct threads or bands in their webs. There are two types of webs composed of combinations of these two kinds of silk; in one the part formed of dry silk is comparatively generalized but the viscid silk is supported by a highly specialized band; in the other the foundation of dry silk is a specialized structure and

the partition composed of viscid silk is comparatively simple. Comstock describes in detail varieties of these two types.

Fighting and Food-Procuring Instincts

Hungerford and Williams (15) have described the food-procuring instincts of a few Hymenoptera, Moore (20) those of several species of caterpillars, Newell (22) those of the rice weevil, Phil and Nellie Rau (24) those of the mantis, Riley (26) those of dragon-fly nymphs, Smith (28) those of *Perla immarginata* Say, Turner (32) those of *Trypoxylon albotarsus*, and Wodsedalek (44, 45) those of *Trogloderma tarsale* Melsh and the nymphs of *Heptogenia interpunctata* Say.

Brocher (2) has performed a series of experiments which induced him to conclude that *Elmis æneus*, *E. volkmari* and *Stenelmis canaliculatus* obtain their supply of oxygen, not from the atmosphere, but from plants immersed in water.

Casteel's recent investigations (4) modify our conception of how pollen is collected by the honey bee. By contact some pollen adheres to the legs; but the mandibles and the tongue are used in removing the pollen from the blossom. The pollen collected by the legs is dry; that collected by the mouth parts is moist. The pollen is gathered into the pollen baskets in the following manner. The first pair of legs removes the pollen clinging to the head and the moist pollen collected by the mouth-parts. The second pair of legs receives this pollen, and probably some from the head, and conveys it to the third pair of legs. By rubbing one third leg against the other the pollen is compacted in the corbiculæ, the moist pollen causing the mass to adhere. In unloading, the middle legs shove the pollen from the third legs into the cell.

Chubb (5) reports that the Rev. N. Abraham, of Natal, observed a spider, *Thaissius spenceri* Chubb, catching small fish and feeding upon them, and that the Rev. Pascalis Boneberg, also of Natal, observed the same species of spider reacting in the same manner toward tadpoles and little frogs. In catching the fish, the spider rested with its hind legs clinging to a stone and the others spread out over the surface of the water. When a fish happened beneath the outstretched legs, they suddenly closed about it and the mandibles of the spider inflicted a paralyzing bite.

Frost (12) noticed three flies of the species *Desmonetopa latipes* Meigen dart under the legs of a spider, *Phidippus multiformis* Emerton, and suck the juices of a bug upon which the spider was feeding.

By confining certain bugs in closed jars for definite periods of time

and then replacing them with other live insects, Girault (14) was led to conclude that the vapors emitted by certain Heteroptera are stupifying, and often deadly, to various forms of insect life. He does not claim that these experiments, which were accompanied by control experiments, settle the protective value of these odors.

Certain bees collect from one kind of flower exclusively. This habit is called an oligotropism. Robertson believes that this instinct is the result of an effort on the part of bees to avoid competition. Lovell (17) is positive that this is an erroneous idea. He writes: "The majority of oligotropic bees, whether they be species of Colletes, Andrena, Perdita, Panurgius or Mellissodes, visit exclusively the Compositæ. This behavior tends to produce competition. . . . No satisfactory evidence has ever been presented to show that oligotropism is an effort on the part of bees to avoid competition."

Sladen (27) asserts that the honey-bee gathers pollen directly into the corbiculæ by scraping the inner sides of the metatarsals longitudinally. The legs are not crossed at all, Cheshire's statement to the contrary notwithstanding.

Belt states that *Polistes carnifex*, on capturing a caterpillar, reduces the whole insect to a pulpy mass, then rolls about half of it into a ball and carries it off. According to C. H. Turner (33), *Polistes pallipes* Lepel. behaves quite differently. "Lepidopterous larvæ captured for food are not stung. Grasping the caterpillar with her forefeet, the wasp rotates it on its longitudinal axis and gradually elevates it while she malaxates its posterior end until her jaws are filled with a ball of pulpy matter. The remainder of the insect is then dropped and the ball of pulp carried off to the nest."

Wheeler (40) noticed a stingless bee, *Trigona pallida* Latreille, of Central America, collecting the crude black oil used to destroy mosquito larvæ and mixing it with her own secretions to form the cerumen with which she constructed her honey pots. Another species, *T. bipunctata wheeleri* Ckl., was noticed using human excrement in manufacturing her cerumen. Yet a third species, *T. ruficrus corvina* Ckl., was observed collecting a malodorous liquid from the insides of garbage barrels. No wonder the honey of some wild bees produces sickness.

Parasitism

Ewing (10) states that parasites have arisen in the following ways, and that among the Acarina we find parasites that have been derived by each method: (1) by predaceous forms beginning to prey on individuals larger than themselves; (2) by scavengers passing from

feeding on dead tissues to feeding on such tissues attached to living organisms, and thence to feeding on the plants or animals; (3) by forms adapted to sucking plant juices transferring their operations to animals.

Miscellaneous Instincts

Death Feigning.—The death feigning behavior of the dragon fly has been described by Riley (26), that of the Ephemeridæ nymphs and *Trogoderma tarsale* Melsh by Wodsedalek (44, 45), and that of *Conotrachelus nenuphar* Herbst. by Gee and Lathrop (13a). The last mentioned investigators agree with Holmes and the Severins in thinking that this form of behavior has developed out of positively thigmotactic propensities.

Hibernation.—The prevailing notion has been that the spotted Rocky Mountain tick hibernates in the nymphal and adult stages only. Bishopp and King (1) state that this is an erroneous idea. Many individuals hibernate in the larval state, only a few in the engorged nymphal stage, and a few in the adult period.

Blaisdell (3) found large numbers of the tiger beetle, *Cicindela senilis*, hibernating beneath flat stones, at from none to three inches deep.

Acrobatism.—Wells (39) records a peculiar acrobatic feat of some small flies belonging to the genera *Microcerata* and *Brema*. The flies were observed resting suspended, by the hind legs, from a spider's thread. At intervals flies would leave the thread and then return and assume the suspended attitude.

Homing

Cornetz (8) criticises Szymanski's work and stresses his former contention that ants are guided, not by tropisms, but by an inner stimulus. Incited by a remark of Santschi's, Cornetz (7) conducted a series of experiments to see what effect the sun's rays can have on an ant after they have passed through an opaque screen. He shaded an ant of the species *Messor barbarus*, which had started out to forage, with a movable vertical screen 75 cm. wide. This screen was shifted as the ant moved. Occasionally the ant was allowed to be in the sunlight for a moment. After the ant had gone far enough to make it possible to predict its line of march, it was shielded with an umbrella and the screen was arranged horizontally, one centimeter from the ground, at a short distance in front of the ant. When the ant arrived at the dense shadow cast by the screen, it halted, made a turn of ninety degrees, skirted along the shadow until the end of the screen

was reached and then turned about and moved on in a line parallel to the original direction. Cornetz reasons that if the ant could perceive the rays of the sun passing through the vertical screen, it should be able to sense the same rays when the screen is in a horizontal position. This ant was not guided at all by the sun's rays that had penetrated the screen. Shadows cast by screens are shadows for both ants and man. Ants are accustomed to shadows cast by vertical bodies; but the dense shadows cast by horizontal screens are seldom encountered outside of the nest. On encountering a strange object afield, ants usually either pass around or climb over it. Cornetz repeated this experiment with *Tapinoma* sp. (?), a species of ant that is much more blind than Messor. The ant continued on through the shadow and reappeared on the opposite side of the screen. Cornetz concludes that rays of light sometimes furnish ants with additional, but not indispensable, information.

Piéron (23) has made a critical review of all of the important papers that have appeared on the homing of ants, and repeated his former experiments. He thinks the theory that ants are guided home by an olfactory trail is well established for those ants that follow the same path going from and returning to the nest, but he does not believe that "being led by an odor trail" will account for the homing of all ants. He contends that C. H. Turner's conclusions are true merely in the immediate environment of the nest, and considers Cornetz guilty of too great a generalization when he claims that ants, when near the nest, always hesitate and describe what Cornetz calls a "tournoiement de Turner." He admits that light plays a rôle in the homing of ants, and believes that there is a zone adjacent to the nest in which ants are guided by sensory impressions, the dominant sense depending upon the species. At a distance from the nest, he thinks ants are guided by a kinesthetic sense, and he believes that there is an inner organ of the sense.

C. H. Turner (33) observed that *Polistes pallipes*, when it intends to revisit a place, makes careful flights of orientation. This caused him to conclude that a memory of the environment guides this wasp.

Memory and Learning by Association

C. H. Turner (30) watched a solitary wasp drag a caterpillar home. When first observed it was moving in a bee line for the nest. On the way the wasp encountered a tall board fence, up which she attempted in vain to drag the caterpillar. She then dragged the burden along the entire length of the fence until the end of the yard

was reached. Then she passed around the fence, turned at an acute angle and dragged the caterpillar to the nest. This line was not parallel to the path along which the wasp originally attempted to reach the nest. Turner concludes: "The behavior of this wasp does not harmonize with the theory that the movements of wasps are tropisms in the sense in which the term is used by Loeb; nor is it apparent how it can be the result of what Thorndike calls 'trial and error' movements. Her whole attitude is that of a creature struggling against obstacles, to attain a certain known place in a known environment."

To test their ability to acquire new responses to light, C. H. Turner (34) has conducted a series of experiments upon roaches of both sexes and all ages. Marked individual roaches were given an opportunity to enter either a dark chamber or a lighted chamber. Whenever the roach entered the dark chamber it was given an electric shock. After a certain number of attempts the roach would refuse to enter the dark chamber; indeed, after a certain amount of training, the roach could not be shoved into the dark chamber without offering resistance. After such a roach had been well trained it was transferred to a pen with a different kind of floor, but one in which the roach had an opportunity to enter either a dark or a lighted chamber. The roach would immediately enter the dark chamber. It was then returned to the former pen, when it again refused to enter the dark chamber.

From these experiments the following conclusions were drawn: "(1) By means of electric shocks roaches can be trained to avoid entering a specific dark place. This is not a reversal of the phototropic responses of the roaches, but the result of learning to avoid a specific dark place because of certain disagreeable experiences associated with it. (2) Generally speaking male roaches are more apt than females and young roaches are more apt than adults; but there are marked individual exceptions to this. (3) In the ability to learn and to retain what they have acquired roaches exhibit marked individuality. (4) Roaches that have acquired the habit of refusing to enter a specific dark place do not lose that habit when they moult. (5) During sickness and just prior to death the retentiveness of the roach is much impaired."

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RECENT LITERATURE ON THE BEHAVIOR OF VERTEBRATES

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Fish.—Parker (28) reports some experiments on the common chemical sense in Ammocœtes and Amiurus. The skin of the former can be stimulated by sour, bitter, salt, and alkaline substances, but not by sugar. The regions of the body are sensitive in the following descending order: mouth, tail, mid-trunk. Amiurus is unlike Ammocœtes in giving no response to quinine applied to the trunk and tail, and in showing no difference in sensitiveness between the trunk and tail. Cutting the various nerves which supply the body surface proved that the common chemical sense involved in these reactions depends on the free terminations of spinal nerves; while the sense of taste functions through the lateral accessory nerve and its taste-buds. Parker believes that not the common chemical sense but smell is in invertebrates the oldest of the three chemical senses, smell, taste, and the common sense, because its neurone is on the type of sensory neurones found among invertebrates and because invertebrates have a chemical distance receptor.

Shelford and Allee (33) find that of various atmospheric gases dissolved in water CO_2 has the most effect on fish, causing death in concentrations which merely reverse the reactions of lower invertebrates. A high N content does not affect fish seriously. These writers (32) have constructed a device whereby various parts of an aquarium can be supplied with water in which different gases are dissolved and the reactions of the fishes to the differing environments noted.

Goldsmith's (17) experiments on Gobius, Pleuronectes, Gasterosteus, and Syngnathus show that these fishes can by being fed from pincers be taught to investigate empty pincers, and by being shown a glass tube with a Mysis inside, to investigate empty glass tubes. The experiments in which she tries to prove color discrimination and association with colors are worthless because both smell and brightness errors are involved. They were condemned on the latter account by Piéron when the paper was read before the Institut.

Amphibians.—The sensibility of the frog to temperature has been studied by Babák (2), using a new method. The breathing

movements of a frog whose forebrain has been removed are of great regularity. When an area .5 cm. square on the skin was affected by radiant warmth (not touched), the breathing rate was quickened; cold brought near the skin slackened the breathing rate. The head was the most sensitive region. The frog's sensibility was apparently equal to or a little greater than that of a human being.

The educability of the axolotl has been demonstrated by Haecker (18). The animals learned to discriminate between meat and pieces of wood which they at first took for meat. The learning was poorest in the winter and spring, at the outset of the breeding season. Family likenesses in behavior were shown by the individuals in several stocks.

Riley (30) reports experiments made some years ago on young toads of the species *Bufo americanus*. He finds that they orient and move negatively to intense artificial light, positively to weaker (16 c.p.) artificial light and to diffuse daylight, positively to light filtered through a blue solution, and nearly as often negatively as positively to red light. No random movements were observed. They respond to contact in preference to light when both kinds of stimulation are presented; rough handling may produce a death-feigning response. They also sometimes react to contact by inflating the lungs with air.

Cummings (12) has made a number of careful observations on the ability of salamanders (*Molge cristata* and *Molge palmata*) to find their way back to water. He calls attention to the fact that the newts make compensatory head movements when carried about for short distances, which may help them in returning to the place from which they were taken. They are aided in finding water in which to breed by their marked tendency to walk downhill. They have also a homing faculty, which has not a very large range, and "probably consists in a topographical knowledge of the locality where the breeding pond is situated."

Birds.—Breed (4) and Bingham (3) both contribute experimental studies of vision in the chick. Breed's work is a continuation of that reported in his earlier monograph. He presents the following arguments in favor of color-discrimination by chicks: (*a*) The chicks showed no preference between a red and a blue at a certain brightness of each, but displayed preference as soon as the relative brightness was changed, hence it may be concluded that the red and the blue were, when no preference was shown, of equal brightness to the chicks: yet they learned to discriminate between them. (*b*) The acquired

discrimination was not affected by changing the relative brightness of red and blue. (*c*) "In the control test on white-blue, the rejection of blue continued perfectly when white was much brighter and when it was much less bright than blue." Both Breed and Bingham got positive results with size discrimination: one of Breed's chicks discriminated a circle 5 cm. in diameter from a circle 8 cm. in diameter; while Bingham, by gradually diminishing the difference in size between the two circles presented, found the limen of discrimination to be from 1/4 to 1/6 of a circle 6 cm. in diameter. One out of three of Breed's chicks apparently succeeded in distinguishing between a circle and a square. Bingham's chicks discriminated between a circle and a triangle when the apex of the triangle was on top, but since this discrimination broke down when the circle was presented with a triangle whose base was uppermost, the chick failing to choose the triangle, Bingham concludes that the chick was not reacting to form difference, but to "the unequal stimulation of different parts of the retina." The reviewer would conclude rather that the chicks were not possessed of an abstract idea of triangularity. A triangle with apex up is a different form from a triangle with apex down: the two have in common only the abstract quality of three-sidedness. The perception of form, as distinct from an abstract idea of form, is based precisely on the unequal stimulation of different parts of the retina. Bingham suggests, and to some extent uses, the method, in discrimination experiments, of presenting first a complex stimulus and gradually eliminating certain of the factors.

Phillips (29) notes that wild Mallard ducks can be tamed, while wild black ducks (*Anas tristis*) are untamable, and in a hybrid with three fourths *Anas tristis* traits the wildness was markedly dominant.

Craig (9) writes further of his experiments on inducing ovulation in the pigeon by preening the head and neck. He maintains that this stimulus does not produce ovulation by a simple reflex, but that the result is due to "the total situation including both the totality of present sense stimuli and also memory factors." It by no means always occurs: all the circumstances have to be favorable. One evidence that memory factors are involved is found in the fact that young doves which have never mated are more ready to enter into abnormal matings.

Observations on the drinking reflex in doves lead Craig (10) to the conclusion that the only innate stimulus for it is the touch of water on the inside of the mouth; that the ordinary pecking reaction first gets the dove's bill in contact with the water; that while pecking

is instinctively imitated, drinking is not; and that experience may associate the drinking reflex with all sorts of stimuli, and may even lead to the giving of drinking movements before going to the water.

Craig (11) finds that the behavior of pigeons in breaking out of the egg is like that of chicks, and consists in pushing out the large end of the egg, thrusting the bill through the shell, and turning around a few degrees between thrusts.

Ménégaux (27) calls attention to the lack of knowledge concerning the migrations of quails and suggests ringing them for study.

Mammals.—An elaborate study of the function of vibrissæ in the white rat has been published by Vincent (38). Her problems were two: the use of vibrissæ in maze running, and their use in discriminating rough from smooth surfaces. In connection with the first problem she constructed a novel kind of maze, with the pathways elevated and the sides removed. Rats with and without vibrissæ, with the vibrissæ on one side removed, with vibrissæ removed immediately after birth, anosmic rats with and without vibrissæ, blind rats with and without vibrissæ, and rats with the fifth nerve cut, were used with this maze. The results showed that the whiskers are very important as mediating a distance sense of touch. For investigation of the second problem the attempt was made to teach the rats to choose a runway lined with corrugated zinc rather than either of two with smooth sides. Rats without vibrissæ took much longer to make the discrimination. Next to the whiskers, the nose is useful as an organ of touch, for blind and anosmic rats learned to make the discrimination where rats with the infraorbital branch of the fifth nerve cut did not. Vincent notes the general sluggishness and lack of tonus in rats deprived of a sense: sensations act as a general stimulus to activity. A theoretical discussion of recognition and association concludes the monograph.

Vincent (37) has performed a service in tabulating the results of a number of investigators (Chievitz, Lindsay, Johnson, Slonaker, and Harris) on the structure of the eye in various mammals. The following headings are used in the table: fundus and tapetum lucidum, shape and color of optic disc, sensitive area, fovea, shape of pupil, divergence of optic axes, refraction, stereoscopic vision, rods and cones, decussation of optic nerve, pupil light reflex, refractive index of lens, refractive index of fluid media.

The Yerkes discrimination box was used in Lashley's (23) study of the white rat's discrimination of size and form. The animals showed a strong tendency, when they could be induced to attend to

the stimuli at all, to pay attention only to brightness difference. When the brightness error was eliminated, they learned to discriminate between a horizontal and a vertical line, and between rectangles whose width was varied; also between two circles of 30 and 50 mm. diameter respectively, the error increasing when the difference in size was reduced. They failed, however, to distinguish between a square and a circle when the area of the circle was made more than three fourths that of the square.

The first of the experimental series reported by Mr. and Mrs. Watson (39) on color responses in rodents consisted in testing a white rat and a gray Belgian hare with spectral red and green. It was found that the red had no stimulating value whatever, a result which corresponds to that of Washburn and Abbott's work with reflected light in the case of the rabbit. In the second series three rats and one rabbit were tested with spectral blue and yellow. The yellow proved to have a very low stimulating value, the blue a high value: this latter fact was also indicated, though not proved, by Washburn and Abbott's experiments. No evidence of discrimination based on wave-length rather than energy was found.

Cornetz (8) compares the rat's method of "remembering" the way to a vessel of water with that of an ant in remembering locality. The rat, according to Szymanski, remembers by reference to its own motor attitude: the ant can remember localities though entirely different motor attitudes are involved. (Compare the account of Hunter's research given below.) A curious misunderstanding is evinced by Cornetz's referring to the conception of learning through the dropping off of useless movements as "a finalistic theory."

Coburn (6) has observed "singing" in a common house mouse: it consisted of a rapid whole tone trill.

Sackett's (31) monograph on the porcupine begins with an account of the habits of the animal in the wild state. Sixteen individuals were experimented upon: all died soon. The first tests dealt with right- and left-handedness. The porcupine will reach for food with either fore-paw indifferently, but shows a disposition to use the "hand" on the side symmetrical with that of the hand that holds the food out to him, even though the food is always held in the same place. The animals were taught to use one hand in reaching for cabbage and the other hand in reaching for lettuce: the basis of discrimination was probably chiefly brightness.

The porcupine's manual dexterity can be considerably improved by training. He did well with puzzle boxes, including one with a

combination lock; in tests after a considerable interval he seemed to remember the order in which the parts of the apparatus should be attacked, but had lost dexterity in manipulating them. From this the author draws the interesting deduction that "associations on the mental side persist more perfectly than muscular coordinations." Sackett believes the unsocial nature of the porcupine rendered the presence of the experimenter on the scene of action innocuous as a source of error: this would be a dangerous statement if generalized. Form discrimination was tested in connection with the instinct to crawl into a den, by cutting holes of different form in a board. The forms used were a circle, a triangle, square, hexagon, ellipse, and rectangle. Such discrimination as resulted was based not on vision of the forms as a whole, but on examination of the edges: "the porcupine would run his line of regard, or visual axis, around the form until he came to the part which differentiated it from the others." Color and brightness discrimination were investigated by a rather unsatisfactory method: gray and colored papers were pasted on food boxes, which gives opportunity for identification by wrinkles, and the smell error was not eliminated quite rigidly. Animals which had learned to choose black rather than gray chose blue rather than green; and when dark blue was presented with light green and dark green with light blue, they chose the darker impression. If the choice of blue rather than green means that blue looked darker to them, their brightness values differ from those of the rabbit and rat, for which, as we have seen, blue has a high stimulating power. Porcupines learned to run the Hampton Court maze with great speed. The maze was situated out of doors on a slope; when it was rotated 90 degrees, the animals were naturally much confused, since the slopes were all changed.

Cole (7) finds touch, especially located in the nose and forepaws, very important in the raccoon. These animals do not seem to smell food more than a few inches away from it. Sight and hearing are both keen: the absolute limen for noise appears to be lower and the power of localizing sounds greater than in human beings. The following instincts of the young raccoon are noted: sucking, creeping, climbing, play, following (this wanes in the seventh month), fear, anger, curiosity.

The growth of English interest in experimental comparative psychology is illustrated by Smith's (35) careful study of color vision in dogs. A fox terrier, a Welsh terrier mongrel, and a whippet were the subjects. The apparatus offered a choice of four compartments,

with shutters carrying colored or gray cards under glass. The cards were 12 by 10 inches. Precautions were taken against identifying a card by surface or markings. Biscuit rewards were used. Smith, like others, found that the dogs would not work for punishment. A color was shown with each of a series of grays, and for every color some gray was found which was especially hard to distinguish from it. Green and yellow were confused with very light gray, blue with a medium gray, and red with a gray not quite so dark as the equivalent of blue. (This suggests brightness values like those for a human being: the low stimulating power of red and high stimulating power of blue which are found in rodents do not appear here.) With practice, however, there was no color that could not be distinguished from a gray. Another argument for the existence of true color vision is found in the fact that the dogs had more difficulty in discriminating grays than in distinguishing a color from the gray nearest to it. They could not discriminate if they were more than from one to two and a half feet from the cards. Many interesting points of the monograph must be passed over without comment because of the space limitations of this review. An important piece of interpretation is the following. The dogs displayed in their choices two types of behavior, which the author calls respectively "self-control" and "inhibition." The former type occurred when the dog in making for a particular shutter suddenly stopped, underwent apparently for some moments a conflict of impulses, and ended by rejecting the shutter. "Inhibition," on the other hand, happened where the dog's reaction to a shutter was suddenly checked, but no period of conflict or hesitation supervened. Smith thinks that the check in the "self-control" type of behavior comes from within the animal's mind, and implies "some species of ideal control"; while in inhibition the checking proceeds from the external stimulus. To the reviewer it does not appear self-evident that hesitation cannot proceed from a conflict of impulses whose stimuli are external, rather than ideal.

Johnson (20) gives in *Science* a review of a newspaper article by Pfungst, on the notorious case of the talking dog (Sechste Beilage zur Possischen Zeitung, 27 April, 1911). The dog, Pfungst reported, has evidently no consciousness of the meaning of his words, since he always gives his vocabulary in a fixed order. He does not imitate the pitch or intensity of his questioner's voice, nor, when he first uses a word, is it pronounced after a human being. The actual sounds which he produces are very few; all the rest being supplied by the hearer's mind. He has one vowel, between o and u; a ch and a nasal n, but

no b, d, k, l, or r. The disinterested observer cannot distinguish between *Hunger* and *Hahn* as the dog speaks them.

Shepherd (34) apparently succeeded in teaching two cats to distinguish between the sound of their names and other articulate sounds but his experiments are faulty in having been performed with the experimenter in plain view of the animals.

Von Maday's (26) book on the horse contains little that is of value to science. It has chapters on the senses and intelligence of the horse, and devotes a disproportionate amount of space to instincts, emotions and temperament, but there is almost no experimental evidence adduced in support of the statements on these various topics.

It appears that the problem of the behavior of "kluger Hans" is regarded, even by some respectable scientific authorities, as not having been satisfactorily solved by Pfungst's hypothesis of unconscious movements on the part of the trainer. Krall (22), a friend of von Osten's, has recently published an account of further experiments with the Berlin horse, and also of the performances of two horses of his own, which he has succeeded in educating to feats even more remarkable than those of Hans. Around this book a controversial literature has grown up of which our bibliography contains only the most important titles (1, 5, 13, 14, 15, 21, 25, 36). Krall's horses not only find cube roots and answer questions with the aid of a conventional system of striking the hoof on the ground a certain number of times to represent certain letters; they have taken to making spontaneous remarks by the same means. The believers, like Krall and Te Kloot, not unnaturally become almost hysterical over the greatest discovery of the age, namely, that an animal may possess a mind of human capacity which has always lain dormant for want of proper means of education. Those who would, like Claparède, fain be conservative are almost persuaded; some, like Döring, are skeptical, while others are frankly abusive with regard to the fraud. Needless to say, the reviewer is unconvinced that the Elberfeld horses possess minds of the human type. Their performances are too wonderful. A few examples will suffice. Careful reading of the account of Krall's method of teaching the horses to multiply shows that the first time they were shown the printed multiplication sign they understood its meaning without being told. It would have been a remarkably clever child who could comprehend Krall's explanation of the process of extracting roots sufficiently well to use the method at once, as the horses did. Döring notes that the horses took no longer to solve difficult problems than to solve easy ones. On the other hand, it

seems probable that some influence besides the trainer's slight unconscious movements is involved. There are too many cases of correct performances when the horse could see no one. Moreover, the trainer is said in many instances to have been walking about and engaged in a variety of movements, which would make the signals very difficult to recognize. (The tests where the trainer was in ignorance of the correct answer to be given give ambiguous results.) The reviewer is inclined to think that the hypothesis of auditory cues deserves further attention.

The behavior of the monkey (*Macacus rhesus*) has been the subject of two recent studies, a short one by Franz (16) on right-handedness, and a series of careful observations by Watson and Lashley (24) on the development of a young monkey from birth. Franz found that "out of six monkeys one showed an apparent preference for the use of the right hand, and two preference for the use of the left hand," in reaching for food. The young monkey, according to Watson and Lashley, is practically complete in sensory development at birth. "There is some evidence that sounds were heard on the second day." The following reflexes were well established on the first day: sucking, grasping, muzzling, crying, sneezing, winking (though not in response to visual stimuli), "uncoördinated movements of the legs when the stimulus for grasping was removed, and an increased muscular tension in the legs in response to the mother's movements." Slight motor response to sound appeared on the second day; turning the eyes and head to follow a moving object on the third day, and on the fifth day reflex grasping at an object seen. The mother showed greatly increased timidity while nursing the baby: this is in contrast to the behavior of cats, which become abnormally brave under such circumstances. Self-imitation on the part of the young monkey was little if at all developed, nor was there any evidence "to show that the infant monkey ever gained a new activity by imitation." Many of his activities were acquired "only after many unsuccessful trials."

Finally, in Hunter's (19) monograph on "The Delayed Reaction in Animals and Children," we have a comparative study of the human and animal mind, of a type whose single previous representative has been the work of Hamilton. Hunter's subjects were twenty-two rats, two dogs, four raccoons, two boys and one girl six years old, a girl of eight and a girl of two and a half. The general nature of the problem was as follows. Light may be shown in one of three directions. If the subject goes to the light, it gets a reward. When this state of things has been grasped by the subject, a delay is introduced

between the showing of the light and the subject's release to go towards it. The problem is thus changed from that of going towards the light to that of going in the direction where the light appeared a short time before. The delays were gradually increased and diminished until a delay was established for each subject beyond which it could not "remember" in which direction the light had been shown. Only four rats were successful with delays of more than one second. One dog made a high record for thirty trials with a delay of three minutes. The raccoons succeeded with a delay of as long as twenty-five seconds. All the children except the two-year-old reached a delay of twenty minutes; the two-year-old failed at one minute. More significant than the maximal time of delay was the behavior of the subjects during the interval. All the rats "remembered" the direction of the light by orienting towards it and keeping the whole body oriented during the interval. The dogs were also dependent entirely on keeping a constant orientation, although it was an orientation of the head and not of the entire body. The raccoons showed their superiority to all the other animals by reacting correctly even though they moved about during the interval of delay. The children, of course, could recall the direction of the light without needing to keep their position constant. Hunter is not willing to grant, however, that the raccoons, like the children, used memory ideas. He prefers to conjecture that some organic sensations represented the direction of the light during the interval after its disappearance, thus assuming the function of a memory idea.

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SPECIAL REVIEWS

Tierpsychologisches Praktikum. Karl Camillo Schneider. Leipzig, 1912. Pp. 719.

Professor Schneider's volume on the psychology of animals is unique in that the discussion is presented in the form of a dialogue in which participate the psychologist, the monist, the vitalist, the physiologist, the Lamarckist, the biologist, the Darwinist, and occasionally the layman.

The dialogue form somewhat lightens the discussion, since occasionally one of the speakers expresses amusement, amazement, or disagreement. Because of the appearance of humor, the book is more readable than is the ordinary treatise of its bulk, yet there is the obvious disadvantage of the extreme multiplication of words.

The volume consists of three chief parts which deal with perception, action, and experience. Under these headings, some thirty odd separate discussions appear. The book is illustrated with one hundred and thirty-nine text figures, many of which are original, and the attempt is made both to bring into clear light the fundamental principles—presuppositions included—and the facts of the psychology of animals. Seventy-two experiments are used as the basis for the discussion of problems.

Professor Schneider has succeeded admirably in formulating problems and in stimulating critical consideration of the rapidly accumulating materials of behavior. He has failed, however, in the opinion of the reviewer, to do justice to the literature of his chosen topics. An analysis of the bibliography reveals that in a total of about two hundred and twenty-five titles, only twenty-five are those of American publications; and of the one hundred and thirty eight authors whose works are included, only eighteen are Americans. Similarly in the authors' index to the volume, we find that of the two hundred odd names listed, only twenty are American. In view of the fact that the psychology of animals is an American science, this neglect of American publications in a book which makes pretense at thoroughness of discussion is inexcusable. It is further noteworthy that Professor Schneider's knowledge of many of the American publications to which he refers is second hand. Indeed, even some

of the figures which he reproduces are taken from foreign reviews or translations of American books or monographs.

The *Tierpsychologisches Praktikum* is so extensive and so inclusive of topics important for the student of the psychology of animals that it is quite impossible to summarize, briefly, the results of the discussion. A mere listing of the topics of the thirty-one discussions will serve to acquaint the reader with the scope of the volume.

In Part 1, under perception, the topics include: (1) an introductory discussion of human behavior in which the typical human act, consisting of reception, association, and reaction, is described; (2) form perception, illustrated by studies of earthworms and spiders; (3) homogeneous and heterogeneous stimuli; (4) the visual field and the object; (5) the environment; (6) orientation in insects: (7) the identity theory, under which are considered identity, parallelism, and interactionism; (8) specific nerve energy; (9) central localization; (10) the peripheral subject. Under this topic one experiment deals with mind-blindness and, among other subjects discussed, are the old and new psychology, idealism, and realism.

Part 2, action, deals with the topics: (11) the tropism; (12) the method of trial and error—a discussion of problem solving in amœba and the infusoria; (13) purpose and accident; (14) the doctrine of compensatory excitation; (15) the mono-, bi- and tripolar hypotheses. This discussion is based chiefly upon the work of von Uexküll; (16) the psychic accompaniment; (17) the effect of feeling; (18) the intellectual value of instinct; (19) the different action types; (20) synthesis of the discussion.

Part 3 treats of experience under the following heads: (21) habit; (22) theories of memory; (23) animals' dreams; (24) the play of young animals; (25) the play of old animals; (26) the so-called intelligence of vertebrates; (27) experience; (28) the speech of animals; (29) objective psychology; (30) synthesis: the biological phantom (it is worthy of note that under this topic hysteria in the dog is the chief subject for consideration); (31) synthesis: the general plan.

As this array of topics indicates, the book deals in a general and conversational fashion with some of the most important aspects of the psychology of animals. It is semi-philosophical in its method and will serve better as a basis for critical discussion then as a students' guide.

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The Mechanistic Conception of Life. JACQUES LOEB. Chicago, 1912. Pp. 232.

The Mechanistic Conception of Life is a collection of semi-popular accounts of Loeb's experimental analyses of what goes on in the development of the egg, in the growth and movement of animals, and in the action of salts in connection with certain life-processes. It will serve as a convenient brief representation of the spirit and methods of a daring, ingenious and sagacious investigator.

Loeb uses these studies to point the moral that biological and psychological science should especially seek to reduce animal behavior to chemical reactions; and seems to consider that this mechanistic conception of life was a prime mover in his own discoveries. The actual lesson of the book seems to me rather that biological and psychological science should seek to enlist the devotion of men of genius. It is always interesting to have revealed the general world-view which a scientific worker either uses to make science advance or derives from the advances that he otherwise makes. But, to my mind, to use Loeb's studies as a stimulus to general argumentation for or against mechanism, vitalism, spiritualism, materialism and the like, is to make a rather trivial and inadequate use of them. It is as stimuli to matter-of-fact study of particulars, not to verbal argument about the meaning of sweeping statements, that they will do their proper work.

The two papers of closest relationship to psychologists' studies are "The Significance of Tropisms to Psychology" and "Pattern Adaptation of Fishes and the Mechanism of Vision." The reviewer has always been unable to appreciate the fundamental antagonism which Loeb seems to find between Jennings' work and his own. It appears to the reviewer that Jennings has illustrated Loeb's own soundest principles, for example, in carrying the analysis of the swarming responses of certain animals in response to certain conditions further than it had been carried, and that Loeb's proper retort should be to welcome the new facts and push the analysis still further by defining the mechanism, for example, for the avoiding reaction of Paramecium and the like. The paper on Pattern Adaptation seems to me a sample of genius at its worst, but it is probably more hopeful for science to have Sumner's observations suggest the idea that "vision is a kind of tele-photography" than to have them suggest that flounders have "minds" which look at scenery and then paint it on their backs by some teleological magic.

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Instinct and Experience. C. Lloyd Morgan. New York: The Macmillan Co., 1912.

This book is an outgrowth of the discussion between Morgan and others which appeared in the *British Journal of Psychology* in 1910. The author defends the thesis that instinctive acts are functions of the lower brain centers. (He has in view only the higher vertebrates.) The physiological evidence for the thesis is drawn chiefly from Sherrington's work on decerebrate and spinal animals.

Consciousness, which is correlated with processes in the cortex, is a mere spectator of purely instinctive behavior. It receives information of this behavior and later comes to control and guide it. The behavior is then intelligent and perceptions then have meaning. It is assumed, then, "that experiencing is correlated with physiological processes in the cortex. . . . Instinctive behavior . . . affords those grouped data in consciousness, which may serve in some degree to explain (so far as it can be explained) the genesis of experience" (p. 21). A vague preperception may accompany the first instinctive act. Except for this all meaning is the result of individual acquisition. Thus instinct and intelligence differ both functionally and genetically.

L. W. Cole

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NOTES AND NEWS

The present number of the Bulletin, dealing especially with comparative psychology, has been prepared under the editorial care of Professor Margaret Floy Washburn.

The following items are taken from the press:

The Académie Française has awarded the Grand Prix Broquette Gonin, of the value of $2,000, to Professor Grasset, of Montpellier. The prize is for "the auther of a work, philosophic, political, or literary, which shall be judged to be of a nature to inspire the love of the true, the beautiful, and the good." Professor Grasset, who is known for his researches on the nervous system, is also the author of several works on questions of psychology, moral responsibility and the philosophy of practical life.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE HIGHER MENTAL PROCESSES (EXPERIMENTAL)[1]

BY PROFESSOR J. W. BAIRD
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I. Memory and Imagination

(*a*) *General Questions.*—Jesinghaus (25) undertook to determine which method of memorial investigation affords the clearest insight into memorial dispositions and their interrelations. He found that the recognition-method reveals the existence of dispositions of such slight intensity that they escape observation when other methods are employed; and the observer's descriptions of his feelings of familiarity enable one to differentiate several degrees of intensity of disposition. A combination of the methods of recognition and reproduction is recommended. Fischer (15) reports a confirmation of his earlier conclusion that an intimate relationship obtains between the memorial dispositions which constitute the basis of recognition and those which give rise to reproduction; but G. E. Müller's paper (36) indicates the existence of a different state of affairs. Müller introduced distractions immediately after certain acts of learning; the reproduction-method showed that the non-distracted data were much more completely remembered than the distracted data, while the recognition-method gave approximately identical results in the two cases. This seems to justify the infer-

[1] The writer is indebted for aid in the preparation of this summary to Dr. S. C. Fisher and Dr. S. W. Fernberger, of Clark University. Three monographs which appeared during the year have not been accessible; and certain papers of which only the first instalments have been published are not included on account of lack of space.

ence that recognition does not demand the presence of effective associations,—an inference which is supported by Gregor's finding that, in Korsakoff's disease, no parallelism is to be found between disturbances of recognition and disturbances of reproduction. Poppelreuter (43) points out that no investigation can disclose the elementary laws of association and reproduction in pure form if it employs a method in which processes of volition and thinking play a part. In his own experiments, he employed the *Treffermethode* with the usual instructions ("Name the other syllable of the same rhythmic group"), and with free instructions ("Describe what comes to consciousness when the syllable is presented"). His results show that associations are profoundly influenced by the participation of will; the assigning of a circumscribed *Aufgabe* may result in a threefold increase of the number of correct reproductions. It should be the aim of the investigator to find an explanation of the phenomena of association and reproduction, not by having recourse to such factors as volition and apperception which regulate and govern associations, but by referring them to certain definite elementary laws of association.

Michotte and Ransy (35) undertook to determine what rôle is played by strictly intellectual processes in the remembering of logically related data. They found that reproductions may be direct or indirect,—the remembrance being mediated in the latter case by an intermediary process. The intermediary may be concrete or verbal ideas of various sorts, affective processes, or *Bewusstheiten* relating to the relation between the presented data. Consciousness of relation was reported in 45 per cent. of the cases. It frequently assumed an intentional form where it determined the coming word, the latter being described as "that which was to come," "that which I was waiting for;" it was present in this form from the instant when the observer apprehended the stimulus-word and set out to accomplish the task of finding a related word. The consciousness of relation appeared in various forms: as a simple remembrance of the identity or opposition, etc., between the original pair of words; as an imageless knowing; in rare instances, as a "thought." Whether accompanied by a sensory symbol or not, it appeared in certain cases to be a mere accessory to the act of reproduction; but in other instances it proved to be an effective factor where it defined the reaction-word in relation to the stimulus-word.

Schöneberger (46) traces the evolution of the experimental

investigation of memory and presents certain of the more important findings. He emphasizes the pedagogical point of view throughout and ignores the results of pathological investigations. Hentschel (22) presented digits, consonants, groups of consonants, nonsense-syllables, and words to a number of children, in an attempt to determine the compass of immediate reproduction. His observers included thirty-one backward children between the ages of eight and fourteen (degree of mental retardation not specified), and twenty-four normal children between the ages of six and thirteen years. He finds that a lesser capacity of immediate reproduction is usually associated with a lesser degree of intelligence; and he is of the opinion that this phenomenon may constitute a test of intelligence. Vértes (52) attempted to determine what correlation obtains between memorial capacity on the one hand, and age, sex, intelligence, and social *milieu* on the other; between compass and promptness of memory; between memorial capacity and permanence of retention. He found a positive correlation between intelligence and memory and between age and memory; between promptness of reproduction on the one hand, and age, intelligence and compass of memory, on the other. The memorial capacity of girls is superior to that of boys; and that of children of well-to-do parents is superior to that of children of poor parents.

Hollingworth (23) undertook to determine the effect of caffein upon a wide range of mental and motor processes. His results show that the effects of caffein are constant and uniform, varying somewhat with the size of the dose, with the body-weight of the patient, and with the sort of efficiency tested. Its effect upon motor processes is relatively prompt and transient; upon the higher mental processes, more slow and more persistent. The general effect was stimulative; but in certain instances the nature of the effect varied with the size of the dose,—small doses giving rise to retardation, moderate doses having no effect, and large doses producing a stimulation, in the case of motor coördinations; while in the case of discrimination reactions, these relations were reversed. Secondary effects were wholly lacking. Hollingworth's second paper (24) reports that the act of typewriting is accelerated by small doses of caffein (one to three grains), but retarded by larger doses (four to six grains); accuracy is improved by both small and large doses, up to six grains.

A consideration of the literature of correlation has convinced Hart and Spearman (19, 20) that the present lack of agreement

regarding correlation between different intellectual functions is due to gross misinterpretation. The available evidence indicates that correlation is due to the fact that all of the performances, however different, depend in part upon a common general factor. This general factor is not a specific process, nor does attention furnish an adequate explanation; the presence of correlation between intellectual performances seems to be traceable to the fact that every such performance inhibits the simultaneous performance of activities of a different sort. This leads to the assumption that every performance draws upon a common fund of energy; and this common fund of energy constitutes the basis of the required general factor. Every mental process depends not only upon this general factor, but also, in varying degree, upon a specific factor which is peculiar to this and to all other similar activities. Expressed in physiological terms, every intellectual activity involves not only the specific activity of a particular system of neurones, but it also involves the general energy of the whole cortex.

(*b*) *Imagery.*—Miss Fernald (14) has made a study of ideational types, and of the best means of determining the type to which a given individual belongs. Her procedure consisted essentially in making a detailed examination of the imagery employed by eleven trained observers in different situations and under different circumstances. She distinguishes a versatile type which is characterized by proficiency in the use of visual-auditory and vocal-motor imagery, and a type which possesses certain favored sorts of imagery in addition to verbal images which are always present. No test can be devised which enables one to make a purely objective diagnosis of mental imagery; but certain objective procedures, when supplemented by introspection, are adapted for detecting the presence and the functioning of the various sorts of imagery. Miss Downey (13) made a study of the imagery employed in representing the self. Selections of poetry were presented either in auditory or in visual fashion to fourteen observers, who then described their experiences in so far as concerned their own orientation in relation to the imagined scene, their felt postures and movements, their organic identification with the persons and objects described, their visual and auditory references to the self, and the like. A marked individual variation appears in the frequency with which an explicit reference to the self is reported, ranging between 19 per cent. and 62 per cent. The act of self-projection may assume various forms: a relatively pure visual form, a relatively pure kinæsthetic

form, a rare auditory form, a cutaneous form, and various forms which are characterized either by an alternation or by a combination of imagery from different modalities. In the experiments of Miss Chapin and Miss Washburn (10) one hundred and ninety-three students were asked to describe the images which they employed to represent the idea "meaning." The imagery reported was either wholly visual, wholly kinæsthetic, or a combination of visual and kinæsthetic; and in almost every instance, the relevant character of the imagery was evident. The imagined movements had to do with groping, grasping, pointing, delving, gazing, and the like; the visual images represented a page of the dictionary with the reader leaning over it, a hand pointing to a word, words connected by a sign of equality, something unfolded, and the like.

Brahn (7) reports the results of an experimental diagnosis of the memory of a mathematical prodigy (Dr. Rückle). It was found that Rückle's ideational type is dominantly visual; but he employs auditory-motor in addition to visual imagery when certain sorts of material are presented, and when material which is presented in auditory fashion can not readily be transformed into visual imagery. Neither vocal nor digital movements were made save in rare cases, but eye-movements seemed to be of significance. Rückle never learned digits in isolation; he usually preferred to combine them into groups of six, but groups of five and seven were also frequent. He made extensive use of numerical relations; 624 was remembered as the square of 25 less one; 26,169 was remembered because 26 is twice 13, and 169 is the square of 13, etc. Rückle is characterized by a keen and vigorous attention and by an extremely rapid apprehension; his wide experience enables him to systematize his act of learning.

Miss Martin (31, 32, 33) has investigated the familiar phenomenon that normal individuals sometimes project their visual images into external space. She determined the temporal relations, and the characteristics of the projected image, and its relation to attention, emotion, and association; she aimed to discover the differences between perception, image and after-image, and between the image of memory and the image of imagination. And the investigation was extended to include auditory and vocal-motor images, and the imagery of abnormal patients. Most observers succeeded in projecting their visual images, and most of them found that the image appeared more readily with closed than with open eyes. Certain definite similarities but also certain marked dis-

similarities between images of memory and images of imagination are reported. The author points out that her method is capable of wide employment in psychological experimentation. G. E. Müller (37) has been led, by his memorial investigations and by a study of number-forms and chromæsthesias, to differentiate four types of localization of visual imagery,—subjective and objective factors being variously combined in the four cases.

(*c*) *Association.*—Wells (53) returns to the question of association types, where an analysis of 10,900 reactions by twenty-eight normal adults confirms his former finding that a certain range of reaction-time seems to be a typical phenomenon. Fidelity to type appears in a tendency toward predicate, subordinate, contrast and internal-objective responses, but not in speech-habit reactions. He finds an indication of a pronounced negative correlation between egocentric category and community of response. Culler's investigation (11) deals with the phenomenon of associative interference, and with individual differences of adaptability in overcoming this interference. He trained his observers to react to certain stimuli with certain movements; and after these associations had become well established by practice, he trained them to react to the same stimuli with other movements; he also had them sort cards alternately into a different arrangement of compartments at alternate sittings. He found that opposing associations interfere with one another in all observers, and that the interference decreases in amount as practice in the new association becomes greater, until finally both give rise to appropriate reactions in wholly automatic fashion. The interference may reveal itself either in a lengthened reaction-time or in an actual recurrence of the former reaction. Individual differences are greater under the modified instructions than in the original, less complex reactions. The reagent who is most efficient at the outset shows quite as much improvement during the process of mechanization as does the less efficient reagent. Miss Atherton and Miss Washburn (3) employed a method which consisted in presenting a word to which the observer was instructed to respond by a reaction-word which had no associative connection with the stimulus-word. These instructions furnish an obstacle to the functioning of the mental processes which would otherwise be in operation; and the question arises as to the nature of those processes which function in spite of the obstacle. These were found to contain mediate associations, or ideas which are connected with the stimulus-word by an intermediate process which has no

conscious concomitants. Wohlgemuth (54) discusses the question as to the justification of the current view that associations tend chiefly in a forward direction. Colors, figures and nonsense-syllables were presented either in pairs or in continuous series. The results show that association may function in a backward as well as in a forward direction; and the author believes that when associations are pure (non-kinæsthetic), they operate quite as frequently in a backward as in a forward direction. Poppelreuter (42) believes that the basis of reproduction is to be found not in the perceptual datum but in the "secondary experience" or the total idea which attends or immediately follows the perception. The reproduction-tendency proceeds directly from the reproduction-motive to the whole of the total idea, and not from part to part as has been assumed. To reproduce means to explicate the parts of a total idea,—the order in which the parts are successively explicated being determined not by their serial order in perception, but by their relative degrees of intensity in consciousness.

(*d*) *Learning and Forgetting.*—Meumann (34) calls attention to the fact that the effect of the act of learning varies, in highly differentiated fashion, with the specific intention of the learner. Many incidents of everyday experience are forgotten because we have not intended to remember them, or because we have intended to remember them only so long as serves our purpose. In the experimental investigation of memory, we find that when the learner's intention is artificially turned in a specific direction by the experimenter's instructions, the learner fails to note and remember that which does not lie in that specific direction. For instance, when a learner has been instructed to memorize a list of syllables by reading them in trochaic rhythm, and when he expects that his memory will be tested by means of the *Treffermethode*, he assumes a highly differentiated attitude toward his act of learning. It may turn out that he is unable subsequently to reproduce or even to recognize the accented syllables; but when they are presented to him by the experimenter he can recall their unaccented mates without error. This paradoxical state of affairs shows that one's intentional learning may proceed in iambic rhythm while one's vocalization follows a prescribed trochaic rhythm. Aall (1) investigated the influence of "temporal perspective" upon the act of learning. Stories and numbers were presented to groups of children. In one case the children were led to expect that their remembrance would be tested on the following day; in another case

they were told that the test would be deferred for several weeks. In both cases the test was actually deferred for several weeks; and the results show that the material was much less completely remembered in the case where the learner expected that the test would take place in the near future. Strong (49) investigated the effect of length of series upon immediate reproduction. Advertisements were presented visually in series of five, ten, twenty-five, fifty, one hundred, and one hundred and fifty; and remembrance was tested immediately afterwards by the recognition-method. It was found that the correct recognitions decreased from 86 per cent. in the series of five, to 47 per cent. in the series of one hundred and fifty,—the percentage of uncertain and erroneous recognitions increasing as the series became longer.

Nagel's investigation (40) consisted, in part, in having his observers learn and relearn series of nonsense-syllables, with the significant variation of method that in certain cases the syllables which constituted a series were presented in a transposed order for the act of relearning. This procedure enabled the investigator to determine the relative significance of identity of data and identity of serial order of data in an act of relearning; and a systematic variation of degree and kind of transposition enabled him to differentiate the significance of such factors as sequence within the series, and absolute position in the series. The procedure in this group of experiments also included variations in the length of interval between learning and relearning, and variations in the degree of thoroughness of learning,—all of which yielded a detailed analysis and a quantitative determination of the factors which contribute to the act of learning. Nagel's investigation also dealt with the relative value of each number of a series of presentations, in rational as well as in mechanical learning; with the effect of various distributions of repetitions; with the differences between the learning of significant and non-significant materials; with the alleged phenomenon of mediate association; with the phenomenon of "total impression" in the act of learning; and with the general problem of methods of memorial investigation. His results are so numerous that they can not be summarized in the space at the disposal of the present reviewer; the reader is referred to the author's own presentation of this exceedingly valuable paper.

In an investigation of the relative effect of various modes of presentation, Kline (26) found that interference with the dominant receptor mechanism results in a more serious impairment of the

process of learning than does interference with the preferred form of expression. Henmon (21) reports the remarkable result that the auditory mode of presentation was most advantageous for all of his observers (of mixed type) and for every sort of material which he employed (nouns, numbers, nonsense-syllables),—a result which he refers to the fact that auditory presentation makes a stronger appeal to the learner's attention, and that it facilitates visualization. Frankfurther and Thiele (17) find that the sort of imagery which appears in an act of reproduction is determined primarily by the ideational type of the individual, and that it is influenced only in subordinate degree by the mode of presentation. Auditory presentation proves to be more advantageous in the case of auditory learners; but the averages of the results obtained by these investigators show that a combined visual-auditory-vocal mode of presentation is by far the most effective. They conclude that the optimal mode of presentation varies with the ideational type of the learner.

Alford (2) reports the familiar phenomenon that the initial and final sections of a series of (relatively uniform) data are more easily learned than the central section; and Dell (12) finds, naturally enough, that this does not hold in cases where the various items of the series represent widely different degrees of complexity of content and difficulty of acquisition. The results of Bean's study of the rate of forgetting (5) furnish "no warrant for altering the general character of the Ebbinghaus curve of forgetting."

In Norsworthy's study (41) of the relation between rapidity of acquisition and permanence of retention it was found that the most rapid learners were able to recall 76 per cent. and the slowest learners only 46 per cent., in immediate reproduction; in delayed recall, a month later, the difference in favor of the rapid learners was even greater, the figures here being 78 per cent. and 36 per cent. Starch (48) undertook to discover whether the superior advantage of distributed over accumulated repetitions holds in the case of materials other than nonsense-syllables, and whether it holds for long-continued acts of learning. His act of learning consisted in establishing an association between numbers and letters; and his distributions of learning-time varied between twelve periods of ten minutes each and a single period of one hundred and twenty minutes. His records show that learning proceeds more rapidly, the shorter and more numerous the learning-periods are. This result is referred by the author to the presence of a higher degree of concentration

throughout the shorter periods, and to the fact that associations tend to become more firmly fixed during a subsequent period of rest.

Krämer's investigation (28) aimed to throw light especially upon the phenomenon of "corner-stones" which constitute the foundation for the process of acquisition in the learning of significant material. He employed selections of philosophical, descriptive, and narrative prose. His method consisted in instructing his learners to devote their attention now to the meaning alone, now to the form of expression alone, and now to both in equal degree; and in interrupting the learners at intervals in order to determine the order in which the several parts of the text were mastered. The author shows the significance of *Einstellung* in the act of learning; he enumerates the various differences in form of expression which constitute aids and hindrances to learning; and he differentiates and describes four stages through which the act of rational learning passes. An appendix by Meumann discusses methods of investigating the memorization of significant materials, the significance of attitudes in learning, and certain general questions which bear upon the psychology of memory.

Miss Woods (55) has summarized the recent literature of memorization, and Richardson (44) has published a similar summary dealing with the acquisition of skill.

II. Intellectual Processes

Titchener (51) points out that in recent investigations of the higher mental processes introspective reports contain materials of wholly different sorts: introspective descriptions, and statements of meaning. In the former case, the introspector has undertaken the task of observing and analyzing his continuum of mental processes; in the latter case, his *Aufegab* consists in stating the meanings which prove on reflection to be implicit in certain moments of the continuum. The former *Aufgabe* alone is psychological; the latter is logical.

Külpe (29, 30) discusses the present status of the problems of the higher mental processes, and indicates an interpretation of the results. An envisagement which limits the content of mind to sensations, ideas, and feelings, is inadequate. The *Bewusstseinslage* and the *Bewusstheit*, which must be added to the traditional components, have to do chiefly with relations and subjective activities by means of which we take up an attitude toward the specific

contents of consciousness. The discovery of the *Aufgabe* and of the *determinierende Tendenz* free us still more completely from the fetters of sensationalism and associationalism. These recent findings are significant not only for psychology, but also for logic, epistemology, æsthetics, and pedagogy.

Selz (47) holds that the *determinierte* consciousness consists in a transposition of the adequate and indirect determination of an internal process into the process itself, by means of a schematic consciousness of a relation. The determination of the indirectly determined goal brings about an actualization of certain complex mental processes which are appropriate to the momentary character of the total *Aufgabe*,—which may be designated by the general term "methods of solution." Koffka (27) found that the choice of reaction-word does not depend exclusively upon the instructions, but is a product in part of the reagent's habitual associations, and of *Einstellungen* which may operate in either a positive or a negative fashion. The transition from the stimulus-idea to the reaction-idea may be mediated by *Gedanken;* these may thrust themselves into the train of ideas and hence they may produce a dynamic effect as determinants. Ideas, therefore, are not of paramount significance; it is thoughts which give rise to determining tendencies, and it is these latter which ideas must obey. Ideas however may, in consequence of their intensive perseverative or associative tendencies, succeed in blocking the operation of the *determinierende Tendenz.* The factors which determine the appearance and the flow of ideas are exceedingly numerous; there are *determinierende Tendenzen* which proceed directly from specific *Aufgaben,* while others possess universal significance both for the individual reagent and for thinking in general. Other determining tendencies are due not to volition but to *latente Einstellungen.* These latter appear involuntarily, and the reagent may be wholly unaware of their existence and operation. Their effect upon the stream of ideas may be direct, or it may be indirect, through the production of new determining tendencies which in turn may have a direct effect upon the stream of ideas. The relation between *determinierende Tendenzen* and associative tendencies is not one of simple opposition; the determination is rather to be regarded as an influence which is superimposed upon the association,—facilitating it and directing it, although the effect may also be inhibitory.

In an investigation of the concept-consciousness, Aveling (4) endeavored to induce an association between nonsense-words and

meanings; he subsequently endeavored to investigate the functioning, in simple judgments, of these words with their acquired meanings. He emphatically affirms the presence of abstract and imageless concepts between which the important associations in thought obtain, imagery being a mere by-product in these processes. He holds that universal meanings tend to appear in consciousness as pure concepts, and particular meanings in the form of images; and he maintains that a conceptual knowledge of universality or particularity of reference is present in both universal and particular meanings. Grünbaum 18) finds that the act of reflection, whether present in relatively passive or relatively active form, possesses three criteria: internal tension, anticipation of the idea sought for, expectation of that idea. In the act of reflection an idea presses forward into the sphere of meaning, and the sphere of meaning becomes more narrow and more concrete. Reflection itself is nothing more than progress from a lower stage of many associated meanings, through a stage of ideas of isolated meaning, to the genuine reproduction of the only idea which is appropriate.

Müller-Freienfels (38) differentiates three forms of non-verbal thinking: (*a*) *untersprachlich*, consisting in mere non-sensory attitudes,—illustrated in the thinking of animals and children, and in such adult acts as the spontaneous investigation of the cause of an unexpected noise; (*b*) *nebensprachlich*, a form not essentially different from verbal thinking,—illustrated in the digital communication of the blind; (*c*) *übersprachlich*, thought which is too complex and too rapid for adequate verbal formulation, although it may be accompanied by fragments of words or phrases. In a second paper (39) he contends that sensory reproduction has been overestimated in so far as its significance for the act of knowing is concerned. Biologically, the sole significance possessed by ideas consists in the production of non-concrete thoughts, which the author calls *Einstellungen*. These may be described as our attitudes toward our mental contents; they are essentially motor phenomena. Strong and Hollingworth (50) find that judgments regarding contents which are grammatically and logically opposed are not merely the positive and the negative phases of the same act; they involve mental processes and criteria which are not identical. With increasing practice in judging, however, the processes and criteria become more and more alike and the two types of judgment tend to coincide. Miss Fisher's paper (16) is a summary of the recent literature which deals with reasoning in children. Bühler

(8) found that the child's capacity to abstract improves regularly with increase in age up to about the age of nine or ten, where a retardation appears. Variation of this capacity with degree of intelligence is so constant that the abstraction experiment may be employed as a test of intelligence.

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MEMORY, CONCEPT, JUDGMENT, LOGIC (THEORY)

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The conflict between the more habitual and fixed methods of thought and the more plastic adaptations of thinking to new and changing conditions appears in various forms in current studies and discussions of logic and of kindred subjects. Formal logic reasserts itself in Coffey's work (2) which is given over to a full and official exposition of traditional logic with the object of showing how it furnishes the true basis for modern methods of scientific investigation, inductive no less than deductive, and with the object as well of extending its range by applying it to some logical problems raised in more recent times. A most thoroughgoing instance of intellectual protestantism, on the other hand, is the equally explicit and compendious treatment accorded to formal logic by Schiller (14). The fundamental position taken by Schiller is that "it is not possible to abstract from the actual use of the logical material and to consider 'forms of thought' in themselves, without incurring thereby a total loss, not only of truth but also of

meaning." Formal logic is vitiated *ab initio* by this paralyzing, soul-devastating abstraction. And symbolic logic is indeed the same thing, only more so, though it is clear-headed enough not to endorse all of its untenable claims about the real validity of its results. In relevancy (17) not in abstraction lies the whole difference of principle between voluntaristic and intellectualistic conceptions of knowledge. Criticisms of Schiller's book have caused him to define certain aspects of his position further in (15) and (16).

The controversy between Poincaré (11, 12) and Couturat (1) centers about the question as to whether mathematical thinking is guided by intuition, "sure instinct," the "logic of nature and of life," in which logical principles are still in the making, or whether it moves within preordained logical conditions or logical constants. Couturat holds that the freedom of mathematical invention is illusory. The "sure instinct," the "more profound geometry," which guide the discoverer are only unconscious forms of logical reason. The reason which invents is conformable to, and at bottom identical with, the reason which demonstrates, which verifies. Poincaré objects to logistics on the ground that it restricts intelligence to a limited arsenal of rules posited beforehand, instead of leaving it free to invent new ones. Couturat rejoins that intelligence may never invent new rules but it may discover them. Poincaré objects further that logistics has so far proved barren of results for either mathematics or logic. Logistics reduces to an immense tautology or else engenders antinomies. It remains sterile unless fructified by intuition. Poincaré interprets Russell as leaning finally towards a no-class theory which sounds the knell of the old logistic.

Padoa (10), a disciple of Peano, has completed the publication of a series of lectures delivered under the auspices of the University of Geneva in exposition and defense of symbolic logic, preceded by a brief historical statement and an answer to objections. Padoa takes the position that symbolic logic is essentially an instrument of thought indispensable to the representation of concepts which on account of their subtlety escape precise determination in ordinary language. It does not create ideas but it reveals them microscopically, so to speak, to the eye of the mind.

Lewis (7) criticizes the use of implication in algebraic logic, as in the phrase "p implies q," advocating a discrimination expressed in terms of different symbols of the two types of disjunction involved.

Hicks (4) offers a sharp criticism of the use of Euler's circles, except for demonstrating simple and obvious relationships. Anything beyond this severe simplicity is open to two objections: (1) the figures by reason of their complexity hinder rather than help; (2) modern refinements of the Eulerian method, especially its extension into adjacent space to represent contradictories, may not only blind one to fallacies already latent, but may also breed fresh fallacies. The same author (5) also contends that inversion is not a valid inference, holding that it violates the fundamental principle of logic and common sense that we should not go beyond the evidence. Schmidt (18) takes issue with this conclusion, undertaking to prove in symbolic terms that under certain conditions inversion is valid. Hick's rejoinder (6) raises the question as to the legitimacy of ignoring the radical qualitative difference between mathematical units and logical units.

Shelton (19) virtually proposes a rehabilitation of the abstractions of logic through the medium of the interpretation of mathematical reasoning as involving an essential distinction between the sphere of concept and that of percept. The application of valid conclusions of mathematical reasoning to concrete perceptual existence varies with a number of conditions and may not be complete. This central idea Shelton proposes to carry over into deductive logic. Validity would be limited to conceptual consistency. Two consequences would flow from this identification of logic with mathematics: (1) In the treatment of fallacies the distinction between formal and material becomes important, formal corresponding to errors in the mathematical process, material, a factor more or less implicit in all reasoning, an inexactitude, always present if only to an infinitesimal degree, in the fitting of a conceptual series to a perceptual series. (2) The existential import vanishes. Every proposition is existential in the sense that it implies a concept. The exact meaning or reference to various "universes of discourse" becomes entirely irrelevant to the validity of logical inferences.

The theoretical significance of Mignard's investigation of error (8) lies in its criticism of both intellectualistic and sensationalistic theories of consciousness. The atomistic conception of mind is almost as false as the unitary theory which preceded it. Pathological psychology has contributed to the development of an organic and dynamic psychology. Error, for example, is not the contrary of truth, but the deviation of methods used in arriving at truth.

Werner's genetic study of the concept (20) emphasizes the variety of the sources of concepts. Concepts may arise from feeling or emotional experience as well as from sensory experience, and from kinæsthetic as well as from static sensory experience, or, finally, from the Kantian unity of self-consciousness as *unsinnliche Reflexionsbegriffe.*

Bearing on the question of the existence of pure thought Müller-Freienfels (9) concludes in the negative so far as its existence as a *Gesamtprozess* is concerned. But in specific acts of thinking there may be portions which have no verbal or sensory content, where there is only a vague feeling. This "pure thought" is always a part of some verbal or sensory process—a word, an image, or a gesture.

The plan of the *Encyclopaedie der philosophischen Wissenschaften* (3) is to provide a sort of tribunal for the foremost philosophical thinkers of various nationalities, in the hope that the comparison of the principles here formulated will bring out the elements that are common to all. The first volume of the encyclopedia is given over to six papers on logic written by representatives of as many nationalities. The only paper in the series which develops to any considerable degree the interrelations of psychology and logic is that by Professor Windelband. The mental processes which logic involves need to be analyzed genetically. Truth is a value derived from practical and biological needs. The truth value needs to be studied from the standpoint of social psychology. Yet these scientific studies furnish only the materials not the principles of logic. At this point Professor Windelband falls back in the Kantian position. The principles of logic are to be found, as Kant found them, in the principle of synthesis: logic is the science of reason.

In Royce's contribution to the encyclopedia (3) two fundamental aspects of the logic of absolute idealism, or of absolute pragmatism, as he now seems willing to call it, are developed: (1) the inherence of order, system, in all scientific work, finding expression first in classification, then in comparative and statistical methods, and finally in the complete unity of theory and practice in certain fields of physical science; and (2) the contributions of modern mathematical logic, particularly with reference to the concepts of relationship, series, and class. These are inherent in the very nature of thinking and judgment.

The logical writings of Renouvier (13) have been republished.

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READING

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The amount of investigation in the field of reading continues to be scanty. The literature on the subject since the last report embraces only a few scattered articles.

Schackwitz (3) has described a new form of apparatus for registering eye-movements, which is at once simple and easy of manipulation, though much less precise than the more elaborate photographic methods of Dodge, Dearborn and Judd already in use. The device consists essentially of a delicate tambour which rests on the eyelid and registers the movements of the ball of the eye by the varying pressures as it moves along.

Rothlein (2) has made a rather extensive and careful study of the legibility of different kinds of print, judged by the distance at which the letters can be read both singly and in combination. She finds legibility to vary with (1) the form, (2) the size, (3) heaviness of face, (4) width of margin, (5) position in the letter-group, (6) shape and size of adjacent letters. Of these factors much emphasis is laid on the importance of the heaviness of the face (the thickness of the lines constituting the letters). The most legible of the small letters tested was that form known to printers as News Gothic.

The optimal position for legibility in a group of letters was found to be the beginning; the end of a group comes next, and least advantageous of all is the middle. Letters of the same height or those which are similar in form become relatively less legible when placed side by side, while letters which are dissimilar in form or size become more legible by contrast when juxtaposed.

The quality and texture of the paper are less significant factors for legibility than is sometimes assumed.

Beer (1) accounts for the different psychological impressions made by reading selections having the same content, such as different translations of the Bible, by showing that the reading time varies with the character of the words used. Thus a preponderance of monosyllabic words makes this time relatively long. A detailed study of the speech curves in reading various selections aloud shows also that in those portions where the number of syllables and the number of words is the same or nearly the same the reading time is slower. The proportionally greater time taken under such conditions is to be attributed to the relatively greater meaning conveyed by the monosyllabic words, since in the German it is only the root syllables of the words that are pregnant with meaning.

Weber (4) submits a semi-popular argument in behalf of the view that the faculty of reading is localized in certain groups of cortical centers which vary with the varying types of education. This view is illustrated by reference to a clinical case which does not seem to be of especial significance.

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GRAPHIC FUNCTIONS

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The investigation of handwriting shows an increasing confidence in its ultimate application in the diagnosis of mental traits but, also, an increased sense of the difficulties involved in any attempt at a thoroughgoing analysis of the writing act and its dependence upon conditioning factors.

The controversy between Schneidemühl and Näcke (18) shows certain points at issue. Näcke distinguishes between graphology as interested in character-diagnosis and graphology as a study of graphic signs of service in the identification of handwriting. He admits the latter form only as scientifically significant. Schneidemühl urges a more precise use of the term graphology and emphasizes the fact that handwriting-individuality is determined chiefly by central factors. Schneidemühl's (19) discussion of the diagnosis of character from writing, based upon thirty years' study, summarizes, with certain reservations, the conventional teachings of the graphologists, and gives extensive references to the literature of the subject but with some striking omissions. For instance, in the discussion of mirror-writing no reference appears to Stern's illuminating treatment. The book makes no contribution to the psychological analysis of the writing-act and has suggestive value only because of the wide experience of the author. Rentzsche's (16) caustic criticism seems, on the whole, justified, so ignorant is Schneidemühl of modern psychological analyses.

As an example of the kind of analysis of handwriting that must exist as a presupposition of character-diagnosis one may cite Hirt's (4) valuable discussion. Hirt emphasizes the need of much more empirical work before a psycho-diagnosis from writing shall be

thoroughly grounded. Attention is called to the striking changes in writing known to physicians. From such changes we may determine the fundamental directions in which writing disturbances may appear and so set the problems for a far-reaching scientific investigation of writing. Quite apart from psychical conditions, the writing-act can proceed fitly only if the integrity of the motor apparatus be preserved. Hence (1) it is necessary to study the physiological conditions of writing and to note those cases of pathological writing, as that of the paralytic, that indicate structural changes. (2) The psychophysics of writing would lead us, further, to seek why certain determined mental conditions are correlated with certain peculiarities of action. (3) The psychology of writing also deserves attention, since certain characteristics of pathological writing are independent of physiological conditions. From the physiological side the investigation of writing demands consideration of the general conditions of voluntary movement and of motor coördination, including the part played in coördination by visual sensations and sensations from the moving parts. Clinical experience shows that insensitive limbs may be brought under eye-control. Skill once acquired is lost only under certain conditions, as in ataxia. The writing of the ataxic, both with eyes open and eyes closed, merits careful study. The psychophysics of writing involves study of individual variations in both reflex and voluntary movements. Through observation of the tendency to and intensity of movements which a man employs in order to gain a certain end, important conclusions may be drawn relative to his personality. Individual types of behavior are to be sought in the temporal relations of movement; in the writing reaction-types, where the author claims to have found experimentally a sensorial and a motor course; in pressure-types, corresponding to the sensory and motor reaction-types; in rhythmic peculiarities; and in variations in rapidity of writing and in fluctuations in rapidity. Numerous problems are raised, as, for example, the cause of the increase or decrease of writing-size when writing is produced with the eyes closed. With extensive citation of literature, the author yet ignores certain American studies bearing on the topics under consideration.

In attempting to evaluate writing for diagnotic purposes, Hirt distinguishes two possible points of view. One may seek to reach conclusions from handwriting as to the nature of the disease; or one may utilize the change in the writing of a patient of known

disease in confirmation of an already recognized disturbance. Hirt gives a detailed account of the handwriting disturbances found in the writing of the patient with progressive paralysis. In general, the handwriting of the manic-depressive, of the hysteric, and of the patient with catatonia is held to be diagnostically serviceable but, in the majority of the cases, pathological writing is differentiated from handwriting marked by personal peculiarities only by the heightening of such peculiarities.

Klages (8) discusses the meaning and limitations of the concept of handwriting as a type of individual behavior. We may attempt to diagnose character from writing only after a thoroughgoing effort to classify a particular writing with reference to the amount of control exercised in the writing-act. After distinguishing the act of writing from that of drawing, Klages classifies various types of writing as either (1) artificial or (2) natural. Artificial writing includes disguised, calligraphic, and ornamental writing. Under natural or spontaneous writing we get (*a*) a more controlled and (*b*) a more involuntary type of writing. Control in writing may arise either from mastery of impulse or from excessive inhibition. Involuntary or uncontrolled writing also shows variations dependent upon acquired traits. It is shown, however, that the concept of an acquired handwriting absolutely inexpressive of the writer's organization is but a limiting notion. Power of disguise or a high degree of sustained control are themselves significant traits. In any case Klages meets the objection that writing-individuality is a matter merely of training and conscious intention.

Köhler (9), in agreement with the majority of observers, finds writing-dreams to be infrequent occurrences and explains this fact on the ground of the complexity of the writing-act.

Attacking the problems of handwriting from a different standpoint, Osborn (15) calls attention to the existence, in various degrees, of form-blindness which operates in rendering the judgments of individuals upon handwriting very uncertain. Tests made on material furnished to Professor Jastrow by Osborn showed that skill in pairing samples of the writing of the same subject "ranges from 100 per cent. accuracy in eight minutes and thirty-five seconds to 60 per cent. of error in nine minutes and fifty-five seconds. Another subject shows 30 per cent. of error in fifteen minutes and forty seconds." Osborn calls attention to the danger inherent in form-blindness when found in a court of law in one who must decide a question involving handwriting comparison and urges the need of enlarged photographs to increase seeing capacity.

From the pedagogical side the most interesting recent development in the teaching of writing is the insistence upon the value of the utilization of kinæsthetic factors as shown definitely by the experiments of Joteyko and Kipiani (5).

King and Johnson (7) have sought to test the practicability of the Ayres scale by a comparison of the judgments of the same person upon 966 samples of writing to determine whether progression by age and grade appears. The test showed that the scale is really workable. A set of 34 samples graded independently by eight judges showed an average of average deviations of 6.1, less than the 10 points apart of the standard specimens. The one judge gave an average deviation from the average of the eight of only 4.8, "indicating that the ranking of the entire set of 966 by eight judges would not have differed markedly from the ranks assigned by this single judge."

Freeman (2) presents a study of the typical methods of teaching writing in vogue in the United States. The information was gathered by a questionnaire sent to all of the cities of the United States of 50,000 inhabitants or more. Such topics as the following were investigated: slant of writing, type of movement, use of copy-books, time devoted to writing, time of beginning writing, posture, analytic versus the synthetic method, development of form perception and of writing movement, development of speed and accuracy, attainment of rhythm.

Gesell (3) furnishes stimulating suggestions relative to the teaching of writing and drawing in the elementary schools.

Great interest continues to be manifested in the various aspects of the drawing activity. Two tendencies are noticeable, first, a summarizing of previous investigations; and, second, an attempt to formulate a program for an analysis at closer range of the problems involved.

Kretzschmar (10) outlines the main problems and emphasizes their importance for psychology, pedagogy, and the history of culture. Three stages in the general course of development are outlined: (1) the scribbling stage; (2) the ideographic stage in which the memory-image is copied; (3) the physiographic stage in which there is a copying of visual percepts. Kretzschmar insists upon the striking similarities in the art productions of primitive folk and of children and cites with approval Lamprecht's attempt to use children's drawings as an indirect historical source. A study of the child's development in drawing capacity shows that

both invention and imitation are fundamental. The innate impulse to activity is given form by environmental influences. Within the social process of assimilation, can any regularity in development be determined? The answer is affirmative since it is held that the assimilative process stands in intimate union with the growth of the mind itself. Comparative studies of the drawings of children of different races show a similar course of development up to ten years in spite of environmental differences. European children, after that age, pass into a critical stage and either develop into a higher form of activity or stop drawing altogether. Children of primitive races assimilate more quickly the race heritage but often halt at a lower level. The diagnostic value of drawings in pathological cases is cited as particularly instructive.

Rouma's (17) résumé of the literature of the subject and of the investigations that have been made is comprehensive and so systematized as to constitute a valuable reference work. The various methods of study in vogue are reviewed critically. A detailed description, with copious illustrations, of the child's development in portrayal of men and animals is given, together with a citation of the stages in the evolution of the representation of movement, orientation and perspective. Particular attention is paid to the characteristics of the drawings of abnormal children. Rouma is sceptical of any detailed parallelism between the drawings of primitive peoples and the drawings of children because of the profound differences in the conditions under which the two kinds of drawings are produced and criticizes Lamprecht's attempt to utilize the child's drawings in an endeavor to interpret race-development.

Kürbitz (11) furnishes a most interesting and valuable report on the drawings of the mentally sick, a report which confirms in many ways Hirt's discussion of pathological writing. Both spontaneous drawings and reproductions of copy were utilized in the investigation. The author concludes that the drawings of the mentally sick stand in intimate relation to the other clinical behavior of the patient. For this reason it is explicable that there should appear in pathological drawings characteristic differences which are more or less typical of particular mental diseases and have, therefore, a differential-diagnostic value. Further, such drawings show many departures from the normal which are similar to those found in the drawings of children and of the *Naturvölker*, such, for instance, as the drawings partly in profile, partly from the front-view and the so-called transparent drawings in which hidden parts are represented.

Marie (13) cites some examples, with cuts, of stereotypy in the drawings of the mentally diseased.

A comprehensive survey of the art-productions of the *Naturvölker* is contributed by Vierkandt (20). These productions are classified as pure or utilitarian art, with the concession that such a distinction is not always easily made and that primitive drawings may be called art only because of developmental coherence with performances unmistakably artistic. Three types of pure art are discriminated: indicative, representative, and realistic art. The range of objects in indicative drawings is limited largely to animals and men. Mechanical repetition and hybrid combinations appear. There occurs, at times, a mere playing with the intention to designate a particular object. Indicative drawings resemble in many respects the drawings of young children. In representative drawings certain schema keep reappearing; objects are drawn partly from above, partly from in front; invisible parts are represented; localization of parts is often inaccurate; the choice of the subject represented and of the details given is determined by the main interest. In the third type there appears representation of single objects in life-like realistic fashion; the type only, not the individual, is portrayed; claims of perspective begin to be observed; color is often used in a merely playful and meaningless manner.

The aim of utilitarian art is to attain some end to which imitation is used as a means. Such an end may be that of serving some religious purpose, that of communication, or that of ornamentation. The whole course of development shows a gradual change from subjectivity to objectivity. The indicative drawing is almost purely subjective, scarcely more than a fixation of floating ideas. In representative art coherence exists between the object and the drawing but the perception lacks unity. In realistic drawing, true objectivity is achieved.

Luquet (12) and Dück (1) furnish brief contributions. Luquet, from material furnished by the drawings of two children, finds in the first stage of drawing, before an intention is present to represent a special object, three moments: (1) drawing without determined intention; (2) the attribution of meaning to such drawing; (3) the addition of some detail subsequent to the interpretation. Dück finds that at the age of puberty artistic development assumes a different course from that in the preceding period. The natural inclination of pupils for different subjects and for different means of technical expression comes to light at this time. Individual

differences in these respects are very great and related to individual differences in the emotional and perceptive life. The teacher may regulate the individual development but should not attempt to alter the fundamental preferences. Joteyko and Kipiani (6) show the rôle of the muscular sense in drawing.

Meumann (14) furnishes an extensive and suggestive program for the psychological investigation of drawing. Visual, motor, and apperceptive factors should be analyzed in detail. Tests on the estimation of spatial relationships, especially in connection with the well-known optical illusions, should be applied in the investigation of drawing-problems with extension of the work to the testing of children. The photographing of eye-movements during drawing activity and the determination of the child's delicacy in discrimination of kinæsthetic sensation and his difference-threshold for passive and active execution of movements are held to be desirable. Under apperceptive factors, Meumann would consider the influence upon drawing activity of the art-ideals of the nation and of a knowledge of art-technique. It is suggested that an attempt should be made to develop *Einfühlung* processes in the child.

Probably the most significant section of Meumann's article is that which deals with an attempt to determine what, psychically, makes for or against talent for drawing. Theoretically, variation in talent may be dependent upon variation in the following factors: (1) hand-skill; (2) efficiency of visual observation; (3) adequacy and persistence of the visual memory-image; (4) inner power of visual reconstruction; (5) emotional reconstruction of the object portrayed; (6) coördination of the sensory mnemonic processes with hand-activity; (7) various combinations of the above factors.

Only extended observation will show whether all possible theoretic variations actually occur. It has, for instance, been doubted whether a specially high visual capacity with great fidelity of visual memory ever exists unaccompanied by drawing-capacity. Meumann doubts the correctness of such a generalization. Moreover, excellent power of visual observation appears at times to exist without corresponding persistence of visual memory. The relation of efficient memory-images to drawing-efficiency is by no means a simple one. Some painters intentionally permit their visual memories to fade in order to allow details to pass away. Talent for drawing appears to involve, above all, some sort of native visual-motor coördination that may be lacking in individuals of striking visual capacity.

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VOCAL FUNCTIONS

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There is a little known journal which ought to be much more widely used and appreciated by American psychologists. I refer to the *Medizinisch-Pädagogische Monatschrift für die gesamte Sprachheilkunde*. Such a bulky name has perhaps operated as a handicap; and little help has come from the additional words, *mit Einschluss der Hygiene der Stimme in Sprache und Gesang*, with the subtitle, *Internationales Centralblatt für experimentelle Phonetik*. Under the circumstances, it is not surprising that an investigator recently sought in vain to get access to this journal in the Harvard library, and later in the Columbia library. "We are sorry to say we do not have it!" But after twenty-two years of existence under the original name, a new title has at last been adopted: *Vox*. *Vox* says in three letters what three lines have hitherto failed to convey: namely, that this journal is indispensable not only to phoneticians, but also to psychologists, physicists and physiologists who are concerned with the phenomena of voice, as well as to teachers of correct and skilful speech and song who know or care to know the scientific aspects of their task.

The *Med.-Päd. Monatschrift für die gesamte Sprachheilkunde* was founded in 1891 by Albert and Hermann Gutzmann. It is published in Berlin. The editorship now rests with Hermann Gutzmann, director of the speech clinic of the University of Berlin, seconded by G. Panconcelli-Calzia who directs the laboratory of phonetics of the Colonial Institute in Hamburg. Panconcelli-Calzia is primarily responsible for the *Bibliographica Phonetica*, which, with concise annotations, and numerous illustrations of apparatus, has for seven years constituted an important fraction of each volume. Next in bulk come the reviews, literary summaries, addresses, and similar briefer contributions. The more pretentious original articles are few in number, and are sometimes duplicates of papers which appear simultaneously in other journals such as the *Monatschrift für Ohrenheilkunde*.

Three articles from the current volume will receive mention here. One, by the chief editor, H. Gutzmann (6), describes a portable apparatus for experimental phonetics and gives numerous valuable hints as to its use. The apparatus is an adaptation of the

portable recording apparatus made by Zimmermann, which uses long rolls of prepared smoked paper, without drum. It has three recording tambours; including one of great delicacy, for voice vibrations.

A briefer paper, by the same author (7), describes a simple lecture-demonstration apparatus for producing artificial vowel sounds and for substantiating the Hermann theory—the theory according to which the vowel character is produced, not by selective resonance of partials, but by the actual vibration of the resonance chamber in the period of the fundamental, each vibration actuating the chamber like a separate blast. The apparatus is simply a glass tube with an adjustable piston through which the air comes from a toy whistle. The whistle must be a striking-reed-pipe with a membrane for a reed rather than a metal tongue.

A longer paper by Hugo Stern (12) takes up the old and persistent problem of vocal registers. The investigation was focused primarily upon the vibrations which are induced in the thorax and adjoining organs. The relative extent and intensity of these tremors were determined for different registers and different vowel sounds, as Zimmermann and others had already done for the vibrations of the bones of the head. Vibratory areas were determined by the touch of the hand and by auscultation; and as a control, the areas were also mapped by a deaf and dumb experimenter, with sensitive touch. A comparison of falsetto tones with those of well executed head-tones, and these with chest tones, leads to a suggested modification of the concept of register. By a register is meant a series of tones which are produced not only by the same vibratory mechanism of the vocal cords, by the same position of the cords, and of the larynx, and by a corresponding outgo of air, but also with the same resonance, as exhibited in the gross vibrations of thorax and skull.

Since a cardinal problem of voice training consists in bridging the gap between the registers, Stern urges that, in teaching, attention should be focused on these felt vibrations. Taylor and others are in error who are contending that the sole means of voice training is through the education of the ear and the musical intelligence. The sense of touch, and also the kinesthetic sense of the singer, need to be trained and used. The sensitivity to the movements of the vocal apparatus furnishes the only cue the vocalist possesses for controlling the initiation of sounds: audition can serve as a control only after the voice has begun to sound. In developing this

desired kinesthetic and tactile sensitivity, it is urged that methods must vary with the varying imagery type of the learner.

One of the important addresses at the Berlin congress for experimental psychology was by Alfred Guttmann, on the *Psychophysics of Singing* (4). Bringing to the discussion of his theme the experience of twenty years as singer and teacher, coupled with extended studies in musical history and various branches of musical science, the speaker aimed to point out the interdependence of these overlapping disciplines, and the need for broad equipment in both science and practice if an investigator is to avoid pitfalls. As illustrative, the first typical problem cited was that of tone-"placing." A singer finds that a tone of given intensity has greater "carrying-power" if he "places" it here or there. A physicist may say this is impossible, since sound waves are much too long to be reflected and amplified in such small resonance chambers as those of the head. But a psychologist may reply that direction of attention initiates unconscious sympathetic movements of muscles in larynx and mouth; and these may result in augmenting the capacity of available resonance cavities and altering both quality and volume of tone. With reference to the problem of vocal registers, similar discrepancies between standpoints of physiologist, teacher, and auditor were indicated. In conclusion, the speaker pointed out how the results of Sokolowski (1911) in determining the accuracy of singing the third and the fifth, would not have been invalidated in certain respects, if only the experimenter, in planning his research, had reckoned with the fact that accuracy of singing is diminished in the region of the voice where transition between registers occurs.

Fujita (3) has been studying one of the obscure causes of involuntary variations of the voice, the cardio-pneumatic effect. He finds that the changes in air pressure within the larynx, due to the heart action, can be demonstrated during phonation almost as clearly as during quiet breathing. These pressure variations he finds to amount to as much as from two to five mm. of water. They produce a rhythmical fluctuation of intensity as well as of pitch, and are perceptible by the unaided ear in sounds produced by an unpracticed singer. The effects, which are often unpleasant, are more in evidence the weaker the air pressure, the more nearly exhausted the air in the lungs, and the more difficult the vocal task.

Improvement in the technique of voice measurement continues. The masterful exposition of recording methods given by Poirot in his *Phonetik* (1911) gave prominence to electrical methods. Wert-

heim-Salomonson (15) has supplemented this account with a careful study of the availability of the oscillograph. Different ways of combining oscillograph and stentor-microphone are compared, and the limits of accuracy and the correction factors are determined.

In contrast to the preceding, MacDougall (10) has undertaken not a specific study of a limited problem, but a general account of the development of speech in childhood. In a series of five brief chapters he treats of the instinctive bases of speech, of the imitative process, of the inarticulate expression of affective states out of which articulate speech develops, of words and the acquisition of meaning, and finally of the development of skill in utterance. Broad statements and didactic suggestions are much more in evidence than references to the opinions or achievements of earlier writers.

It is sometimes difficult to draw the line in preparing a summary which is restricted to the field of normal psychology. A strict interpretation excludes reference to studies of speech defects; and no mention is here made of the literature on the cure of aphasia, stuttering and the like, except to call attention to three recent handbooks by Appelt (1), Fröschels (2), and Scripture (11). These are all brief general accounts, not too technical to be of service to the layman. Scripture's little manual on *Stuttering and Lisping*, in particular, is clear and simple without minimizing in any degree the seriousness or the complexity of the practical problem. Most psychologists will be glad to refer to it the many parents and teachers who come seeking information on behalf of afflicted children. Scripture devotes a few brief pages to the psychoanalytic treatment, but avoids the pit into which Appelt falls, of seeking in applications of Freudian methods the main resource for the permanent cure of stuttering.

In conclusion, attention may be called to new editions of Vietor's *Kleine Phonetik* (14), Trausler's *Einführung in die Phonetik* (13), and Gutzmann's *Uebungsbuch* (5); and to an excellent brief introductory text by Jespersen, *Elementarbuch des Phonetik* (9).

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DISCUSSION

THE EFFECT OF CHANGES IN THE GENERAL ILLUMINATION OF THE RETINA UPON ITS SENSITIVITY TO COLOR

The March number of the BULLETIN[1] contains a review by Professor Holt of an article published by Miss Rand entitled: *The Effect of Changes in the General Illumination of the Retina upon its Sensitivity to Color.* Professor Holt says of this article: "Rand's paper is on simultaneous contrast which she calls 'induction.' She finds that 'induction' depends (in positive sense) on the differences between the brightnesses of the adjoining fields, increases with the distance from the fovea, and (within the limits experimented upon) with decrease of illumination. The reviewer does not think that the author's general statement is justified, viz., that a white field adds more black to a patch of color seen on it, than a black field adds white to a similar patch of color; nor does the reviewer see how 'induction' was prevented from affecting the surface which was employed to measure this very 'induction.'" The writer is somewhat at a loss to know what to make of this review. By the most liberal interpretation it can scarcely be considered as representative of Miss Rand's article, which is one of extreme importance, the writer believes, in its bearing on the technique of the investigation of the sensitivity of the retina to color. Moreover, the review is incorrect in statement. The writer asks, therefore, the privilege of making in the BULLETIN the corrections of this review contained in the following pages.[2]

The work reviewed is, in the first place, not a study of contrast or "induction." It represents a part of a long series of studies carried on in the Bryn Mawr College laboratory to find out all of the factors that influence the sensitivity of the retina to color, and to make a quantitative estimate of these factors. Early in this study the effect of changes in illumination was forced upon our attention. The changes of illumination that took place from day

[1] HOLT, E. B., "Vision—General Phenomena," PSYCHOL. BULL., 1913, 10, 90–91.

[2] The writer is urged to make these corrections only because of his belief in the importance of this article and its companion article on standardizing to our methods of working in the optics of color.

to day, the progressive changes during the day, and the many sudden changes even in the course of an hour, rendered any constancy or close reproduction of results entirely out of the question. With regard to the effect of changes in illumination on the color observation, two cases may be recognized. (1) When the colored light used to stimulate the retina is independent of the general illumination, *i. e.*, when it is obtained from the spectrum, from monochromatic sources, or from standard filters; and (2) when it is obtained by reflection from pigment surfaces. In the first case the effect is produced through the influence of changes of illumination on the action of the preëxposure and surrounding field; in the second there is added to these effects a change in the amount of colored light coming to the eye. By preëxposure is meant what the eye rests upon immediately preceding its stimulation by color. When the preëxposure is darker than the color, white is added as after-image to the stimulus color; and when it is lighter than the color, black is added. Similarly when the surrounding field is darker than the stimulus color, white is added by contrast; and when lighter, black is added. The effect of these two factors can be eliminated only by working in a light-room, and by choosing as preëxposure and surrounding field a gray of the brightness of the color. But if the general illumination changes, the relation of the brightness of the preëxposure and the surrounding field to the colored stimulus also changes. Standardization for the effect of preexposure and surrounding field can, therefore, be accomplished only when some means has been devised to maintain the general illumination of the field of vision constant. It was the purpose of Miss Rand in the work reviewed to give an experimental demonstration of this fact. A quantitative estimate was made for pigment stimuli of the effect on the results of the color observation of measured amounts of change of illumination. The following determinations were made. (1) The effect produced by the change in the amount of colored light reflected to the eye; (2) the change produced in the amount of contrast induced by the white and black screens across the gray of the brightness of the colors employed; (3) the effect of these amounts of induction on the limens and limits of color; (4) the amount of change in the brightness relation between stimulus and surrounding field produced by the changes in illumination; (5) the amount of contrast produced by these changes; (6) the effect of these amounts of contrast on the limens and limits of color, etc. True enough, then, a study of the

amount of contrast induced by the surrounding field over the colored stimulus, or rather the change in this amount produced by changes in the general illumination, and the determination of the effect of this induction on the saturation of the color, does become a prominent feature of the work; but to say that the "paper is on contrast which she calls 'induction'" is to mask undeservedly the true purpose of the work. Furthermore, the study was published as a companion article to a description of a method of standardizing the illumination of an optics-room by daylight.[1] In this article a very sensitive method of identifying the illumination of a room by daylight with that of any previous illumination was reported and means of controlling this illumination were described. Results also were given to show that although a large M.V. is obtained in the determination of color sensitivity by the best methods that had been previously used to control illumination, the limens and limits of color can be duplicated within very narrow limits indeed by the method adopted in this work. That is, in our experiments two comparison series of determinations were made. In both all the factors that influence sensitivity to color except change of illumination were eliminated. And with regard to changes in illumination, the best of the precautions that had been used in previous investigations was observed in one series; in the other the illumination was controlled by the method described in the paper referred to. Now of these two articles, although the one on standardization was of primary importance, and the other was contributed only to show the need of standardizing, both the article on standardizing and any reference of the other article to it were completely ignored by Professor Holt either in this review, or any of his reviews representing the year's work in this field.

Further on, Professor Holt says: "The reviewer does not think that the author's general statement is justified, viz., that a white field adds more black to a patch of color seen on it, than a black field adds white to a similar patch of color." In this statement the writer can not help but point out that Miss Rand has been rather badly misquoted. She did not by any means say that "a white field adds more black to a patch of color seen on it, than a black field adds white to a similar patch of color." Taken literally this statement would mean that a white field adds more black to a patch of color than a black field adds white to a similar patch of color

[1] FERREE, C. E., and RAND, G., "An Optics-Room and a Method of Standardizing Its Illumination," *Psychol. Rev.*, 1912, 19, 364–373.

regardless of the brightness relation of the color to the surrounding field. Such a claim would be nonsense and it is not even remotely implied in Miss Rand's article. The statement to which Professor Holt obviously refers occurs on p. 474 of the article criticized as the first item in a general summary of results. It is as follows: "The results show in general the following facts. (1) The amount of induction from the white screen is greater than that from the black screen." This is by no means the broad statement made by Professor Holt. Nor is his statement justified by the context. The range of application of the statement criticized is, in fact, limited by its context. It is an item in summary, not a general conclusion. Moreover, it is specifically stated that the summary is intended to apply only to the tables published. In these tables is given the amount of induction of white and black screens on grays of the brightnesses of the four standard Hering colors: yellow, green, red, and blue. This induction was measured at 25° and at 40° in the temporal meridian on the grays of the brightness of each of these four colors as seen at these points both under the illumination selected as standard and at a fixed illumination less than the standard.[1] A survey of the results shows the following facts. Of the 32 measurements of induction recorded in Table I., three exceptions occur to the general statement made by Miss Rand. For example, in Column 2, row 7, the induction from the white screen at 40° on gray No. 24 (gray of the brightness of red as seen

[1] Measurements were also made at 55° and 70° on the nasal meridian. The conditions at the nasal 55° point were very similar to those at 25° on the temporal side. The measurements at 70° nasal were midway in value between those at 25° and 40° on the temporal. The 40° point is very near the limits of color sensitivity in this meridian, and the induction here is very great. For one observer the darker stimuli appeared black at this point when the white background was used. In such cases the difference between the induction at standard and at decreased illumination is more clearly shown by the observations made at 25° temporal meridian and at 55° and 70° nasal meridian than at 40° temporal. Miss Rand chose, however, for two reasons to present in her tables only the results obtained in the temporal meridian. (1) The results obtained in this meridian demonstrate sufficiently well all the facts that need be taken into consideration. Space was not, therefore, taken for the results for both meridians. (2) The second point of her problem required her to correlate the increased amount of induction caused by a given decrease of illumination with the change in the color limits it produced. The limits of color sensitivity can be more easily investigated in the temporal meridian because the sensitivity to some colors extends in the nasal region beyond the 92° point, which is the limit of measurement for the apparatus she used. This was true in particular in case of one observer (*C*) as may be seen on p. 482 of her article, Table XI. Both purposes of the investigation were, then, better satisfied by the results obtained in the temporal meridian.

at this point) is given as 0° black; and that for the black screen as 60° white. A comparison of the printed table with the manuscript shows that this is a typographical error. The measuring-disc to match the stimulus acted upon by the surrounding white field should have been recorded here as containing 360° black. (2) In Column 2, row 5, the induction of the white screen over gray No. 2 at 40° is given as 200° of black at standard illumination and that from the black screen as 300° of white. (3) In the same row, Column 4, we find that for decreased illumination the measuring-disc recording the induction from the white screen on gray No. 2 contains 320° of black; that for the black screen 360° of white. There are in reality, then, out of 32 items, only two exceptions to the general statement made by Miss Rand, and these two occur for gray No. 2, which is only one gradation removed from the Hering white, and is at least 48 gradations removed from the Hering black. In Table II. for Observer *C* out of 32 items of measurement four exceptions are found. These are again at the 40° point and in case of the grays near to white: gray No. 2, the gray of the brightness of yellow at standard illumination; gray No. 3, the gray of the brightness of yellow at the decreased illumination; gray No. 7, the gray of the brightness of green at standard illumination; and gray No. 4, the gray of the brightness of green at the decreased illumination. Thus not only has Miss Rand not stated that a white field adds more black to a patch of color seen on it than a black field adds white to a similar patch of color, but she has not even stated that a white field adds more black to a color equally removed in brightness from black and white, than a black field adds white, although this conclusion might very well have been drawn from her results. She has merely stated in summary of her tables that at the points of the retina examined and with the illumination employed, more black was in general induced by white over the grays used as stimuli, than white was induced by black. There was no attempt, for example, to contradict the well-established law of brightness contrast for the central retina, namely, that the amount of induction in general sustains a relation to the amount of brightness difference between the inducing and the contrast surfaces. Instead this law was enlarged upon and its application was extended to the peripheral retina. For example, in items (2) and (5) of the same summary from which Professor Holt gets his material for criticism, she says (2) that the amount of induction increases with the distance from the fovea; and (5) that the white and black screens induce

more contrast across the stimuli that are farthest removed from them in brightness and least across those which are most like them. The present writer thinks, then, that Professor Holt's criticism at this point is not at all justified. He has in fact in the first place through some oversight misquoted Miss Rand's article, and in the second place he has failed to see that the statement made by Miss Rand, qualified as it is by its own formulation and by the other items of summary, is amply borne out by the results of her tables. Apparently one ground alone, therefore, could remain for criticism, namely, to question the accuracy of her tables. It would not, the present writer believes, be like Professor Holt to do this without citing the results of similar experiments to support his criticism.

Professor Holt finally states: "Nor does the reviewer see how induction was prevented from affecting the surface which was employed to measure this induction." A brief résumé of the conditions under which the measurement was made will probably best introduce our reply to this criticism. The gray surface over which the contrast was to be induced was exposed through the opening of the campimeter screen.[1] This opening was of the same magnitude as was ordinarily used in our color work, namely, 15 mm. in diameter. The amount of induction was estimated upon a measuring-disc made up of adjustable sectors of the gray of the stimulus and white or black, according to the screen used. The measuring-disc was mounted on a motor which could be moved along the graded arm of the campimeter to any position from 20°–92°. The fixation-point was placed directly in front of the measuring-disc and as far from its edge as conditions would permit. The surface of the measuring-disc projected approximately an inch in front of the campimeter screen. Now with regard to whether or not contrast was induced over the measuring-disc by the campimeter screen, the writer would say in the first place that for Miss Rand's purpose it would have been of little consequence whether or not contrast was induced, so long as it was small in amount as compared with that which was induced over the stimulus. But we can go further than this, and say that if contrast were induced it was in amount less than noticeable, for a comparison of her measuring-disc with a disc made up of similar sectors surrounded by a field of its own brightness showed no noticeable difference in the brightness of the two. This was probably due to the following reasons.

[1] For a description of the apparatus used, see FERREE, C. E., "Description of a Rotary Campimeter," *Amer. Jour. of Psychol.*, 1912, 22, 449–453.

(*a*) The measuring-disc was made as large as could be used on the apparatus. There was, then, a big area over which to induce. (*b*) It projected almost an inch in front of the campimeter screen. Since the observing eye was only 25 cm. in front of the screen, it can be readily seen that this gave very unfavorable conditions for contrast. Added to this was the fact that the edges of the disc and their supporting back, even in case of the most careful cutting, made contrast-eliminating margins, especially when the surface of the disc was viewed somewhat obliquely by an eye only 25 cm. distant. The big difference, of course, in the conditions affecting stimulus and measuring-disc was that the image of the former fell on the peripheral retina which is extremely sensitive to brightness contrast, in part because of its low illumination; and the image of the latter fell on the central retina which is comparatively insensitive to contrast. In any event whether or not the above is a complete analysis of the conditions affecting the experiments, a noticeable amount of contrast was not induced over the measuring-disc. Moreover, that was scarcely the point at issue in her work. She was trying to find the effect of change of illumination on the induction of the surrounding field over the stimulus. The real question, then, is not whether contrast was induced on the measuring-disc by the surrounding field, but rather whether there was any change in the amount of this induction produced by changes of illumination. This point is more difficult to determine directly than the other. But we can say this. This apparatus has been used for three years by us to detect changes in the illumination of our optics-room. The principle upon which this detection is based is that if measuring-disc and stimulus are made to match for a given illumination, a change in the illumination causes the match to be disturbed. That is, when a white screen is used, the stimulus becomes darker than the measuring-disc if the illumination decreases. Whether or not the measuring-disc also is darkened by contrast to any considerable extent can be judged by the sensitivity of the method for detecting changes in illumination. This sensitivity was compared, for example, with that of the Sharpe-Millar portable photometer. The comparison was made in our optics-room at a degree of illumination at which the test was made (390 foot-candles). The optics-room is on the fifth floor of an isolated building and is illuminated by a skylight beneath which are swung diffusion sashes of ground glass. The illumination of this room is varied by means of a series of curtains varying in opacity from a very thin white curtain to a

light-proof black curtain. By our method a change could be detected which was produced by pulling the white curtain 1 cm. from a position in which its edge was directly above the long axis of the campimeter. But with the receiving surface of the portable photometer in precisely the same position as the stimulus screen of the campimeter, the edge of the curtain had to be moved 11.3 cm. in order that the change of illumination might be detected. Moreover, this amount of change could be detected only in case the photometric field was continuously observed while the curtain was being drawn, in which case the comparison field was observed to become slightly darkened. The judgment was made, then, in terms of a just noticeably different brightness of the field which was illuminated by the daylight, rather than in terms of a disturbance in the brightness-equality of the two fields. When, on the other hand, the judgment was made in terms of a just noticeable disturbance in the equality of the two fields, as the judgment would have to be made if the photometer were to be employed for the reproduction of any former illumination taken as standard, the curtain had to be drawn 44.2 cm. before the change could be detected. This j.n.d. represents an amount of illumination equal to 2.5 foot-candles. But the Sharpe-Millar photometer is insensitive for daylight work. In this photometer one of the comparison fields is illuminated by the light of the room and the other by a standard tungsten lamp enclosed in the photometer box. When the room is illuminated by daylight, the field receiving the light of the room is seen as white, while the field lighted by the tungsten lamp appears as a saturated orange. The difference in color between the two fields renders the photometric judgment difficult and renders the instrument, as is stated above, insensitive for daylight tests. However, we have supplemented this comparison by one that gives a fairer evaluation of the sensitivity of our own method. At the request of certain physicists who have become familiar with the method as used in daylight work, we are now working it out in a form that will apply to the regular work of photometring artificial lights. That is, the campimeter screen and measuring-disc are used in connection with a photometer bar which carries in turn the standard and comparison light. Our work so far shows that the method possesses for colorless light as much, if not more, sensitivity as the best Lummer-Brodhun photometer, for example, and has the advantage besides of simplicity and cheapness of construction. It is in color photometry, however, that it

possesses, comparatively speaking, its greatest advantages. It gives us a highly sensitive method of direct comparison more accurate, as will be shown in a later paper, than the flicker method. It is obvious, then, from the results of this photometric work in which the method is used of matching or measuring the amount of contrast induced in the peripheral retina by the surrounding field over the stimulus, that the measuring-disc can be affected little, if at all, by changes in the inductive action of the surrounding field produced by changes in the illumination of the room, else such small changes in this illumination could not be detected by the method.

C. E. FERREE

BRYN MAWR COLLEGE

THE HIPP CHRONOSCOPE WITHOUT SPRINGS

In reference to Dr. Max Meyer's remarks[1] concerning my method of using the Hipp chronoscope, I have at present the following to say: First. My method cannot properly be designated an attempt, in view of the fact that one of my students has completed by this method a set of 37,000 reactions. Daily pendulum checks of the chronoscope during this work revealed an extreme variation in the chronoscope readings during the year (due to temperature changes) of less than five sigma on a normal time of one hundred and fifty-eight sigma, and a mean variationon any given day always less than one sigma, which means practically absolute accuracy. Second. I have not tested Schultze's modification of the Hipp, but from long experience with induction currents I feel safe in saying that, in the hands of an expert, serious constant errors might be avoided (these errors would not be revealed by ordinary methods of checking); but that variable errors are practically unavoidable, since the intensity of the induced current varies greatly with the speed of the break of the primary circuit. For accurate operation, it is essential that the starting and stopping currents be of equal intensity: this condition may be uniformly maintained by a pendulum or other control instrument, but not in actual reaction timing, where the stopping current is produced by the reactor's break of the primary circuit. Third. Leaving out of account the high degree of proficiency in electrophysics required for the operation of the Schultze-Hipp, and the unavoidable variable error, I recommend my method, because it may be used with the ordinary Hipp with which most laboratories are provided.

[1] See March BULLETIN, p. 122.

If the reed of the chronoscope is adjusted for the right rate at a given temperature, and the same circuits are used in checking the chronoscope and in the actual reaction timing, when the chronoscope is once properly checked no further checks need be made so long as the set-up is not changed, and the temperature of the chronoscope room is maintained approximately at the normal.

KNIGHT DUNLAP

THE JOHNS HOPKINS UNIVERSITY

THE EFFECT OF VERBAL SUGGESTION ON THE AFFECTIVE VALUES OF COLORS

In the BULLETIN for July 15, 1913, Professor Scott reviews Minor Study Number XXI from the Psychological Laboratory of Vassar College, which appeared in *The American Journal of Psychology* for April, 1913. The writer of that study, while appreciating the courteous tone of the review, feels impelled to make a few statements in reply. In the first place, she acknowledges the justice of the criticism that the article should have given information as to the prestige of the experimenter. The experiments were as a matter of fact conducted throughout by Miss I. Powelson, a fellow student of the observers, who did not in their eyes have any especial prestige as a judge of the affective values of colors. Secondly, to Professor Scott's criticism that "no statement is made as to the variability of the original results," it should be replied that the mean variations of our averages were without bearing on our main problem. All kinds of causes produce fluctuations in judgments of the affective value of colors; what we sought was the expression of a constant tendency which, if it existed, would appear in the averages which we compared. The criticism cannot mean that the results of individual observers were not separately treated, since they were so treated throughout. Thirdly, Professor Scott says that there was no statement "of the standardization of the conditions under which the experiments were performed." Here we feel that we have a grievance against him. He quotes as our description of our method a single sentence, describing the formula by which the suggestions were given. He omits our description of the following further conditions: the length of the series of colors, the size of the colored areas, the nature of the background, the fact that the same order of presentation of the colors was always followed, the fact that the experiment was performed twice on each subject, with an

interval of several days, unfavorable suggestions being given in one sitting and favorable ones in the other; the fact that for half of the observers the series with unfavorable suggestions was given first, while for the other half the order was reversed; and the precautions which were taken to show that any raising or lowering of affective values that occurred was really the result of suggestion and not of other causes. Space of course forbade him to give so detailed an account of our method, but he should not have suggested to the reader that we had omitted all details but the single one he quotes. Finally, we did not share Professor Scott's surprise at the comparative infrequency of the positive effects of suggestion in our results. Direct verbal suggestion is usually the least effective form. In many observers it stirs up so strong a reaction of opposition that it works negatively. Personally, I should not have been surprised if the large majority of our observers had found the colors less pleasant under suggestions of pleasantness, and *vice versa*. Perhaps this is a sex difference?

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THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

CHILDHOOD

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As a moderately complete bibliography of child study for the years 1911–1912 contains approximately some three thousand titles, the only thing possible in a general summary is to select from this superabundance of material a few of the more representative books and articles, which will serve to illustrate the more important topics, and to indicate the general directions in which the subject has developed during the last two years.

Congresses.—In the Kongress für experimentelle Psychologie (46, 70), held in Berlin in April, 1912, applied psychology, for the first time, held a prominent place in the program, especially along the line of child psychology and its educational applications. At the Erster deutscher Kongress für Jugendbildung und Jugendkunde (7), the chief topics of discussion were vocational schools and the problem of intelligence in relation to school work. Papers on the various aspects of the latter problem were given by Stern, Meumann, Kramer, Deuchler, Petzoldt and Rasopke. These are printed in full by the "Bund für Schulreform" (14). A brief report of the second Russian Congress for Pedagogical Psychology, which was held in 1909, is furnished by Steinhaus (89). The program included the following subjects: psychological foundations of education, psychological foundations of instruction, psychology and pedagogy as subjects of instruction in the middle and high schools, art in the life of the child, psychology in its relation to school, hygiene, and children's literature. At the annual meeting of the British Association for the Advancement

of Science, held in Sheffield (83), the sections of anthropology and education devoted a joint meeting to the subject of mental tests,—in which MacDougall, Spearman, Burt, Otto Gross and Wiersma took part. In both 1911 and 1912, at the annual meeting of the American Psychological Association, an entire session was given to the discussion of mental tests, and in 1912 the program was continued through a second session, and a joint session with the Educational Section of the American Association for the Advancement of Science with the Educational Section was devoted to educational psychology. There were in all seven papers dealing with the character and results of different methods of testing the mental abilities of children and adults. In August, 1911, the first international conference for the study of childhood was held in Brussels (73). The Conference was divided into five sections: (1) General Child Study and Nomenclature, (2) Anthropometry and School Hygiene, (3) Child Psychology (normal and abnormal), (4) Pedagogy of Normal and Abnormal Children, and (5) Sociology of Childhood. Hungary (97) has already held her first congress for child study, and two congresses for experimental pedagogy (55) have taken place in Russia.

Instituts.—The advance along scientific lines is further shown by the various so-called *Instituts* for child study, which are usually university departments. As a general report of scientific child study, the work of Lipman and Stern (14) is one which deserves the gratitude of all students of the subject. Through a system of international coöperation, the authors have collected and systematized in compact and convenient form, information in regard to child study periodicals, associations, *Instituts*, congresses, psychological clinics, and university courses throughout the civilized world. Since progress in this line is now so rapid, it is to be hoped that the good work will be continued and revised at frequent intervals. Several of the newer foundations are of sufficient importance to deserve special mention.

In a contribution to the *Zsch. für päd. Psychologie* Professor Meumann (59) gives a brief sketch of the purpose and proposed methods of the psychological *Institut*, recently established at Hamburg, and a further account is furnished by Hasserodt (34). The need of a center where the diversified and widely scattered contributions to child study, especially in its educational applications, may be brought together has long been felt, and this Professor Meumann hopes to realize as well as the even more fundamental purpose of research. No instruction is given by the *Institut*, the entire time of its members being devoted to research and coöperative work. Four

groups of methods will be applied: psychological experiment, collections of children's work, direct observation, and statistics.

Of special interest are two brief reports by Kretzschmar (48, 49) in regard to child study in the *Institut für Kultur- und Universalgeschichte*, opened in 1909, at the University of Leipzig through the efforts of Professor Lamprecht. Here a special department of genetic child psychology has been established in the interest of anthropology and culture history, and the work of the seminaries is jointly carried on by historians, ethnologists and psychologists. The *Institut* possesses a remarkable collection of children's drawings, numbering between 115,000 and 120,000, representing different nations. Among the subjects which have already been taken up by the seminary in comparative research are "Introduction to the fundamental questions and methods of comparative psychology"; "Stages of development of ability and graphic portrayal in children;" "The development of space ideas;" "The influence of the culture *milieu* as exemplified in East Indian and Japanese drawings;" "Mental development in the children of primitive peoples;" "A comparison between graphic and speech development of the child." That a department of comparative child psychology should be established as a part of the first German *Institut* for culture history is in itself a significant fact in the history of child study.

The *Institut* J.-J. Rousseau (9) opened in October, 1912, at Geneva, although primarily for the training of teachers, is unique in having as its basic principle the study of the child. The establishment of the Children's Bureau at Washington as a governmental department marks an important step in the conservation of childhood. Its first work, as announced by its head, Miss Julia Lathrop (16, 52), is the collection of statistics of infant mortality in the United States.

General Treatises.—Among the books dealing with the general psychology of childhood, Stern's *Differentielle Psychologie* (90), is the most important contribution, although it does not deal exclusively with childhood. Sellman's book (82), while making little contribution in the way of new knowledge, summarizes child psychology up to date. Ament's well-known *Seele des Kindes* (3) has been revised and now appears in its third edition. Heller (36) publishes a course of four lectures given before the Committee for the Promotion of Juvenile Protection in Vienna. The first two sketch in outline the psychological development of the normal child, the third discusses the problems of infantilism and feeble-mindedness and the last, which is of special value, deals with hysteria and its complications.

Unger (99) has given an appreciative presentation of Ludwig Strümpell's aims and methods of work in child psychology, with especial reference to its significance for pedagogy. A fourth edition of Claparède's *Psychologie de l'enfant* has appeared, with additions chiefly along the line of experimental pedagogy. About one third of the book is devoted to the discussion of intellectual fatigue. An English translation of this (17) has appeared. A third edition of Groos's *Das Seelenleben des Kindes* (33) has been published, as also a second edition of Gaupp's admirable little book (29). The latter deserves translation into English. Its clearness, brevity and scientific character would make it an excellent text-book for normal schools, for although the first part of the book deals with infancy, by far the larger portion is devoted to the school child. In infant psychology there is a study of unusual value by Dr. Peterson (71), psychologist to the Lying-in Hospital of the City of New York, who observed and tested 1,060 individual babies, among whom were 41 premature children and 25 pairs of twins. Sight, hearing, taste, smell, cutaneous sensibility and power of grasping were tested. Thirst, hunger, organic sensations, and the beginnings of memory, feeling and consciousness were also noted. The summary of conclusions given by the author is regarded as only preliminary. Kirkpatrick's *The Individual in the Making* (45) is a subjective view of child-development, containing many suggestions to parents and teachers. Here, too, should be mentioned the two recent bibliographies of child study (87, 100) compiled at Clark University and the short but carefully selected list compiled by H. C. Warren (102) for the *Zeitschrift für Psychologie*.

Studies of Individual Children.—The second volume of the record kept by Mr. and Mrs. Scupin (81) which covers a period, the fourth to the fifth year, where the dearth of records is even greater than for the earlier years, is of especial value. Another contribution is Martha Silber's (84) *Fragen, Reden und Denken eines Kindes*, as recorded in a daybook kept from the third to the ninth year. Of quite a different order, but interesting as giving a glimpse of the life of a Japanese child, is the autobiography of Yoshio Markino (56) and the record of the fanciful imaginings of a child of three recorded by Nancy Price (74). There is also a recent translation of Otto Ernst's *Roswitha* (25), which is an excellent version of a book whose charm and scientific sympathy will be recalled by all who have read the original delineation of the little daughter of the author.

Mental Tests.—In the literature of child study for the past two

years, the most prominent topic is undoubtedly mental tests. In this field, Stern (91) has done the great service of summarizing a vast amount of literature which will soon be made available to English readers by Whipple's translation now in press. But Stern's work is much more than a mere summary of mental tests, for the author has not only made a digest of the most important literature but has added many criticisms and constructive suggestions for future work. The paper has two chief divisions, the first of which is devoted to single tests and series of tests, particularly those which have been used by psychiatrists; the second and larger division takes up the Binet tests, and reviews the most important literature on the subject, making through this a comparative study of the merits and defects of the system, as shown by the results obtained in different countries and with different languages, by those who have actually used the tests. The work of Bobertag and Chotzen in Germany, Mlle. Descoeudres in Switzerland, Miss Johnson in England, Goddard, and Terman and Childs in the United States, furnish material for comparison, which is valuable, not only as regards agreements in the results, but equally instructive through the variations and disagreements. Most experimenters agree in finding that while collectively for large numbers of children the Binet scale is fairly trustworthy, this does not hold true of the tests for the separate years. In general, the tests for the early years are too easy, and the later tests too difficult. Stern's attitude is, on the whole, an optimistic one, for although in its final revision the individual tests of the Binet-Simon scale may be completely changed, he believes that the fundamental principle of tests for mental age is correct and the revision of the scale should, in Stern's view, be a matter for international coöperation. Each single test should be tested on large numbers of children and should not only be performed by 75 per cent. of the children of the given age, but should show a sharp gradation between the ages immediately above and below, *i. e.*, should be performed by practically all the children a year older and less than half of those a year younger. In grouping the tests for any given year, after a sufficient number of single tests have been satisfactorily worked out, care must be taken to test as many mental functions as possible, and in the further arrangement in series the same principle must be kept in view. Parallel series should be arranged so that when, for any reason, a test is invalidated, another series may be given. The scale should be extended to cover the years up to fifteen, for at present no child over ten can be fairly tested because of the lack of supplementary

tests in the succeeding years. Physiological as well as chronological age should be taken into account in estimating mental age, and both social class and school attainments have been shown to have influence on mental development. A final section of the paper deals with the estimation and testing, with the aid of the correlation method, the finer degrees of intelligence to which the Binet-Simon tests are not applicable. A carefully selected bibilography of 82 titles is appended.

As supplementing Huey's (42) summary of the Binet-Simon tests, it is necessary in this connection to note only a few of the more recent publications.[1] Kuhlmann (51) has used the tests on 1,300 feeble-minded and epileptic children at the State Institution at Faribault, Minn., and, though finding deficiencies and realizing the need of a standardization of the tests, concludes that with all its defects, the accuracy of the Binet-Simon scale is nevertheless greater than that of any other method except prolonged, careful observation by a skilled observer of the individual child. From so careful a worker as Dr. Kuhlmann, this opinion cannot fail to have weight. A previous article by the same writer (50) and a recent discussion and criticism by Clara Schmitt (80) should also be mentioned. Dr. Goddard has continued his work of testing normal children, and has re-tested many cases. As yet only the preliminary report of this, given to the American Psychological Association (62), is available.

Although the Binet-Simon tests occupy by far the most prominent position in the literature of mental tests, several other series and individual tests represent recent work in this field. Miss Squire (96) publishes a series of graded mental tests which were worked out on eighty children in the Chicago School of Education, so that chronological, physiological and psychological ages should be correlated as nearly as possible. A functional basis underlies these tests. Abelson (1), in England, has also devised an interesting series of tests which have been published in the *British Journal of Psychology*. The Healy and Fernald (35) tests, now published in monograph form, are the result of practical work with the children of the Chicago juvenile court, and are very comprehensive in scope. Meumann (60), whose opinion of the Binet-Simon tests is not so favorable as that of the majority of those who have worked with them, has devised a test which, although his main aim was to establish qualitative differences, proved to be quantitatively usable. Pairs of words were so chosen that different relations between them were possible, although only a logical connection made good sense. The tests

[1] See also FREEMAN, this BULLETIN for July, 1913.

were first tried on selected pupils by Meumann himself, and then given to five hundred pupils of the Bürgerschule by Schröbler. Eight different forms of solving the connection appeared, and these corresponded to types of intelligence. Numerous examples, some of which are extremely interesting, are given to illustrate these types. A Japanese experimenter, Dr. Matsumoto (57), made use of a motor test which he considers correlated with mental development. The test consists in picking up beans with both hands, as many beans as possible in thirty seconds. Right and left hands are tested separately. Subjects from 3 to 90 years of age were tested, and a regular increase of motor ability, which reached its highest point between fifteen and nineteen years, was observed. After this age there was a gradual decline. From these results Dr. Matsumoto arrives at a periodical division of life, which contains six instead of the seven classic ages described by Shakespeare.

Feeble-mindedness.—As a study in the heredity of feeble-mindedness, Goddard's *Kallikak Family* (31) is a work of unusual interest, for beginning with a feeble-minded girl in the Vineland institution, he has traced the family for eight generations back. At this point he finds a division of the family into two branches, an abnormal branch starting with the illegitimate child of a feeble-minded girl. The father of the child later married and founded a normal branch of the family, whose members are all of sound mind, and among them are to be reckoned many of brilliant attainments in social and professional life. Of the five hundred and eighty descendants of the feeble-minded girl whose records have been traced, one hundred and fifty-three have been shown to be definitely feeble-minded and only fifty-six are known to have been normal. None have risen above mediocrity. The contrast is the more striking because the two branches of the family have remained in the same state and the broader social environment has been practically the same. Two other studies in heredity (20, 26), made under the auspices of the Eugenics Record Office at Cold Spring Harbor, bring out the heredity character of mental degeneracy, and are valuable studies, though lacking the special interest given to the Kallikak family by the existence of the normal branch of the family for comparison. Such studies as these will do more than anything else to enlighten the public in regard to the social danger of leaving the mental defective unprovided for and at large in the community.

Holmes's *Conservation of the Child* (40) is the most complete presentation of the psychological clinic and its social significance which

has yet appeared in print. While based on data derived from the psychological clinic which was established in the department of psychology at the University of Pennsylvania sixteen years ago, to the author's own experience have been added the conclusions of other workers in the same field. Several systems of mental tests are given and although the book is primarily intended as a guide in clinical psychology, it includes discussions of some of the broader social and educational aspects of mental defectiveness, so that it is of interest to teachers and all those interested in child welfare. The Clinical Classification of Delinquent Children, according to causative pathology, issued as a part of the annual report of the Seattle Juvenile Court (4), and the first annual report of the Gatzert Foundation of the University of Washington (88), likewise furnish items of value for those interested in clinical psychology. Baldwin (6) also contributes to our knowledge of psychological clinics, showing the character of the work done at Vineland and other clinics, and the problems which are presented by mental defectives. Dr. Huey's little volume (41) is a series of clinical studies in the psychology of defectives, made at the State Institution at Lincoln, Ill. Thirty-five border-line cases were studied with Binet tests and others. The careful clinical records of these cases furnish an excellent model for further work in the same line.

Precocity.—Several studies of precocious children have appeared during the last two years. Miss Dolbear (21), in her study, has selected for comparison groups of children of unusual intellectual development, making use of both present-day prodigies and those of earlier date whose lives are now completed. While no dogmatic conclusions are drawn, it is pointed out that in some of these children there appears a serious danger of one-sided and partial development; that both heredity and training seem to have been important factors, and that precocity is by no means always associated with genius, but that, on the contrary, the reverse has often proved true. Addington Bruce (12) has drawn from German sources the almost forgotten case of Karl Witte, whose development offers some points of especial interest. Williams (103) gives a comparison between John Stuart Mill and the son of Dr. Boris Sidis, whose precocious mathematical ability has attracted attention at Harvard. From the psychological laboratory of the University of Rome (19) comes a study of 41 exceptionally intelligent children, selected from 1,488, attending the kindergartens and public schools of Rome, and ranging in age from three to twelve years. As tests of intelligence, the Binet-

Simon scale, Ebbinghaus's combination and memory tests and Bourdin's test for attention were used. General conclusions drawn from this study are, that there is a correlation between physical environment and development of intelligence, and also between physical and mental development. Both mechanical and associative memory were good in all these children. From Japan we have a study by Professor Sakaki (79), of the Imperial University of Tokyo, of so-called abnormally intelligent pupils, in which he classifies these children into six groups, in only one of which he finds the children to be perfectly free from pathological taint, and of stable superiority throughout life. True geniuses are found only in this class, the early development and precocity of the other classes tending either to early decay or one-sided development. Stern's contribution on the "Supernormal Child" (92) is rather a plea for educational provision for gifted children than a study of their development, but is based both upon such study and knowledge of the injustice which they suffer under our current educational systems. Although cast in the form of a novel, Mary Antin's *Promised Land* (5) furnishes us an unusually vivid autobiography of a gifted child and her development, which has a positive psychological value which entitles it to mention.

The Montessori System.—On the distinctively educational side of child study, the Montessori system has, during the past year, held the most prominent place and probably no system has ever suffered more from exploitation than this. But of the flood of literature which has appeared on the subject, only a small proportion is based on any real study of the system or actual observation of the schools. Dr. Montessori's own books are here the chief source of information. While the *Montessori Method of Scientific Pedagogy* (64) contains the chief exposition of the system, the *Anthropological Pedagogy* (63) supplies a background which greatly aids the understanding of the system in its broader aspects. Mrs. Fisher's book (27) is a delightfully written account of an American mother's application of the Montessori principles in her own home. The *Montessori System in Theory and Practice* (86) is a brief statement of the principles of the system, its possible application to American education, its similarities and dissimilarities to the kindergarten. A final chapter, by Miss Kennedy, of Providence, gives the actual experience of an American teacher. The United States Bureau of Education has issued a bulletin on the Montessori System (85), and there is also an exposition and criticism by S. A. Morgan (65),

of Toronto. Here, too, should be mentioned Holmes's introduction to Miss George's translation of the Montessori method, and Gesell's (30) criticism in a supplementary chapter of his *Normal Child and Primary Education*. Among the many contributions to periodical literature are to be noted the paper by Warren (101); and the excellent articles of Ellen Yale Stevens (94, 95), comparing the kindergarten and the Montessori system, a comparison based on actual observation of the Montessori school and kindergarten in Rome as well as on the knowledge of American kindergartens. *A Guide to the Montessori System* (93) by the latter author is an appreciative and helpful presentation of the principles, derived not only from the study of Dr. Montessori's books but from personal contact with the schools and their founder in Rome.

During the years 1911–1912, a number of studies dealing with the child of school age have appeared. Among these must be mentioned Pohlmann's book (72) which is an investigation of the developmental progress in the understanding of the content of the words used by school children, *i. e.*, the relation between the child's speaking vocabulary and the logical meanings connected with it. He finds that children have not always even an approximate understanding of what they verbally express, though the understanding of words used in sentences is nearer their logical content than when such words are isolated. Often words used by children are mere combinations of sounds without meaning and context. The subjects of research were children of the elementary schools, from 5 to 14 years old, and ten groups of words were used to test their knowledge, namely, words indicating (1) concrete sense objects, (2) various sense qualities (except taste), (3) taste-qualities, (4) tools and instruments, (5) materials, (6) nature study concepts, (7) names of relations, (8) social and social-ethical ideas, (9) religious ideas, (10) complex concepts, *e. g.*, curly hair, edible fruits, electric bell, etc. Nearly one third of the book is devoted to the actual definitions given by the children, and the analysis of these furnishes many interesting points in the psychology, not only of speech development but of the thought activity of the child. W. H. Winch (104) has made, in the London elementary schools, a somewhat extensive inquiry into the relation between the age of entering school and school progress, and finds that from the entrance age of three to five, early entrance is no intellectual advantage to the child, either in his infant school work or as regards his later school progress. There seems some reason for supposing that the children entering after five may show some re-

tardation in school progress. As England has no system of public kindergartens, the question of school attendance for children three to five years of age, which to Americans scarcely seems a problem, is a very real one and involves serious considerations. Gesell's book (30) is the joint work of two authors, who have had both practical experience and training in genetic psychology. A brief historical introduction serves to sketch the influences which have led to the conception of the child as a problem to be scientifically studied. Part II. is an outline of the genetic background upon which child study is based. Part III., the pedagogical section, is the core of the book, and discusses in a practical, helpful way the problems of the primary school which occur in the daily program of school work. While dogmatic assertions are conspicuously absent, principles underlying successful teaching of the subjects of the elementary school curriculum are clearly and helpfully given. Part IV. deals with the conservation of child life. Another book dealing with the application of child psychology to school problems is that of Rusk (78). This is based on Meumann's *Vorlesungen zur Einführung in die experimentelle Pädagogik*, and makes accessible in English the gist of Meumann's two volumes. Use has also been made of the results of English investigations and much which has been made available since the publications of Meumann's work has been incorporated.

Sleep.—Osborne (69) has made an extensive investigation of the relation of sleep to weather conditions, food and nutrition, brain development and the emotional life. The paramount importance of the character and amount of sleep to brain development and the rhythmic character of sleep as related to nutrition are specially emphasized. The Study by Andress (2) is of a different character and is based on a record of the sleep habit of 49 normal school students, 26 juniors and 23 seniors, who furnished a total of 1,301 records in response to a questionnaire provided by the author. Results showed an average of over 8½ hours sleep. Dreams were remembered for 44 per cent. of the number of nights' sleep recorded, and 28 per cent. of these dreams were recognized as being reflections of the school work of the previous day, a fact of interest in connection with the Freudian theory of dreams. A third contribution is the study by Terman and Hocking (98) on the sleep of school children. The first section deals with the distribution of sleep according to age, first summarizing the estimates of the need of sleep as given by the various authors who have studied the subject and then carrying out an independent investigation on 2,692 children, between the ages of

6 and 20 years. One of the most striking facts of this investigation is the excess of sleep among these American children as compared with the German children studied by Bernhard, and the English children studied by Ravenhill, which amounts, for most ages, to between an hour and an hour and a half. Better home conditions and more outdoor life are probably important factors in this respect. The second section describes the relation of sleep to intelligence, school success and nervous traits. There was practically no correlation, either positive or negative, between amount of sleep and mental achievements. This was true for every school subject and for every age. Various tentative explanations of this unexpected result are offered. The third section of the paper is a study of the conditions of children's sleep, which includes housing conditions, ventilation, hours of going to bed, and miscellaneous external conditions. Internal conditions, such as improper diet, obstructed breathing, eye strain, nervousness and conditions resulting in night terrors and bad dreams, are also considered, and there is an appendix on the sleep of feeble-minded children. A bibliography of 40 titles completes the study.

Memory and Association.—Several studies on memory and association have appeared during the last two years, of which Meumann's *Ökonomie und Technik des Gedächtnisses*, translated into English by Professor Baird, is the most important. Hentschel (37) has made a study of immediate retention. The subjects were 31 children, 8–14 years old, in the special classes and 24 normal pupils in the third to the eighth school years, and material used was series of consonants. His conclusions may be summarized as follows: (1) With a low degree of intelligence, there is also, as a rule, a low capacity for immediate retention. (2) This phenomenon is so certain and evident that testing of the memory span should form an integral part of mental tests. (3) Retention of five consonants in a series must be regarded as a normal capability. (4) Pedagogy must take into account the individual differences in memory span and should formulate aims and methods according to them. Another experimental study has been made by Lobsien (53), on the development of the acoustic word memory in school children, 1,281 boys and 1,557 girls, of ages from 7 to 15 years. Lay's material of two-syllabled senseless words was used. Great variation was found in the course of the successive school years; although there is in general a rise of the errors for the succeeding years. The tenth and eleventh years show a plateau in the curve and the errors are greatest here. In general, no sex differences

appear, although in individual cases there are interesting variations. Dr. Goett (32), of the K. Universitäts-Kinderklinik at Munich, publishes the results of an investigation of 52 children, by the method of *Tatbestandsdiagnostik*, used by Jung and his followers. The Rosanoff (76) research of association in children is a careful study of 300 children, ranging in age from four to sixteen, by the Kent-Rosanoff technique. A study of association in feeble-minded and delinquent children by Eastman and Rosanoff (24) leads the authors to the conclusion that "States of arrested mental development present certain fairly characteristic associational tendencies. These tendencies are characterized mainly by failure of reaction, non-specific reactions, and certain types of individual reactions." The association test as thus used is an aid in the diagnosis of feeble-mindedness. A monograph by Braunshausen (10) presents results of memory tests in the Luxemburg gymnasium. It is prefaced by a chapter on methods of investigating memory, and the conclusions are mainly of a pedagogical nature, as the work is intended especially for teachers.

Æsthetic Development.—Meumann (58) has sketched a program for the psychological investigation of children's drawing, in which he discusses the different problems involved in a thorough psychological procedure. Three chief psychological processes, each of which includes many partial ones, are involved in drawing, and need investigation on the basis of a scientific pedagogy of drawing. These are the activity of the eye, or, more correctly, sight in general; the activity of the hand and arm, or the motor processes involved in drawing; the apperception processes involved in the comprehension of the object to be drawn; the coördination of these different processes. In the latter are to be distinguished (*a*) the coördination of eye and hand in drawing, *i. e.*, the coördination of optic-sensory and motor processes, (*b*) the coordination of sight ideas and the hand, (*c*) the coördination of these processes with the apperceptive factors. Each of these processes is discussed in detail by the author, and a large number of problems for investigation are thereby suggested. W. Jones (44), of the *Psychologischen Institut des Leipziger Lehrevereins*, has contributed a careful experimental study on the development of the color sense in children, the particular point of investigation being the threshold for color saturation for children between the ages of 4 and 14 years. Two boys and two girls of each age, and four adults for comparison, served as subjects of the experiments. Interesting and elaborate conclusions are drawn, but further experiment along these same lines on

larger numbers of children seems desirable. Böhm (8), of Jena, has also investigated the color knowledge of children entering school, but the tests given were in regard to color names rather than actual ability in color discrimination. He found that most of the children entering school were able to name the simple colors, and to a limited extent, some of the mixed colors. Twenty children in the first year of the practice school were tested. Rouma's monograph (77) is the most comprehensive which has appeared since the work of Levinstein and Kerschensteiner. It, however, adds little that is new to their conclusions, and its permanent value is chiefly in the extensive reproductions of children's drawings which are thus made available for further comparative study. Luquet (54) sketches the development in graphic ability and analyzes this from a philosophical point of view. As 1,687 drawings are reproduced, we have again a valuable contribution for comparative study. Kretzschmar (47) discusses the scientific results already obtained from the study of children's drawings, and points out the possibilities which they offer for future investigations in psychology and pedagogy; and Müller (67) publishes a monograph on the æsthetic judgments of children.

Sex.—Aus dem Seelenleben des Kindes (43), by Hug-Hellmuth, is a summary of the Freudian contributions to child study. The findings in a few cases of extremely neurotic and abnormal children are used as the basis of a theory which the author then attempts to apply to the normal children studied by Preyer, Stern, Sully, Scupin, Miss Shinn and others. To anyone who has closely studied the normal development of children, the most striking feature of the book is the perversion of normal facts to fit an abnormal theory, and, as a consequence of this, the germ of truth which it contains is almost completely obscured and made to assume a repulsive aspect. Moll's study (61), recently translated into English, though written from a physician's point of view, and dealing extensively with pathological manifestations in children, finds no corroboration of the Freudian hypothesis, even in pathological cases. Though the character of the work is such that its greatest value is for physicians, and those dealing with juvenile delinquents, the final chapter on sex education is of interest and value to all parents and educators, as it deals with the subject from a normal and ethical point of view.

Social Studies.—The Delinquent Child and the Home (11) is the record of a research made under the auspices of the Russell Sage Foundation and is an important and valuable contribution to the study of juvenile delinquency. More than 14,000 cases of delinquent

children, brought before the Cork County Juvenile Court, were analyzed, 2,770 girls, and 11,413 boys. Study was made of environment as well as the individual, and the results furnish a basis for the strongest possible plea to the community to aid in removing conditions that annually bring thousands of children before the juvenile court. Clopper (18) also presents a study of the child from a sociological aspect. As Secretary of the Child Labor Committee for the Mississippi Valley, he discusses the form of child labor which has thus far received too little attention from legislators. The conditions, and mental, moral, and physical effects of the street trades are depicted in a condensed but vigorous way, and the facts recorded carry conviction with them.

Interest and Attention.—Nagy (68) presents the results of his observations on a niece and nephew respectively 5½ and 6½ years old, which continued for five years, and after a break of two years, for two years more. These children were taken yearly to a blacksmith's shop, a threshing floor, a nut-gathering and grain-harvesting, and their successive development of interest in the various objects and activities connected with these observations was noted. These records were supplemented by continuous observation of ten boys and ten girls, of ages from 5 to 15, in a summer *Ferienkolonie*, with whom the author made bi-weekly excursions. From this somewhat limited material he finds five stages of interest which he characterizes as follows: (1) sense interests, 1–2 years, (2) subjective interests, 2–7 years, (3) objective interests, 7–10 years, (4) permanent interests, 10–15 years, and (5) a stage of logical interest from 15 years onward. These stages are discussed with considerable detail, especially the third and fourth, in relation to the feelings, memory and logical connections, and pedagogical applications. Numerous illustrations of the various stages are given, but it is certainly desirable that larger numbers of children, in more varied environments, should be studied before general conclusions are shown.

Hoffmann's article (39) is a critique of previous studies on this subject, made by Lobsien, Stern, Walsemann and Wiederkehr, and disputes the validity of results obtained by the question method of determining interest. Three short contributions by Dück (22, 23) deal respectively with the historic, geographical and æsthetic interests of school children. Here, too, should be mentioned two studies of children's ideals, one of American school children, by Hill (38), and one of German children by Richter (75). A study of attention comes from Motora (66), of Japan, who experimented on the effect of practice on

the attention. These experiments were carried on with groups of children and students, laboratory devices for measuring attention in the fields of both sight and hearing being used. Professor Motora reaches the conclusion that for children where mental endowment is not of a high order, there is a beneficial effect through practice, but that other children make no essential progress in periods of the length considered.

Miscellaneous.—Worthy of note are also the following unclassified contributions.

Buchner (13) contributes to a field where little material exists. He presents systematically and in chronological order the observation of the parents on the emotional manifestations of the first year of life. These early rudimentary expressions of the awakening of emotional life are classified under the headings of feelings of pleasantness and unpleasantness, surprise, astonishment, curiosity, fear, anger, elementary æsthetic feelings, inclination and sympathy and senses. Photographic reproductions of these manifestations add to the value of the monograph.

Dr. Carrigan's study (15) is a work of value to all interested in child welfare. The author, who has had practical experience as a lawyer, has brought together in compact and convenient form information which has hitherto been accessible only at the cost of much labor, and has compiled a summary of American Laws relating to child-welfare, which begins with the unborn child and follows out its legal status until it reaches majority.

Fischer's (28) study of laziness is, as the title indicates, analytical in its nature, and the author excludes all cases superficially classified by parents and teachers as laziness but which are really due to causes quite apart from the will, such as physical depression in consequence of anæmia, inhibitions caused by rapid growth, acute illnesses, malnutrition, overlooked sense defects, native poor memory, etc. Nor does he include under laziness cases of weakness of voluntary attention, but restricts it to choice, definite cases in which there is a yielding to the inclination to avoid what is unpleasant, associated with an inner recognition of a duty to be performed. Laziness is thus an habitual weakness of the voluntary attention, combined with an indolent self-indulgent aversion of the unpleasantly toned sensations of a strained attitude and fatigue. The author further distinguishes the form of laziness, the resistance form and the indolence form. The latter is the laziness of the dreamer; the former is often brought about in children by undeserved censure after they have

really made an effort to do their best, and is therefore of pedagogical importance.

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ADOLESCENCE

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It is the aim of this *Sammelbericht* to outline the main contributions and tendencies for the past two years within the field of the psychology and pedagogy of adolescence. For purposes of orientation and analysis these contributions may be centered around (1) Physical Growth; (2) Sex Maturation and Instruction; (3) Juvenile Delinquency; (4) The Normal Boy and Girl; (5) Experimental Studies; (6) Educational Tendencies.

Physical Growth.—Weissenberg's study (118), a most significant publication, contains chapters on fœtal growth, the proportions of the bodies of babies, absolute and relative increase during the periods of childhood and adolescence, with the conditions and laws influencing growth. Excellent tables and charts are included which give the growth of different parts of the body together with the relative height and height increments of Jews, Russians, Americans, Englishmen and Belgians. The data are scientifically treated and of particular value are the distribution charts for each of the thirteen bodily measurements studied. Baldwin's (9) series of investigations based on consecutive records of physical growth show that the taller, heavier boys and girls with good lung capacity begin and end their pubescent acceleration earlier than those below median height; they are physiologically more mature and maintain, on the average, higher school grades and better school marks. It is recommended that the grading of a school system should be based on the physiological and mental ages of the child rather than on the chronological age, as is customary. The mental tests, as is well known, are based on a two-dimensional scale, that of chronological age and mental age, but they do not take into account the third dimension or physiological age, which, according to his results, is closely correlated with the mental age as evidenced by school standing. It will be necessary in order to formulate a complete and comprehensive system of mental tests to be used as a measuring scale of intelligence, to go further than the Binet tests and include criteria of the physiological age of the child. Harding (57) finds in comparing the percentage in school standing of 114 boys averaging 141.9 cm. in height and 34.6 kg. in weight with 105 boys averaging 145.8 cm. in height and 36.8 kg. in weight, that the latter group maintains a higher school standing.

Substantiating this view from the standpoint of the nervous child, Barker (12) has reëmphasized the fact that "If we wish our children to be strong, energetic and courageous, if we desire to insure them against the nervous ills which follow in the wake of debility, inertia and timidity, we must see to it that all the muscles of their bodies are systematically and regularly exercised. In the schools they should never be pushed ahead too fast; competition is dangerous for the nervous child."

Sandiford (98) gives practical applications of the theory of measurement illustrated by a study of the heights and weights of 50 Manchester grammar school boys ranging in height from 53 inches to 68.75 inches, together with methods of computing correlations. Feldman

(38) offers a summary of the Jewish child's development and calls attention to the fact that between the ages of 6 and 11 the growth among the Jews is less than among non-Jews, and that Jewish children are shorter and lighter than other races. Tallant's records (110) of 401 delinquent girls at Sleighton Farm show that 57 per cent. are below Bowditch's norms in height and 50 per cent. in weight. Goddard's (46) study is the most thorough presentation of the physical growth in the field of feeble-mindedness. It gives in classified form the height and weight of morons, imbeciles and idiots ranging from birth to 31 years of age, together with composite growth curves for boys and girls. No mention is made of repeated measurements, but the conclusions maintain that there is a remarkable correlation between physical and mental growth. The growth processes are most retarded or "upset" with the idiot; the imbecile follows and later the moron. Defectives are heavier at birth than normal children and sex differences are less marked as the scale is descended in grades of defect.

Sex Maturation and Instruction.—Baldwin (9) recently found that the curves in height, weight and lung capacity offer tangible objective criteria for teachers and parents in determining the advent of first menstruation as a factor in pubescent development. If a girl is tall, healthy and well nourished, this physiological stage may be reached as early as eleven and one half years; if tall, but under weight, it may be slightly delayed; if very short and markedly light, it may be retarded until sixteen or seventeen years of age. The wide educational applications of these conclusions on physical training, school work and social activities emphasize the fact that the smaller adolescent girl should be treated as a younger person who has not had the physiological disturbances and the accompanying mental awakenings and experiences that her chronological age in years would seem to indicate. Weissenberg (118) also found that the girls who have had their first menstruation before thirteen years of age are taller, as a rule, than those who have not reached this stage before fifteen years of age.

Willson's (123) *The Education of the Young in Sex Hygiene* is the first extensive text-book on this subject. The book is sane, scientific, practical, and educational in its point of view and treatment, approaching the problem from the standpoint of plant, insect and animal development. Sex hygiene means sex health obtained and incurred through the prevention of ignorance regarding the normal sex functions. Sex hygiene, the economic relations and social diseases, the

boy's need and the girl's need are discussed in the first four chapters; the succeeding five chapters deal with heredity and what must be taught both the boy and girl; this leads to the topic of the training of the teacher. After devoting three chapters to talks to boys and girls, the methods of transmission and eradication of social diseases are discussed. The author believes that after "a few years a very different type of text must be prepared which will enter into greater detail and amplitude with regard to sex relations than seems wise, even if justifiable, at this time." Unfortunately he has tried to combine information for both children and adults in married life and consequently some of the advice is of such a nature that it is beyond the child's experience and the book should remain in the hands of the teacher as a guide. In Weyse's translation of Thoinot's *Attentats aux Mœurs et Perversions au Sens Genital*, appear many references to the perversions of adolescent sexual instincts for physicians or those interested in the clinical, psychological, medical, and legal phases of their profession. The work is of a practical pedagogical value for specialists, since all discussions are based on actual cited cases. Hug-Hellmuth's (67) volume, which treats the subject from the Freudian point of view, has been properly evaluated by Dr. Smith in the preceding summary. Mention may also be made of Brill's *Psychanalysis* (20) which sets forth the Freudian theories and practical applications of psychoanalysis. The chapters on The Œdipus Complex, and The Only or Favorite Child in Adult Life are perhaps the most significant in this connection. Van Teslaar (116) and Chabot (24) have published some very excellent summaries of recent literature on psychoanalysis with particular reference to the theories of Freud. Wile's (122) little book is suggestive for parents and teachers. So also are those by Kohl (74), Buck (21), Ellis (36) and Scharlieb and Sibley (99). Jane Addams's (1) *A New Conscience and an Ancient Evil* is the most humanely written and the most authoritative exploitation of the subject which the title of her book connotes.

In summarizing the work on sex instruction, Foster (43) attempts a selection and concatenation of the facts given by workers in medicine, hygiene, education, psychology, ethics, and allied subjects on this problem and maintains that "instruction is essential to eliminate the unnecessary worry and self-reproach of the uninstructed adolescent, to overcome the deceit and hypocrisy which he is forced to maintain toward his parents and others who insist on silence on sex matters." Bigelow (15) believes that if the girls of tomorrow can be physically strengthened and mentally and morally prepared for

motherhood by knowledge of the laws of hygiene and the laws of sex, we shall have the right to be proud and feel that our educational system is sound and good. Parkinson (91) finds biology the direct method of approaching sex instruction and this view is also held by Bigelow (14). In working toward a solution of the control of the reproduction of feeble-minded children, Goddard (47) concludes that it is not a question of segregation *or* sterilization, but segregation *and* sterilization. Among the other helpful contributors to this field are Cabot (24), Bleuler (16), Eddy (33), Eliot (35), Mönkenmöller (85), and Wild-Cassel (121). It is now recognized that sex-education is only one of several possible lines of attack on the tremendous sex problems of our day, but the outlook toward improved sexual morals and health is hopeful.

Juvenile Delinquency and Crime.—Since Dr. Weidensall has given us a *Sammelbericht* of criminology and delinquency in the June number of the BULLETIN, it will only be necessary to include in this section of the present summary a few additional significant studies and to supplement briefly the cited reference to G. G. Fernald (39) from the viewpoint of adolescent psychology. In testing 100 newly committed delinquent adolescent boys to the reformatory in order to differentiate the responsible and irresponsible, Fernald used twelve series of mental tests and found that weight discrimination, ethical discrimination, extent of movement, recognition, calculation, cancellation and achievement capacity, or the time a subject can stand on his toes, were of most significance in diagnosing cases of mental deficiency, subnormality, and normality. He found 25 per cent. deficient and 25 per cent. subnormal but subject to good disciplinary training. This valuable paper, like Healy and G. Fernald's monograph, is full of psychological data but attempts the difficult double problem of standardizing tests and at the same time depending on them for diagnostic indices and remedial treatment. In Paul's translation of Engel's book (37) are a number of data on the course of disease, degeneracy, illiteracy and criminality, and their protection among proletarian children. It is estimated that the annual number of illegitimates in Europe exceeds 600,000 and while the mothers in most cases belong to the proletarian, only 45 per cent. of the fathers may be classified thus. The chapter which is most suggestive from the standpoint of adolescent psychology deals with criminality in youth which is due to inherited predisposition, bad educational influence and poverty. For remedial purposes, a juvenile offender who is discharged under the present prison system is less likely to commit another offense than if sent to prison.

The Juvenile Psychopathic Institute in Chicago has been making catamnestic studies on the various types of temporary adolescent psychoses, but has published little during the past two years. In his work with 1,000 repeated offenders among juvenile delinquents, Healy finds that 7.5 per cent. are epileptics who often have premature and excessive sexual development. He agrees with the current trend of belief that "the disease itself produces very frequently a characteristic, definite mental and moral deterioration shown most markedly in the field of social inhibitory powers. Hence, the gross appetites, the cruel behavior and the vicious crimes." The other cause is found to be inherent in environmental conditions.

One of the most fertile fields in the psychology of adolescence is in connection with the study of Juvenile Courts. This work is now carried on at Chicago, Seattle, Newark, Cincinnati, Philadelphia, and a number of other places. There seems to be no settled agreement as to the predominance of the type of mental disturbances or weaknesses among these children. Healy (59) emphasizes the prominence of epilepsy, and Goddard (48) the large percentage of feeble-minded children. Goddard maintains that probably 80 per cent. of the children in the Juvenile Courts in Manhattan and Bronx are feeble-minded, while in Newark 60 per cent. of the children in the Juvenile Courts were found to be feeble-minded. Baldwin (10) concludes that the moral defects of many delinquents may be explained on other grounds than feeble-mindedness.

In answer to the question, "How Strict Are You with Your Daughter?" magistrate Freschi, in a popular article, finds that many of the girls in court are denied parents' sanction to harmless amusement and this leads to intrigue, deception and finally to downfall, for secrecy is the principal source of evil and romance is part of a natural girl's life. That unhappy and conflicting home environment is largely responsible for juvenile delinquency and crime, is shown by Dorr in a popular study of the "Wayward Girl," Hall (56), Henderson (62), and Godin (49). In answer to the question, "What is Wrong with Our Boys?" Miller (84) finds that most complaint comes from those who employ them. He further makes an analysis of individual differences in boys and concludes that the greatest deficiency of our boys is the lack of ability to think, to work and to prepare work carefully. In analyzing hoodlumism, Riis, writing for parents, finds the lack of rational recreation its strongest ally. The early elimination from school and "our children becoming senseless automatons in the industrial grind calls for more men rather than more millionaires. The school houses must have work shops."

The question of juvenile labor is a pressing one. In the southern part of the United States there is a general feeling that the evils are being overemphasized and that it is better for children to be at work under proper conditions than idle on the streets or in the country. In the northern part of this country there is harsh and often unintelligent criticism of this view, while, in England, Greenwood (53) maintains that "The work of the early years of the twentieth century is to push the age to which control and protection extend to the upper limits of adolescence. The cry of the adolescent is as insistent to-day as 'the cry of the children' was three generations ago. It is a cry against what is to them useless toil, which robs them of full opportunities for expressing the new strange, inchoate desires, impulses, and emotions betokening the passing of childhood and the coming of a new epoch. The problems of juvenile labor, therefore, are educational rather than industrial."

The Child in the City (19) gives the papers presented at the Conferences held during the Chicago Child Welfare Exhibit and contains papers of significance in the study of adolescence of deficient children by Lathrop, MacMillan, Judge Pinckney, and Jane Addams. A most practical study of the field of adolescent development is being carried on in Boston under the auspices of the National Federation of Settlements. These investigations concern the problem of adolescent girls between the ages of fourteen and eighteen and began during the winter of 1911–12. Over two thousand workers among girls contributed their experiences. The work, which has been extended to every one of the four hundred settlements in the United States, is now being carried on with Robt. A. Woods as secretary. The investigations include the general conditions and environment of working girls, the home, industry, recreation, morals, club and class work, and future development. Among the best studies in adolescent labor should be mentioned *Juvenile Labor Bureaus and Vocational Guidance in Great Britain* (112); Clopper's *Child Labor in City Streets;* and the books by Dodge (31), Greenwood (53), Ogburn (90), and Goldmark (50). Among the other significant contributions to this question are Eastman and Rosanoff's *Association in Feeble-minded and Delinquent Children* and Moore's (87) *Mentally Defective Delinquents.* In regard to the distribution of defective delinquents, Hart, in a recent number of the *Survey*, has given us a valuable discussion which treats of the number of defective children in reformatory schools, the significance of sterilization of defective delinquents, and a working program. He finds that the number of feeble-minded children ranges

from 20 per cent. in the Illinois State School for Boys at St. Charles, to 60 per cent. in the Industrial School at Baltimore. On this basis he estimates there are 26,000 defective delinquents in prison and 6,000 in juvenile reformatories. At present, laws providing for their sterilization have been passed by Indiana, 1907; Connecticut, California and Washington, 1909; Nevada, New Jersey and Iowa, 1911; and New York, 1912.

In her introduction to the *Delinquent Child and the Home*, published by the Russell Sage Foundation and written by Breckenridge and Babbitt, Miss Lathrop says: "For the first time in history a court of law, the so-called juvenile court, reveals a great social situation and thereby bestows the greatest aid toward social justice which this generation comprehends—*the truth made public.*" These authors have not only performed a service in bringing to the lay reader a vast amount of information collected by the Chicago Juvenile Court, but the individual histories and statistical material bearing on 14,183 offending boys and girls for the past ten years abound in psychological data on delinquency, vagrancy, criminality, immorality, incorrigibility, larceny, and their relationship to or dependence upon home conditions, poverty, orphanage, degeneracy, ignorance, vice and lack of recreation. From the study of philanthropy and penology, Stewart (105) gives valuable constructive, remedial suggestions in regard to the delinquent child. Lull (78) emphasizes the value of moral instruction through social intelligence, and Paul-Boncour (92) that of medical pedagogy.

The Adolescent Boy and Girl.—Puffer (95) has written the best organized and most practical book that has appeared on the gang interests and instincts of boys between twelve and sixteen years of age. Exceptionally good are the chapters on the Organization of the Gang and The Gang in Constructive Social Work. In a very popular book Eldred (34) gives in a dramatic and interesting way the life histories of two competing boys' clubs, together with some suggestive insights into adolescent boys' interests and traits as well as particular comment on how to organize boys' clubs. In a sane, practical treatise with less of the sentimental than usual in such booklets, McCormick (80) finds the boys' club a practical evangelistic agency. Hoben (63) makes a humanitarian plea to help educate the church out of a negative or indifferent attitude toward the absorbing play interests of childhood and youth and shows how this may be done through the club. Bourne's book (18) contains chapters on the meaning of youth, the virtues of seasons of life from quasi-religious

and philosophical points of view. Alexander (4) gives a wide grasp of adolescent development, since each of the sixteen chapters is written by an authority in the field or a person of particular aptitude and appreciation toward boy life. McKeever's (83) *Training the Boy* is a quasi-practical book with timely suggestions from the point of view of inner religious revelations, containing helpful bibliographies and appropriate illustrations. *Twelve Years with My Boy* (5), published anonymously, is particularly helpful for those dealing with adolescent boys in church. With some psychological insight but little definite experimental data, Kirtley (73) discusses the problems of adolescent boyhood from a practical standpoint. Foerster (41) gives us a practical book as a guide to adults in assisting the adolescent youth to form a good strong character. Werner (119), in a popular book on bringing up the boy, attempts in a hortatory manner to give the boy's viewpoint from his own reminiscences, naively stating that the passing years have not dimmed his full understanding of the boy's tendencies, impulses, impressions, and point of view. Whitehouse (120), a member of Parliament and Honorary Secretary to the National League of Workers with Boys, makes from his experience with secondary school boys a very readable book on problems of boy life. To be commended, too, are Hall (56), Peper (93), and Wayne (117).

The City Club of Chicago under the direction of Professor Mead (27) has made its report on vocational training which centers around the idea, "retardation makes for elimination and elimination spells defective education." The last part (IV.) includes the results of educational tests given by Ristine to boys who left school for work. In his *Introduction to the Study of Adolescence*, Andrews (6) emphasizes the pathological symptoms of adolescent development, including chapters on the science of education; adult influence on education; immorality and sexual perversion in schools; their cures; self assertion from the disciplinary, psychological and physiological aspects with some future ideals. The great prevalence of homosexual immorality in English boys' schools is emphasized and found to be due to ignorance, inherited pathological tendencies, latent forms of mental derangement, environment, unhygienic conditions and the personal influence of other boys. As a rule the perversions are among the most gifted adolescents who possess potentiality both for genius and for perversions in excess of their fellows, but who later fall back to mediocrity of achievement. Since perpetual control, dogmatic religion and athletic training will not take the place of self-reliance,

sex instruction and social obligations, the remedy lies in *co-education.* Albee's (3) *Confessions* includes morbid experiences of adolescence, play activities and apprentice experiences. Among the important autobiographies which recently have been published and which throw much light on the ideals, motives, interests and common experiences of adolescents are those of Muir, Hay, Gideon Wells, Roosevelt, Yoshio Markino, and Henry James. The indomitable courage, self suppression, limitless sympathy, heroic silence and nobility of a great adolescent boy, Lincoln, is told in story form in Aitken's (2) account of our American martyr. Among the more significant magazine articles on the boy problem should be mentioned those of Bourne (17) and Miller (84).

In a psychological interpretation of the club as a social institution from a genetic standpoint, Hartson (58) studies the functional aspects of the gang life of children, basing his conclusions on the experimental inquiries of McGhee, Bonser, Puffer, Browne, and Culin, and later the work of Sheldon and others. He finds that the age-curve for the formation of clubs covers the span from the 7th to the 18th years, with the curve of frequency for both sexes rising highest from 10 to 14 years, and that each club consists on the average of eight members.

The Camp Fire Girls of America, which is the natural auxiliary to the Boy Scout movement, originated with Dr. and Mrs. Guick, who have conducted a Girl's Camp for the past twenty years during the summer months. The movement spread rapidly and twelve hundred Camp Fires were established without use of propaganda of any sort. The purpose of the organization is to show "that the common things of daily life are the chief things of beauty, romance and adventure; to aid in the forming of habits making for health, vigor, and out-of-door habits and the out-of-door spirit." The Misses Beard organized "The Girl Pioneers of America," a somewhat similar organization, basing its appeal on the hard virtues of our pioneer women rather than on the more fantastic and picturesque Indian motif.

Practically no significant books on the psychological and educational aspects of the development of girls have been written during the past two years unless that of Moor (86) be considered of this type. In a history of the Young Women's Christian Association, which now numbers over a half million members, she summarizes the work of many great women and presents some tangible ideals for adolescent girls among their own sex. Russell's book (97) contains some data on adolescent play with particular reference to Boy

Scouts and girls' clubs. Fish (40) discusses in a practical way the physical, instinctive and emotional life of a child and gives some suggestions on co-education, religious development and the relation of parents to their children. Elizabeth McCracken (81) emphasizes the appreciation side of the child life and deals primarily with the preadolescent period. Hodges (64) shows that children grow in religion not by emphasis on habits of introspection, and not by being hedged about with protection or limitation, but by being brought into definite religious activity because they need aggressive goodness. Mention should be made in this connection of G. Scholz's *Moderne Jugendprobleme und Evangelische Kirche*, which is based on practical work in a mission in Berlin and shows a critical appreciation of the problem of adolescence and the church, and of the studies of Forbush (42), Dugas (32), Johnson (68), Chabot (25), Schroeder (100), and Störring (106).

Experimental Studies.—Burt and Moore (23) have made experiments which aim to show the differences between the mental abilities and capacities of the two sexes from 12.5 to 13.5 years of age. The tests were made to measure the mental functions of controlled movement, perception, association and reasoning. The girls were found to be acute to space discriminations measured by the æsthesiometer, more sensitive to pain, more sensitive to recognize the presence of odors but less able to discriminate the qualities, more acute to recognize differences in pitch, and less accurate in judging distance. In the simple motor tests boys were quicker at tapping and in reacting to light and sound. In reading, writing and counting, measured for speed, the girls were more successful; in mechanical puzzles, measured for accuracy, precision and ingenuity, the boys were shown to be the better; in the free association tests, the boys were observed to be the better, but in the restricted association tests there was very little difference between the sexes; sex differences in reasoning were, however, very slight. On the whole, the higher the process that was tested, the less observable the difference. The conclusions drawn by these authors include the following statements: "Innate sex differences are very slight and they are quantitative rather than qualitative; the mental life of males seems to be predominated by the control of the movements, while that of the females is predominated by the natural expression of the emotions; the mental differences that do exist seem to be caused by anatomical and physiological peculiarities of sex rather than to different nervous organisms. The sex differences seem no greater than the individual differences within the sexes.

Lode's (77) investigation of *Die Unterrichtsfächer im Urteil der Schulkinder* is based on a study of 198 boys and 77 girls between 13 and 14 years of age. In a comprehensive report of a series of tests administered to 800 fourteen-year-old children, Wooley and Fischer make the following generalizations on children leaving school to go to work: The girls are superior to the boys in height, weight and perfection of coördination, while the boys are superior to the girls in strength, rapidity of motion and vital capacity; the girls are somewhat superior to the boys in all mental tests; the tests of physical development show a slight correlation with grade, and the tests of mental ability a more marked correlation.

Burness (22) makes a comparative study of boys and girls in secondary education and concludes that boys and girls should be taught together in the majority of subjects by men and women, since sex differences are not as marked as individual differences within the sex. In a comparative study of white and colored children including principally adolescents, in the schools of Columbia, S. C., Morse (89) tested with the Binet test 119 white children and 120 colored. 25.2 per cent. of the white tested below age, 42.9 per cent. at age, 28.6 per cent. above age; and 60.8 per cent. of the colored below, 30 per cent. at age, and 9.2 per cent. above. The "near-white" showed the widest variation. Counting as satisfactory those who tested their age and one year either above or below, the results are 83 per cent. for the whites and 68 per cent. for the colored. Chancellor (26) finds the negro precocious in childhood but having a short-circuited adolescence "with a pragmatic maturity." In a substitution test in learning, Baldwin (10) finds the negro girls much slower to warm up to the occasion, and the first to drop back and lose interest. The negroes accomplish 65 per cent. as much work as the white girls and make 245.3 per cent. as many errors. The learning capacity of these delinquent negro girls differs quantitatively and qualitatively from that of the white girls, and the educational corollary follows that different methods of instruction and training may be required for the negro girls than for white girls during the adolescent period.

Beck (13) found that inferiority in orientation among mutes was present only under "artificially arranged conditions." Little if any inferiority in the sense of direction was present while diving in water blindfolded. Sylvester (109) finds in an experimental study of 85 adolescent blind children with the form board: "(1) Those who have had visual experience retain their visual imagery and are assisted by it in the interpretation of their tactile impressions; and (2) tactual

imagery, even in those who have no other recourse, is not as effective as a combination of tactual and visual imagery." Heck's (60) studies on fourth, fifth and sixth grade school boys and girls show that mental fatigue in relation to the daily school program is far less than is generally believed. The small amount of fatigue noticeable during the school day was more probably caused by improper conditions of ventilation, lighting, etc., than by the school; physical defects, however slight, in the children are undoubtedly the great causes of fatigue in most schools. Although children are apparently fatigued after a school day, no consistent depreciation in quickness and accuracy of perception, decrease in sensitivity, mental abilities or in muscular capacities could be demonstrated by the selection tests applied by Martin (79) to a limited number of 13 and 14 year old pupils.

The subject of mental tests does not fall within the scope of this paper. It should be said, however, that while the 15 tests outlined by Simpson (102) have not been standardized on the basis of the study of adolescence, they are just the kind of material which should be given to adolescent boys and girls, since they aim to determine the significance of certain types of tests by showing their relationship to one another and to general intelligence. Geissler[1] has recently offered a general intelligence test providing for a continuous and graded measure of acquired knowledge and native rationality for pupils between the ages of 9 and 19. Wyatt (126) in a study on the higher processes in order to ascertain to what extent different tests correlate with a subjective estimate of intelligence and to select those tests which give the highest coefficients of correlation, found that the analogies and completion tests give the highest correlation with the subjective estimations of intelligence; that the theory of a general common factor is supported by the fact that correlational coefficients admit of hierarchial arrangement; that the retention of nonsense syllables is a prominent factor in the mental process of the higher levels; and that some tests which are relatively similar in content give low coefficients of correlations with each other. Giroud (45), experimenting in the laboratory of the Sorbonne, demonstrated that certain types of suggestibility decrease with age. Sleight (103) finds in his study of pre-adolescents, in the years from 11 to 12, in three schools, that practice does not necessarily develop any general power in memory training, but general improvement may be inferred when common elements assist the practice in substance effecting an im-

[1] Cf. this BULLETIN, 1913, 10, 170.

provement in that subject but in no other. Courtis (30) gives the results and conclusions of "a study of the reliability of single measurements in the derivation of standard scores in adding." The original tests were made on 270 eighth-grade children in the eight larger grammar schools of San Jose, Cal. The Courtis tests have a very distinct educational value. Winch (124) in a study of school children ranging from 8 years and 11 months to 13 years of age, finds that the children of the social class A, who live in more spacious and expensive houses, do better than those in class B, who live in crowded conditions and cheaper houses. This difference seems to be dependent more on inferiority or natural ability than on educational environment. In her work with 17 young "superior" adolescents, Ulrich (111) finds the foremost qualities to be self-control, self-helpfulness and concentration of attention.

The most important publication on the provision for exceptional children in public schools has been compiled by Van Sickle, Witmer and Ayres (115), and the most complete study on retardation and elimination by Strayer (107). In a book called *The Special Class for Backward Children*, Witmer (125) and his assistants outline the motives and aims of clinical work, the purpose and organization of special classes.

So much experimental work has been appearing on the feeble-minded child that if experimental educational psychology is to be of assistance to education, the differences between the mental traits and capacities of normal children and feeble-minded children of the same mental ages must be distinguished and differentiated. The assumption has been made that the feeble-minded children of a mental age of children of seven have the same mental traits as a normal child of this mental age, but this assumption is untenable. Witmer is making some very important contributions to this problem indirectly by experimenting with border line cases and differentiating carefully between *mentally deficient* children and children with *mental defects*. Heller (61) deals in the last part of his book with juvenile hysteria. The well-known fact that hysteria may appear in an epidemic form is due to the susceptibility of children to suggestion. The author attaches first importance to manual training in the treatment of the psychopathic child. In this way coördination of movement is achieved and the training of the motor-areas reacts on the psychical development of the child and the will-power is gradually educated. Holmes (65) gives a detailed study and classifications of various cases (mostly young adolescents) dealt with in the psycho-

logical clinic at the University of Pennsylvania. There is a good chapter on the classification of moral deviates and the author sets forth in convincing form a plea and argument for a consideration of the sociological relations of the clinic. Supplementary to the data and methods for the psychological clinicists are discussions on the educational and sociological aspects of child life, together with many notes on adolescent psychoses. Another book on feeble-mindedness is that of Lapage (75). Gross's book (54) should also be mentioned. Grozmann (55) reveals in places brilliant insight into the mental development of adolescent children. The books by Richard (96) and Van Biervliet (113) have an important indirect bearing on adolescent experimental psychology.

The most important contribution to the study of the elimination of high school students has been made by Van Denburg (114) which goes into the details and causes of elimination based on the information given by about 1,100 pupils who entered various high schools in 1906. Limitations of this method of securing data are duly recognized and the conclusion is that early elimination from high school is favored by late entering age; by having younger brothers or sisters; by childhood free from illness; by foreign parentage; by the choice of business or occupation for boys and stenography for girls; by disbelief in the values of a high school course; by uncertainty as to probable length of stay and a determination to leave early. Gossett's (51) study on retardation is of particular value because it aims to give the life histories of 314 children and emphasizes the need of applying standardized tests of intelligence and of performance in school subjects to retarded children.

Education.—Swift (108) shows the rôle and educational applications which racial instincts play in the emotions, intellect and will of children. The spirit of adventure, the ways of youth, the chance to grow, the school and the community, the vagaries of the school, fallacies of moral training, the spirit of the gang and the release of mental forces are treated successively. Many individual life histories from newspaper clippings and personal observations are included. Cornell's (29) book is the best so far published showing the effects of malnutrition, sense defects, defective teeth, enlarged tonsils, adenoids, diseases, bad posture, and mental defects on adolescent boys and girls and the methods of removing these defects. There is a great deal in this book bearing directly on the normal and abnormal mental and physical traits of adolescence. *The Conservation of School Children* contains the papers of a conference held at Lehigh University

before the American Academy of Medicine (28), centering around the problems of the feeble-minded, hygiene, and sexual instruction.

Johnston (69) gives a most comprehensive treatise on the functional and methodological aspects of the high school program of studies. In the introductory chapters the editor develops the psychological phases of the general high school problem of instruction, and a number of the other 24 writers have been fairly successful in adapting their methods and material instruction to the successive stages and nodes of adolescent development. This is particularly true of the chapters on the principles or plans for reorganizing secondary education, and on the teaching of English, physiology, hygiene and psychology. The chapter on sex hygiene is particularly comprehensive, sane, frank and suggestive. While there is lack of continuity from chapter to chapter, each one in itself is worthy of careful reading by high school teachers. King (72) carefully analyzes some of the phases of the social interests and activities of pupils during the high school age, and calls attention to various ways in which the social life of the school may be correlated with the social development and awakenings of the adolescent.

Judd (70) discusses the meaning of secondary education, and in reviewing the change from an eight year elementary school to the new seven year course as carried on in the University of Chicago Elementary Schools, he states (71) that "A general social consciousness and a desire for the simpler forms of social life which are known in the high school and are cultivated by adolescent children, begin to appear in students of the eighth grade." Gray's (52) study of variations in grades is based on experimental data which not only show present conditions in regard to the unreliability of methods of grading, but also present a relatively simple method by means of which any high-school principal can study the condition of the grading in his own school and take due steps to remedy the faults that he may find. In a most commendable attempt to show the intimate and necessary relationship between school organization and the individual child, Holmes (66) gives the various systems of promotions in vogue, calls attention to class versus individual instruction with normal, sub-normal, gifted pupils and pupils with mental defects, and includes the de Sanctis and Binet and Simon Tests with some directions as to their application. A good bibliography is appended. The book is eclectic and not particularly psychological in treatment but suggestive for school superintendents.

Experimental schools affiliated with university and college depart-

ments of education in this country, Germany, France, Italy and England have so far given us few scientific experimental studies in adolescent education or psychology. A few general problems are being attacked, such as the dropping of the seventh grade at Chicago, and the fourfold type of education at Gary. A very significant experiment in adolescent education on a large scale is in process at the new Washington Irving School in New York where the girl, and what she wishes to become, and not the subject or method of instruction, is the center of correlation. MacAndrews personally states: "All of the high schools I have known have been innocent of both social purposes and individualistic aim. The daily occupation of the high school is to do that which all the authorities insist education is not." Bagley (8), in answer to his question, "Do the High Schools Need Reconstruction for Social Ends?" maintains that the study of juvenile delinquents shows that one of the most potent factors in the increase in crime is the gradual weakening of home discipline. Shallies (101), after making a study of the distribution of graduates of 735 high schools in New York, finds that the group of students who go to college is larger than any other group and that the students that belong to this group are distinctly above the average. The normal school group is made up more liberally from the lower grades. The professional group is small. The remaining group is left without comment. Snedden (104) calls attention to the fact that certain forms of vocational power and flexibility are acquired with difficulty, if at all, under an apprenticeship system resting largely upon a psychological foundation of imitation and suggestion. Careful experimental studies of the processes by which skill—flexibility and capability of growth—may be developed, must be made. But no less important is the knowledge, auxiliary forms of skill, and ideals which function in the larger or flexible and more prolonged vocational efficiency. Baldwin (11) definitely states: The trained teacher for the first adolescent period from twelve to sixteen should by all means be a man. This is the period for seeing visions and making plans, for formulating ideals characterized by a fleeting, changing and shifting of interests closely correlated with contemporary experience. Since these ideals are immediate, temporary and flexible, the teacher and parent must meet the conflicting attitudes with patience, sympathy and a multitude of resources in regard to boy life. The methods must be based on the boys' interests and feelings—those things which adult men may have lost and which never were common to women. After proving the superiority of boys over girls in mathematics and

in certain other sciences, Burness (22) holds that "when we have learned that every individual whether boy or girl needs special treatment it will not seem an impossible matter to differentiate between the sexes without losing the grand advantage of assisting them together in one corporate body." Poirson's (94) *La Coéducation* has not been accessible to the reviewer.

In the *Journal of Educational Psychology* have been appearing for the past two years a series of valuable articles on How to Adjust the Teaching of Various High School Subjects to the Successive Stages and Nodes of Adolescent Development. The scattered psychological data included in these various articles by Thorndike, O'Shea, Pierson, Rochelle, Snedden, Freeman, Metzler, and many others are worthy of careful analysis. Of similar value is Lay's study (76). During the past two years a council of the R. E. A. has held two important conferences at New York and Cleveland on the subject of "Morals in the High School." So also have been organized special commissions on the relation of the Sunday School to adolescent boys and girls in educational institutions as reported at Culver, Indiana, May 17–30, 1913. Moore (88) has also recently issued a high school text on the English plan. In a report of the National Council of Education on Standards and Tests, moral delinquency, it is asserted, demands special treatment. "We should more frequently judge the efficiency of schools which attempt to reform the morally delinquent in terms of the later activities of the individuals placed in these special schools."

The present needs are: (1) Definite, detailed, consecutive studies and experiments on the physiological phases of growth and on the permanent, intermittent, and transitory mental traits and instinctive tendencies of adolescents from ten to twenty years of age. (2) Comparative and individual studies for this age on the various aspects of sensation, and the analysis of ideation, memory, association, habit formation, perception, judgment, conception, reasoning, emotion, and the interrelation of imitation and suggestion with the view of future studies in correlation; and the formation of mental tests for this period where they are least satisfactory, because the detailed preliminary work has not been done. (3) Group and individual studies in the social awakenings and interests in their relation to the dawning of the new conceptions of the new self which marks the adolescent period. (4) Experimental and laboratory high schools where courses of study, methods of teaching, systems of promotion and self-governing plans of discipline may be carried out under

standardized and controlled conditions. (5) More refined methods and tests for diagnosing the causes and controlling factors in juvenile delinquency and series tests for aid in evaluating the moral status of the nodes of development during childhood.

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SPECIAL REVIEWS

The Original Nature of Man. (*Educational Psychology, Vol. I.*) E. L. THORNDIKE. Teachers College, Columbia University, 1913.

The present volume is the first of a series of three planned by the author, of which the third volume, *Individual Differences and their Causes* appeared first in 1903 under the general title, *Educational Psychology.* The second volume, *The Psychology of Learning*, is to appear later.

This work on instincts represents without doubt the best and most accurate scientific thought to date about a problem or group of problems on which there has been more loose discussion in the name of science than upon any other phase of human nature.

The beginning of the volume presents a statement of the problem and method of attack which will be of permanent value to the scientific psychologist. The plan of treatment in the words of the author is as follows: (1) The description and classification of original tendencies, (2) their anatomy and physiology, (3) their source or origin, (4) the order and dates of their appearance and disappearance, and (5) their control in the service of human ideals.

The ideal of scientific method held by the author is well brought out in his distinction of three "stages in the description of human nature." The first, the stage of "mythical potencies," among which was "instinct." The second stage substituted "instincts" for "instinct," and attempted to describe behavior in terms of the connections between "particular responses or reactions to particular situations or stimuli." The third stage, as yet only imperfectly attained, has as its ideal the description of behavior in terms of such objective events as "any impartial observer can identify and . . . verify." The study of instincts thus resolves itself into a careful description of the situations, the unlearned responses to these situations and, ideally at least, the neural bond which exists in the organism between the situations and the responses. The subjective states, for example, of fear, anger, etc., are ruled out. The scientist is confined to the three elements mentioned above on the ground that these alone can be verified by impartial observers. The reviewer ventures the reflection that many thoughtful readers will wonder whether the mere fact of the difficulty thus far experienced of describing satisfactorily the subjective or psychical accompaniments

of intinctive behavior, warrants eliminating them altogether, and especially whether the hypothetical "neurone-actions" are really any more objects of scientific treatment. Certainly the psychical states are phenomena, even though they are not as conveniently described as the "behavior" and "situation" elements. The reader may raise these questions even though recognizing fully that the larger part of the problem of instincts is that of behavior.

The author very pointedly criticizes the inventories of man's original nature thus far made, on the basis of unreliable methods of gathering the data and the general difficulty attendant upon even a scientific investigation. The reader then turns from these obviously defective data to the author's own inventory and finds that what he has to offer is largely provisional, dependent upon his own "personal judgment, possibly his mere intuition." That this judgment is good, in all probability far better than any previous investigator's, may be admitted; but it strikes the reader as something like an anti-climax to the summary way in which the work of previous investigators is disposed of. The author however avoids dogmatism and is quite successful in presenting his own discussion as a definite setting of problems rather than the final word upon the topic. The book is packed with suggestive, well thought-out material which it would be impossible to summarize in a brief review. A few random references to distinctive points made here and there will have to suffice. The critical discussion of imitation is particularly keen and very much needed. He disposes very effectively of the hypothesis that there is an original impulse to duplicate particular perceived acts. Practically all cases of supposed imitation of this mechanical variety "must be explained as the results of the arousal, by the behavior of other men, of either special instinctive responses or ideas and impulses which have formed, in the course of experience, connections with that sort of behavior."

"Original satisfiers and annoyers" are explained on the basis of the readiness or unreadiness of certain neurones to act as conductors of the stimuli concerned. Such complex modes of behavior as constructiveness, curiosity and many others, commonly called instinctive, the author resolves into tendencies "to manipulate objects," "to do something rather than nothing," or to get "a more varied and novel series of impressions." "Man wants sense impressions for sensation's sake. . . . It is because they satisfy this want as well as because of their intrinsic satisfyingness, that visual exploration and manipulation are the most incessant occupations of our waking infancy."

Suggestive and valuable as is the point of view of behavior it seems to the reviewer to come most nearly to breaking down when it is applied to the psychology of the emotions, at least if one insists that what is worth saying at all must be cast in terms of behavior. If, however, it be admitted that the account in terms of behavior is only partial, there need be no quarrel. As the author says, "we do not know just what situations originally provoke smiling, laughing, crying," etc. And again, "No one knows with surety what man would laugh at, apart from training," although there have been many theories of the laughable all of which at one point or another fail to fit the facts. Is this the limit of the scientist's legitimate interest in laughter? Perhaps it is. The reviewer does not pretend to say.

In the chapter on The Anatomy and Physiology of Original Tendencies the reader will find much help in imaging the sort of changes in the neurones which may be supposed to furnish the substrata of instinctive modes of behavior.

One of the most brilliant, and from the point of view of certain types of popular pedagogy most needed critical discussions in the whole book, is that regarding the recapitulation theory of the order of the appearance of the instinctive tendencies. The conclusion is that it is "an attractive speculation with no more truth behind it than the fact that when a repetition of phylogeny, abbreviated and modified, is a useful way of producing an individual, he may be produced in that way."

As to waxing and waning of tendencies he finds entirely too much stress placed on the suddenness of the process. Every case which has been carefully investigated is found to mature gradually rather than suddenly. Likewise the waning is far less frequent than is ordinarily supposed and when it does occur it is certainly very gradual.

In the last chapter, the author criticizes the doctrine of Nature's infallibility in regard to instincts, the doctrine of catharsis, the use of original tendencies, illustrated specifically in the problem of school grades and in the theory of education by suggestion, and the true significance of plasticity. This latter term cannot refer to any supposed indefiniteness in man's instincts but rather to their richness by which he can learn in a degree unknown in the lower animals. The final section of this chapter and of the book states pointedly the way in which "original nature is the ultimate source of all values."

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NOTES AND NEWS

THE present number of the BULLETIN, dealing especially with child and educational psychology, has been prepared under the editorial care of Professor C. E. Seashore.

PROFESSOR LILIEN J. MARTIN, of Stanford University, has received from the University of Bonn the honorary degree of Master of Liberal Arts and Doctor of Philosophy. The degree was conferred in recognition of original investigations in experimental psychology and æsthetics. The diploma specifies particularly the achievements of Professor Martin in the introduction and development of a method of exact measurement for the study of mental images, and in devising and formulating a method for the study of memory by the projecting of mental images.

A CORRECTION.—In the August number of the BULLETIN (Comparative Psychology Number) at line 13 of page 318, "invertebrates" should read "vertebrates."

THE following items are taken from the press:

DR. CHRISTIAN A. RUCKMICH, of Cornell University, has been appointed instructor in psychology in the University of Illinois.

A CONFERENCE on the Binet-Simon tests, arranged by Professor Lewis M. Terman, of Stanford University, was held at Buffalo on August 29 in connection with the Fourth International Congress of School Hygiene. The special purpose of the conference was to consider matters relating to needed revisions of the scale and to its proper use.

IN accordance with the decision of the council of the American Association for the Advancement of Science, Dr. Robert M. Ogden, of the University of Tennessee, has been appointed the temporary associate secretary of the American Association to further the interests of the association in the south and to promote the meeting to be held next winter at Atlanta, Georgia.

DR. TH. WAGNER, who for many years has been associated with the editorial staff of the *Zeitschrift für Psychologie*, died suddenly on July 6 of heart disease.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

CORRELATION

BY PROFESSOR JAMES BURT MINER

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Simpson (17), working under Thorndike's guidance, has made the most extended contribution during the year to the problem of the correlation of mental abilities with each other and with "general intelligence." He applied fifteen tests to two groups of men of extremely different types of ability, testing each man individually. The good group consisted of seventeen professors and advanced students of Columbia University, the poor group of twenty men who "had never held any position demanding a high grade of intelligence"; eleven were staying at the Salvation Army Industrial Home until they could get work, seven were in a mission on the Bowery.

In the interpretation of his results Simpson finds justification for the assumption of "general intelligence," but not for Spearman's common central factor. "On the other hand certain capacities are relatively specialized, and do not necessarily imply other abilities except to a very limited extent." Subject to the limitations of the experiment he believes that "general intelligence" implies the different abilities tested in the relative order (*a*) selective thinking, (*b*) memory and association, (*c*) quickness and accuracy of perception, (*d*) motor control, (*e*) sensory discrimination. This conclusion rests in part upon the closeness of relation of each of the tests for these capacities with the others. It is corroborated by the kind of tests in which the poor group most overlaps the good group. With a combined score of five of the more distinguishing tests he finds that not one of the poor group reaches the lowest of the good

group. As confirmation of "the view that by far the most influential factor making for efficiency in these tests is the native capacity of the individual in question, and not simply his training and environment," he cites the low correlation (.38) between rank in eight of the best tests and number of years schooling.

As a matter of method Simpson compares the correlations within each of these extremely different groups and with the combined group, thus using these three coefficients for the same test to check each other. In the author's opinion this gives "a far more accurate idea of the true amount of the correlations among abilities for people in general." Presumably he means a better idea than would be obtained by testing the same number of unselected individuals. Although he recognizes that spurious correlation results from combining two extreme groups he apparently thinks that he has checked this by comparing the coefficients of the combined group with those within each of the extreme groups.

From his table of "estimated true coefficients," prepared by averaging the coefficients for the poor and good groups and then averaging that result with the coefficients of the combined group, he calculates the average of the correlations between each of twelve tests and the rest. In order these are as follows: hard opposites .60, Ebbinghaus .58, memory of words .56, easy opposites .53, A test .50, completing words .47, memory of passages .44, adding .43, learning pairs .41, recognizing geometrical forms .40, estimating lengths .26, drawing lengths .13.

The correlation between the combined score for five of the more distinctive tests with the estimates of general intelligence within the good group he finds to be .92, after correction. The reliability of the combined score in this group is .72, as tested by the first and second trials. The opposites, Ebbinghaus, and memory of words show the closest relation to estimated intelligence, two giving coefficients of over .90.

The product-moment formula was used for calculating the coefficients, the central tendencies were measured by the medians, and reliability coefficients were determined for each test. The coefficients are corrected for chance observational errors by Spearman's formula, but Simpson feels that the extra labor involved might better be spent in making more accurate measures of each individual. Instead of being "attenuated" by errors of observation, a number of the raw coefficients seem to have been "fatter" than after correction. He proposes to test the Spearman hypothetical ex-

planation of correlation through the relationship to one common central factor by showing that two tests correlate more closely with each other than the common element in them correlates with the common element in two other tests. This he supposes would be impossible if all correlation was explained by the Spearman hypothesis. Neither does he find that his coefficients take the form of the Spearman hierarchy. An important critical résumé of the work that has been done in the investigation of the relationship of mental abilities is included in the monograph.

The close relation between mental deficiency and the extreme form of alcoholism which goes with admission to the Inebriate Reformatories is confirmed by Heron's study (7) of 865 female inmates from the data collected by the inspector of the British reformatories, Dr. Branthwaite. Not only are the conclusions of great importance for the scientific explanation of alcoholism through heredity, but the selection of different equations for correlating various kinds of data forms a model for similar studies. Correlations are determined for sixteen different characteristics bearing upon alcoholism, and either r or η is given for each relationship. The mental condition was determined by the estimation of the Inspector, whose opinion thus remains as constant a quantity as is possible for such estimations. He classified 554 as mentally defective. The author concludes that "we are on fairly safe ground in asserting that the relationship between inebriety and mental defect is about .76." Furthermore there is a close relationship between mental defect and education, which is "largely determined by causes which are pre-alcoholic." "This is strongly in favor of the view that the defective mental condition of these inebriates, like the extent of their education, is pre-alcoholic and that the alcoholism flows from a preëxisting mental defect, not the mental defect from the alcoholism." "The amount of mental defect among those who have been drinking for many years is only slightly greater than that among those who are at the beginning of their alcoholic careers. There is a close relationship between the intensity of alcoholism and the mental condition of the inebriates but no relation with their physical condition." The latter is judged by the ability to do hard work in the reformatories and this lack of relation to intensity of alcoholism is brought out when allowance is made by partial correlation for constant age at onset and constant duration of alcoholism. "All this lends support to the view that the mental defect of the inebriate is not a gradual growth; it is born, not bred; that inebriety is more an incident in the life of the inebriate than the cause of his mental defect."

As indicative of the importance of the partial correlation method Heron shows clearly that Branthwaite is mistaken in his conclusion that his figures "demonstrate the influence of continued drunkenness and the life associated with drunkenness in the making of the unfit." The figures indicate a definite and regular increase in the percentage of those physically unfit for work with every additional decade of habitual drunkenness; but the partial coefficient, with age constant, is only .04. This proves that the relation between duration of drunkenness and unfitness is only the indirect effect of increase in age.

The attempt to determine the relation of correctness of memory to a number of factors, in particular to volitional attitudes of truth-telling, has brought Franken (5) to use the method of correlation for obtaining a general picture of the situation. His new plan of decision and precision questions (*Entscheidungs- und Bestimmungsfragen*) which cannot be taken up here, provides that the subjects first commit themselves as to whether they know certain facts and then be tested by questions as to the correctness of their decision. Among the various correlations which he studied the following are some of the more important: Those who give many correct decisions also, as a rule, give many incorrect decisions, although few untruthful ones if the untruthfulness is judged relative to their opportunity for incorrect report. Those who permit themselves to give many untruthful answers also make many incorrect decisions. The formal characteristics of memory span, readiness, correctness, show positive correlations with each other. For example, the corrected coefficient for rich fund of knowledge with ready control of it was .439, which he thinks is contrary to popular opinion. The decisions of those with average knowledge possess usually the smallest truth value. Those with a limited extent of knowledge can thank their lack of ambition for the high truth value of their decisions. Those with ability oppose their better judgment to the opportunity for untruthful decisions. The well-informed are as a rule ambitious but also more truthful than the less informed. The more readily a person asserts the correctness of his knowledge the less likely is he to have much knowledge. The conclusions are all limited to the conditions of the experiments, which were carried on mainly with pupils in school and bore upon their knowledge of geography, history, biography and literature.

Harris (6) collects the data as to the correlations of husband and wife in various characteristics including stature, span, forearm,

cephalic index, hair and eye color, general health, duration of life, intelligence, temper, temperament, success in life, nervous and mental disease, economic position. The amount of data when thus brought together is quite surprising and supports his contention that it is "highly probable that a great variety of physical and mental characters influence human matings, and in such a way that, on the average, similar individuals tend to marry." Pearson and Elderton (11) calculate that the correlation between parents and children in general health is about .38, somewhat less than that for physical characteristics, which for these classes is on the average .46. The previous work of Macdonald and others suggesting that dark types are less likely to disease is not confirmed by the investigation of Saunders (15) of the relation of pigmentation to infectious diseases among Birmingham school children. The disagreement with Macdonald may possibly be explained by the differently composed populations of Birmingham and Glasgow. The results confirm Elderton as to no correlation between pigmentation and height or weight.

Terman and Hocking (22) after showing practically no correlation between hours of sleep and school standings in any subject, nervous traits, or social status, for every age from 6 to 16, with 2,692 pupils, contend that this does not prove that any person should not sleep as much as he can, since the factor of safety which requires an excess of sleep over immediate needs is unknown. Winch (25) finds that a group test for visual memory of letters given to a class of 45 thirteen-year-old boys showed reliability coefficients from .87–.90 for the sixth, seventh and eighth trials. For a group averaging eleven years a simpler test of auditory memory for letters showed coefficients of about .74 for the first four trials. Moreover he found that on subsequently dividing these groups into two portions and testing the parts under different conditions of fatigue the individuals in the two halves who held the corresponding ranks retained their same relative positions in the tests under new conditions with a correlation of about .86. In a more recent paper (26) he gives similar results with the use of arithmetical tests on groups of school children in investigating mental adaptation.

Pyle (13) shows the interrelations of a number of group-tests for mental activities given to a group of several hundred adults for the purpose of selecting tests to be used on large groups of children. He finds that Whipple's marble statue test for logical memory showed the highest average correlation with the other tests used.

Immediate memory in this test correlated with retention after five weeks by .76 and .70 in two different groups. Although this immediate memory test showed the highest correlation on the average with the other tests, that average was only .29. With some school grades it correlated .69 with class standing. Four tests used by Burt are repeated on 115 college freshmen at the University of Texas by Calfee (2) and she finds much reduced coefficients in the correlations of the test with each other and with class standing when she gives each test only once, compared with Burt's results when he took the average of two applications of the tests. Hoyt's study of the relation of knowledge of grammar to the ability to write compositions or interpret poetry into prose is repeated in part by Rapeer (14) who verifies Hoyt's low correlations, the highest coefficient being .24, with 200 high school students.

An important paper is contributed by Pearson (9) dealing with the best methods available for the correlation of variates classed in a few broad categories. It provides a number of formulæ for making corrections when the material is classed in an $n \times n$-fold table. Besides considering the correction for the use of class indices, the paper takes up the correlation between the true quantitative value of a variate in any individual and that individual's class mark. In another paper Pearson (10) gives a short method for calculating the error of r when found from a four-fold table. Everitt (4) gives supplementary tables for facilitating the determination of the correlation coefficient by the method of the four-fold table in cases where the correlation has a very high value. In (21) we have a correction to be made to the correlation ratio for grouping under special condition.

Three of Yule's formulæ, his "coefficient of association" (Q), his coefficient of colligation, and his correlation-coefficient for a two $\times$ two-fold table are emphatically attacked in an extended paper by Pearson and Heron (12). They give a complete theoretical discussion of the assumptions on which the formulæ are developed. The third of these coefficients they term a method of pseudo-ranks. "The coefficients of association and colligation are in our opinion wholly fallacious, they represent not true properties of the actual distributions, and they have no adequate physical interpretation. The coefficient obtained by the method of pseudo-ranks is equally fallacious, unless the variables proceed by and have been grouped by discreet units." The authors regard these formulæ especially dangerous to statistical work because they are so easily applied that

already they have been used by a number of investigators. The values of Q and Pearson's tetrachoric r are wholly different and tend in opposite directions as the point of division of the attributes is changed. "The new 'coefficient of colligation' is really an old friend, which under the form of Q (sub-3) did not possess the 'fundamentally different properties' with which Mr. Yule credits it." The writers contend that the controversy between Mr. Yule and them is "the old controversy between nominalism and realism," since they claim that Mr. Yule is using class-names which represent discrete units as if they were real units, when in reality the attributes thus treated are continuous variables and should not be treated as if discrete. Yule's simple proof of Sheppard's correction for the influence of grouping on the standard deviation is demonstrated by Pearson (8) to be fallacious.

Important labor-saving formulæ are provided by Spearman (19) to be used after the correlations of several series of values have been calculated, when it is desired to determine the correlations of some of the values averaged together, added or subtracted. The formulæ supplement that given by Woodworth for combining results of several tests, and enable the investigator to make allowance for the differences in the standard deviations of the series without the labor of reducing each measurement to its proportion of the deviation. The equations are expected to be serviceable where the experimenter, for example, wishes to discover which form of pooling tests will give the closest correlation with estimates of "general intelligence." Moreover the formulæ show that the customary replacement of the correlation of averages by the average of correlations cannot under any circumstances lead to the right result. Spearman finds that several equations given previously by him are corroborated by the present demonstration and that they are correlaries of the more simply obtained new formulæ. This applies to the equation for increase of correlation obtained by increasing the number of measurement. Soper (18) develops an equation for determining a mean value of correlation coefficients obtained from small samples and the standard deviation of these coefficients from this mean value. When the coefficient calculated from a small sample is small, the defect in it he estimates may be of the order of 5 per cent. in samples of 10 and of .5 per cent. in samples of 100. He gives some experimental confirmation for his method of calculation. Pearson (9) gives the proofs that the formulæ showing the general influence of selection on correlation and variation are independent of any Gaussian

assumption. Wagner (24) provides a formula for giving a mathematical expression to the direct relation between a series of measurements and their repetition. Spearman (20) and Betz (1) continue the discussion of the value of Spearman's formula for correcting the correlation coefficient for chance observational errors. Spearman explains that it is the practice of his laboratory when the correction of the coefficient is over 10 per cent. to take further measurements, if possible, or otherwise to improve the method of measurement. He contends that in any case, however, the corrected coefficient is better, and that without it the customary comparison of coefficients is illusory. Betz replies that Spearman thus admits that when the correction is large it is of doubtful efficiency.

In the revised edition of his *Mental and Social Measurements*, Thorndike (23) has elaborated his chapter on The Measurement of Relationships into two chapters. In one chapter he repeats his discussion, in somewhat more elaborate form, of the effect of uncertain zero points in calculating relationships and takes up in addition the variety of methods for expressing this relationship. He does not, however, in either chapter set forth Pearson's method for calculating the correlation ratio when the relationship is not rectilinear, or for testing the question whether the relationship is rectilinear. He apparently prefers, for his simplified treatment, to depend upon the presentation of all the facts in a correlation table and then calculate the relationships desired. In conformity with one of the purposes of the new edition to amplify the discussion of what the various procedures measure, he devotes the second chapter to a more elaborate treatment of the problem of correlation, the data available for estimating it, the methods of calculating it, the cautions to be observed in interpreting the results. The translation into English of Schulze's *Experimental Psychology and Pedagogy* (16) may make a word of caution necessary in regard to his chapter on Psychical Correlations. The method of applying the product-moment formula directly to variations of ranks from the mean rank, which is given by an example in detail, would be generally condemned at present. The chapter attempts to suggest the importance of the correlation method to pedagogy.

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DYNAMIC PSYCHOLOGY

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Quite the most conspicuous contribution is that of Watson (8). It is an unusually concrete statement of a central idea that has always claimed certain adherents among us, at least as an idea. Therefore the way in which many have received it seems to be due not so much to either its source or content as to a changed attitude in those who read its words. A well-aimed blow at the autistic method in psychology, every one who was at Middletown knows that it came home. Among its nuclear sentences are:[1] "The psychology which I should attempt to build up would take as a starting point first, the observable fact that organisms . . . do adjust themselves to their environment by means of hereditary and habit equipments. These adjustments may be very adequate, or they may be so inadequate that the organism barely maintains its existence. . . . Psychology has failed signally, I believe, during the fifty-odd years of its existence to make its place in the world as an undisputed natural science . . . as it is generally thought of, has something esoteric in its methods. . . . For a 'pure' psychologist to say that he is not interested in the questions . . . because they relate indirectly to the application of psychology shows in the first place, that he fails to understand the scientific aim in such problems, and secondly that he is not interested in a psychology which concerns itself with human life." The first of these is not improbably the product of the second. "One of the earliest conditions which made me dissatisfied with psychology was the feeling that there was no realm of application for the principles which were being worked out in content terms. . . . Should the human psychologists . . . refuse to modify their position, the behaviorists will be driven to using human beings as subjects and to employ methods of investigation which are exactly comparable to those now employed in animal work." Well, there are many who have had Watson's difficulties, if not everyone would have given them so judicious—or moderate—expression.

Although delivered before Watson's paper, that of Angell (1) is

[1] Not quoted in the order in which they occur.

published subsequent to it and should also be read after the other. The rôle properly assignable to introspection, which in Watson's paper centered about the "language method in behavior," was left in need of a clearer formulation, and this is what Angell's paper is especially valuable for. He takes the position that if one restricts himself uncompromisingly to the objective means now at hand for the interpretation of behavior one obtains an account not only very incomplete in itself, but with very little prospect of ever being completed by objective means. There is no doubt of a real loss here, and while Angell does suggest a line of defense on the ground of its unimportance, it is only with a "perhaps" that looms very large on the mental horizon of a psychopathologist. Only a behaviorist who is prepared to give up all the "pragmatic sanction" of behaviorism can be expected to dispense with the data of those mental reactions of which no account is obtainable save in linguistic descriptions. It ought to be very clear that objections to introspection adduced by the psychoanalytic school are strictly objections to *rationalizing* from introspection. Technically, the psychoanalytic method is itself introspection raised to the *n*th power, so that it would be surprising if members of this school should see fundamental difficulties in the way of its descriptive functions. Such would more probably be that introspective data on any significant matter, unless obtained under psychoanalytic conditions, were too apt to be falsified.

Last, not least, Angell calls attention, objectively, to the temperamental factor in psychological attitudes, a topic that would repay much further development. Let it be repeated that the two papers supplement one another admirably, and should by all means be studied together.

In a brief note Miss Calkins (4) "admits and indeed emphasizes" the indictment on the grounds of remoteness from life, but makes a point of defending introspection as a mental discipline. Attention is again called to the ineffectiveness of the "objective" method when similar reactions ensue to different stimuli, or opposed reactions with very allied mental states. The intellectual position seems quite close to that of Angell.

Preëminent on the constructive side are the formulations by Bleuler (2) of the concept of autistic thinking, and by Dodge (5) of the theory and practice of measuring mental work. While neither is one of those who must needs make things easy for the reviewer, Bleuler has given the main points of his conception in a summary on which there would be little purpose in trying to improve. It runs, substantially,

There is a kind of thinking, which is independent of logical (*resp. experiential?*) laws, being governed instead by affective motives, autistic thinking.

It is seen most prominently in dementia præcox and in the dream, also in mythology and in superstition, in the day dreams of the hysterical and normal, and in poesy.

Autistic thinking is able to serve its purposes with wholly unlogical material; sound associations, chance coincidence of perceptions and images may take the place of logical associations. Concepts partially thought out, false identifications, condensations, displacements, symbols with the value of realities and similar abnormal psychisms make up a part of the material which is employed in autistic thinking. Obviously, however, normal material and normal thought processes are by no means disregarded.

Logical thinking, conditioned by reality, is a psychic reproduction of such combinations as reality presents to us.

Autistic thinking is governed by the instinctive trends; it follows the direction of the trends without reference to logic and reality. According to the familiar laws, the affects underlying the instinctive trends facilitate associations corresponding with them, and inhibit contradictory ones.

It is a part of our tendencies to withdraw from unpleasant experiences not only coming from without but occasioned by mere images. The immediate result of autistic thinking is therefore the creation of pleasant images and the suppression of unpleasant ones. *The primary function of autism is wish-fulfilment.*

But where a negative mental attitude is present, the trend of autistic thinking may be negative. This is the case on the one hand in melancholic depressions, on the other hand when the autistic imagery is brought into too sharp conflict with reality.

In the melancholic depressions, autism is expressed in depressive delusions, distinguished from those of the ordinary depressions in their greater detachment from reality.

The unpleasant feeling of the conflict of autistic ideation with reality leads to delusions of persecution.

Autistic thinking may be conscious or unconscious in the same way as logical thinking. But in dementia præcox its finished products are apt to appear as hallucinations, primary delusions and falsifications of memory whose elaboration has taken place in the unconscious.

There may also be a variety of autistic thinking which rather satisfies logical necessities in unlogical ways (for example certain portions of mythology and symbolism), and in which the affective motive is secondary.

Autistic thinking is not a primitive form of thought; it could develop only after thinking in memory images considerably preponderated over the immediate mental reaction to real, external situations.

Ordinary, realistic thinking, the "*fonction du réel,*" is fundamental, and to a viable organism with a mind, is as essential as reaction in accordance with reality.

That the weakening of realistic thinking brings about a preponderance of the autistic is obvious, because realistic thinking with memory images must be learned through experience while the autistic proceeds according to mechanisms that are inborn. These may make use of any imaginal material according to principles inherent in every organism.

That the rôle of autistic thinking is so great, and is not eliminated by selection, is probably due on the one hand to the fact that it is impossible for a finite intellect to define the boundary of realistic and autistic thinking, and on the other hand that

pure autism has its value as mental discipline,[1] just as physical play on the bodily side. Nevertheless, its phylogenetic significance is still in many ways unclear to us, for example in its extension to art.

It requires some familiarity with the underlying mechanisms of personality, in which pathological experience is especially helpful, to grasp the full meaning of these passages; only a slight earnest of the observational data on which they are founded can be given in the body of his paper.

Dodge approaches our problems from an entirely different angle, a definite experimental inquiry calling for highest refinements of technique, and is one to whom such problems are not likely to call in vain. The earlier portion of his article is distinguished for an exceptionally frank statement of the difficulties involved with respect to incentive, interest and impulse, together with what he believes to be a tendency to greatly misconstrue the affective values of different portions of the experimental situations (pp. 16–19). The criterion taken for mental work is a metabolic one, given in the pulse rate, but recorded, perforce, under very different conditions from those which prevail in ordinary sphygmographic measurements. The present sphygmograph operates electrically, and is a telephone receiver actuated by the temporal artery, recording upon a string galvanometer, thus providing for the subject freedom of all ordinary movement, and the essential separation from the registering apparatus. Experimental data are given chiefly by way of illustration, showing the effects of small mental operations, and of the work incidental to examination periods. In this way different sorts of work may be roughly equated according to their having equal or similar metabolic resultants. Thus the mental processes of multiplication approximate somewhat to the raising of a one-pound weight every four seconds. To arrive at an adequate estimate of the mental work of examination it becomes necessary to control the writing movements and also certain gross bodily activities, both efficiently accomplished by means whose ingenious simplicity is characteristic. The indication of the records quoted is in Dodge's own words: "the muscular demands on metabolism during the examination period incident to the process of writing are conspicuously less than the demands of the distinctly mental processes." The highest pulse rate tends to be found in the first non-writing period, when the questions are first seen, "the period of most active mental adjustment." There is generally a gradual fall to the end of the exami-

[1] *Vide* Calkins, *supra*.

nation period. The paper concludes with some theoretical formulations to fit these and other observations; the whole marking a decided step in the development of objective method.

The study by Haggerty and Kempf (6) is significant as the first successful attempt in an important field which has hitherto been approached experimentally only by the free association method. Comparing groups of men and women in the controlled association tests arranged by Woodworth and Wells, they found an average of better performance by the women in cancellation, naming, substitution and directions tests, but an average of poorer performance in the large group of tests included under the head of "logical relations." A number of general possibilities are unfavorably considered by way of interpretation, among which it may be mentioned that the situation regarding the personality of the experimenter was not such as to make this a probable factor in the differences observed. The actual interpretation seems to be along the following lines: the tests of "Group I." make few demands on *choice* in the subjects, though they may make considerable ones on ratiocination, as in the directions tests. The *logical relations* tests, on the other hand, make much greater demands on choice, though less than the free association experiments. Now it is to be noted that certain periods of confusion, producing lengthened reaction times, are present in this type of controlled association reactions quite as truly as in free association reactions, and are indeed often more clearly defined here. Examining the results in this direction, it is found that these episodes of "confusion" are about twice as frequent in the women as in the men, and it is of this that their lengthened time in this type of test is the expression. Conflict, suppression and substitution are the verbal forms which the authors give to their ideas of the causes of these episodes, and while they do not mention the term it is quite probable that they have the psychoanalytic work in mind. The results are, indeed, quite confirmatory of what may be observed with the free association experiment, and presumably have the same origin. The presentation does not actually bring out how consistent the group difference is or how much the two groups intergrade. But since the authors raise the issue of "importance" in respect to the main fact, it should be brought out that it is not as a sex difference that it is important, but as a tempermental one between individuals of whatever sex. We are in little need of new criteria for sex; we are in great need of experimental correlations with mental habits and personality. As the study helps to point the way in this direction it is a genuine contribution to dynamic psychology.

Karpas (7) presents a conception of the constitutional psychopathies formulated in terms of mental adjustment. He describes concretely the way in which various pathological reactions may manifest a disproportion of affect, intellect and volition. The unbalanced factor may lie in any of three spheres and produces a definite type of personality accordingly. On the emotional side he distinguishes two groups of subnormal affective life, the regular shut-in personality and a "seclusive personality subject to tantrums." In the hyperaffective group he includes the manic and a hysterical temperament without clearly defined conversions or complex-fixations. These individuals, and the second group of seclusive personalities above mentioned, present a feature of special psychological interest in their subjection to transitory psychotic flurries, on the one hand of the tantrum, on the other often of a panicky nature, whose mechanisms, when they can be observed at close enough range, are quite instructive in the matter of mental hygiene. While these varieties tend rather to personal difficulties, it is the lack of volitional balance which most frequently leads to conflict with society through the medium of the law. Various criminal and poorly controlled reaction types are described, but their definitions seem not so clear in the author's mind as with the previous groups. The intellectual forms of defect are dismissed quite briefly, perhaps because they are otherwise the more familiar. There follow some general remarks under the headings of diagnosis, prognosis and treatment, concluding with a summary of the Binet-Simon tests. The chief value of the paper lies in its clear emphasis upon the "inferiority" as a maladjustment, and the amelioration of this adjustment as the chief therapeutic point of attack.

Burrow (3) contributes a thoughtful paper on the consequences of a far-reaching penetration of the present psychoanalytic doctrines into the social mind. In the first instance he points out the necessary subversion of religious beliefs, and in the genetic analysis of those groups of mental activities associated with the intensest feelings, the destruction of those "springs of primitive sentiment which have actuated all that is best in human conduct." He mentions how these interpretations are applied to a number of specifically biblical teachings, and voices the "unhappy" conclusion that philosophically psychoanalysis becomes a name for the "utter abrogation of religion and the apotheosis of sex."

The longer portion of the paper is concerned with the more definite issue of *Ausleben oder Neurose*. The neuroses are of course

held to be conditioned by failure of sexual adaptation, but Burrow seems to view the issue rather more simply than it really is in the Freudian mind. He does not introduce the distinction between actual and psychoneuroses nor the for him most important one of neurasthenia and fear-neurosis, but takes up only the possibility of neurosis brought about by suppressed sexual activity, and meets it with the readily to be admitted fact that neuroses may be present in those without noticeable somatic repressions, indeed among "veritable Don Juans." The difficulty is mental, as Freud himself pointed out.[1] But even though *Ausleben* were to provide a solution, it is not one which Burrow would countenance. Psychoanalysis must recognize its responsibilities to society as well as to the individual and must not give the sanction of "cruel nervous disease" to conduct subversive of social order. *"Und wenn Sie auch Protestantisch sind, deswegen dürfen Sie doch kein Meineid schwören!"*

It is difficult to have many fears about the broader issue. Newton's discoveries did not disturb the properties of gravitation, but furthered their more intelligent use; and nothing worse need be expected of the factual material of psychoanalysis. The most immediate hope of its justification to society lies in its furthering with all of us the last step of what Disraeli said were the three tasks in the career of the English lawyer: to get on, honor,—and honest.

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[1] Freud, S., *Selected Papers on Hysteria and other Psychoneuroses*, pp. 184–185. Cf. also *Amer. J. of Psychol.*, 21, 1910, 217–218, and Jones, E., *Psychoanalysis*, Chs. XIX. and XX.

VOLITION AND MOTOR CONSCIOUSNESS

BY PROFESSOR E. B. DELABARRE

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Ribot believes that every state of consciousness is a complex whose stable, resistant portion, its skeleton, is formed by motor elements, kinæsthetic sensations. In (5) he shows this, confessedly as a matter of probability, of simplicity and adequacy of hypothesis, rather than of full proof, for the intellectual states. These all contain kinæsthetic elements more stable than the accompanying elements from the special senses, though the latter may obscure the former, and yet the former form the synthesis of the latter, their support and principle of permanence. All association is an association of movements, and in its mediate form the mediating member remains unconscious and is constituted solely by motor elements. Attitudes also are forms of motor activity, with a very feeble coefficient of consciousness. Motor activity interpenetrates and envelops all our psychic life, and forms its solid portion. Under the form of presentations or representations—percepts, images, concepts—it contributes to the formation of all states of consciousness and of their associations, and it constitutes those dispositions, general and momentary, called attitudes. In (6) he shows that motor images possess the same indispensable character in the affective states, and that they form that portion of the psychic field commonly called unconscious or subconscious. In regard to this latter, one class of psychologists holds that the phenomena are genuinely, though faintly and imperceptibly, conscious; another class, that they are psychically nonexistent. In opposition to both, Ribot contends that what exists in this field is the kinæsthetic portion of states of consciousness, motor phenomena that more than all others possess a tendency to organize and solidify themselves.

Schumann's book (7) is here merely cited for reference, without having been examined by the reviewer. Martin (4) writes of the psychology of volition with an aim directed particularly toward its pedagogical applications. Consequently he is less concerned with the full analysis and inner mechanism of the phenomena, than with their general forms and sequences. The general character of the book can be described best in the words of Malapert, who contributes the preface: "What interests him most is the development of voluntary activity, the different forms that it may take, which appear to

him as successive phases through which in the course of its evolution the will normally tends to approach toward the finished, the typical volition; and then the rôle played in this evolution by the intellectual functions, the impulses, and the feelings; and further, the many conditions and influences that can further or hinder the formation of this completed will, whose characteristics are unity, stability and morality. Finally the work indicates the principal means that the educator can use for strengthening, organizing, clarifying and moralizing the will of the child, for teaching it the technique of willing, whereby it may facilitate the intervention and triumph of its will and know how to deliberate, decide and execute rationally."

Dauriac's article (1) is a review of experimental work by Mechotte and Prüm (Le choix volontaire, *Arch. de Psychol.*, 1910) and by Barrett (*Motive Force and Motivation Tracks*, 1911). He describes their experiments, and defends them as genuine observations of the process of deliberating, choosing and acting, instead of being, as might be assumed, mere matters of suggestion, of submission to the prescriptions of the experimenter.

The problem of freedom is touched upon by both Martin (4) and Dauriac (1). The former gives it very little discussion. His attitude seems best summed up in the statement in his introduction (p. 3): "The will is free. . . . This is a power marvelous and incomprehensible." Dauriac holds that whether or not man is metaphysically free, yet psychologically there is no doubt as to the fact of free voluntary activity. I can resist a passion, can strive against a given class of causes and reduce their action to an "influence," and am so little slave of my ideas that in absence of every favorable motive, I can deliberate and cause just this motive to appear. Therein I am free. But this psychological freedom is not necessarily in conflict with determinism. A triumph over passion is a triumph, even if fated.

The two remaining articles deal specifically with the question of freedom and determinism. Foltz (2) argues for "automatism." The appearance of indeterministic action is due to the inadequacy of perception to unravel its complexities, and the resulting ignorance of the causes that are at work; but this ignorance is no evidence of the absence of deterministically working causes. Suffering is due to incomplete organization; and it is beneficial, banishing inertia and leading to better specialization and organization, the essential features in progress. Rightly understood, determinism does not discourage effort, nor produce a feeling of helplessness and irre-

sponsibility, of "weight and pressure of the rule of mechanism" in those who believe in it. "I can see no reason why we should not welcome with open arms a conception so beneficial to the body, to the understanding and to the craving of the heart."

Gaultier (3) claims that the idea of liberty or free-will is a concept the most contradictory, the most shadowy, the most devoid of meaning that the human mind has ever devised. It is impossible to find place for it in a philosophy of reality as it presents itself; and it is irreconcilable with the postulates of the philosophy which has devised it. To be sure, as the believers in liberty wish to establish, there is something else at work in the world besides determinism; but this something else is altogether other than what they conceive as freedom.

Phenomenal existence springs from a double source. Its principle of determinism is a matter of constant relations, and gives rise to science, calculability, prevision. But the questions, why one phenomenon leads to a definite other, why any substance has any particular properties, why force is attached to one character rather than another, can be answered only in terms of an improvisation—an arbitrary factor, an "alea," a fatality—whereby life begets itself according to the multiplicity of its modes, independently of all constraint and of all reason; and this improvisation introduces into the phenomena of existence an irreducible feature of the incalculable, of ignorance, of uncertainty, of contingency. Some eliminate this fact of improvisation, and wrongly make the world wholly deterministic. But the libertarians attempt to introduce between the factors of improvisation and of determinism a new factor, liberty, thus denaturizing improvisation and conferring on it properties that it does not possess.

The idea of liberty is a delirious invention of sick minds, dissatisfied with existence as it is given. Finding suffering, they invent fault to account for it. Inventing also justice, they invent free-will to justify punishment for fault. These are all fictions, necessitating one the other, and all of them unfounded and contradictory.

The moralists have believed that if they could reserve some domain of life from the inflexible play of causality, this would prove the existence of liberty. Their opponents have singularly accepted the dialectic strife on this ground. Instead of denying their premise, the author strengthens it by showing that causal necessity is a case of contingence; that the "unforeseeable" which Bergson, and the "contingent" which Boutroux thought were identical with free-will,

are not such at all, but are cases of the incalculable and the arbitrary involved in his idea of improvisation, which supplements determinism but never introduces itself into its field as an exception to its applicability.

There is an absolute contradiction between the terms choice and freedom. A choice is a choice only on condition of being strictly determined by an inclination, immediate or reflective. By definition, contingence is something that we cannot foresee, create, favor or resist. A person could never be held responsible for a leap of the will that a sudden irruption of contingence (if contingence took this form) had produced in him. We can free the will from determinism only by subjecting it to a rigorous form of fatality. However we take reality, as it is, or with any manner of distortion, and in whatever manner we try to formulate free-will, it is a conception full of contradiction, devoid of genuine meaning, and powerless to support the ideas of responsibility, of merit and demerit, of the justification of punishment and reward.

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FATIGUE, WORK, AND INHIBITION

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Sherrington[1] has shown that "when the scratch-reflex elicited from a spot of skin is fatigued, the fatigue holds for that spot, but does not implicate the reflex as obtained from the surrounding skin." Forbes (6) reports that stimulation of one reflex arc until it is fatigued does not affect another allied arc. He, consequently, declares that the fatigue does not involve the motor neurones but

[1] C. S. Sherrington, *Integrative Action of the Nervous System*, 1906, 218.

that its seat is in the synapse. That is, the reflex center is not fatigued as a whole, but merely the particular channel of approach which has been employed. From a study of the refractory phase of the wink reflex Dodge (5) concludes that mental fatigue phenomena do not operate to prevent absolutely the repetition of an act or to increase necessarily the time of performance, but rather bring about a tendency toward not repeating the act. Successive repetitions thus require a constantly increasing stimulus or else the interval of time between each will be successively lengthened.

Arai (1) carried on an extensive series of tests in mental multiplication on herself for periods extending up to 12 hours in length. Fatigue was shown by a gradual increase in the length of time taken to do the examples,—an increase which amounted to about 100 per cent. after 12 hours of continued work. Similar tests on a group of subjects for 2 hours showed an increase of 24 per cent. in the time taken to do the examples. Arai also reports (1) that "there is a decrease of pulse rate as a result of continuous mental work,"—a decrease which is positively, though slightly, correlated with decrease in efficiency of the work; (2) that "the feeling of fatigue is somewhat, though far from perfectly, correlated with the state of mental inefficiency"; (3) that "fatigue in a special mental function as well as in general is slightly transferable to other functions and that the greater the fatigue the greater the transferred fatigue"; and (4) "as a rule, the more competent people are less affected by fatigue." Martyn (13) tested three individuals as to (*a*) spatial threshold, (*b*) muscular capacity, (*c*) respiration, (*d*) pulse, and (*e*) speed and accuracy of perception before and after an hour of multiplication. She found no significant indication of fatigue in the five tests nor in the work of multiplication.

Three other investigations have been made concerning the nature of mental fatigue, but related specifically to school problems. Winch[1] has already shown that children improve in arithmetic more rapidly when the class meets in the morning than in the afternoon. He now adds to this information concerning fatigue-effects from school work at different hours of the day two further facts. (1) There is a reduction in efficiency of about 5½ per cent. in one group and 2 per cent. in another group in the late afternoon as compared with the early morning when measured by immediate memory tests (26). And (2) children in classes meeting early in the morning do not

[1] W. H. Winch. Mental Fatigue in Day-School Children, as Measured by Arithmetical Reasoning. *Brit. J. of Psychol.*, 1911, 4, 315–341.

improve so rapidly in arithmetic as those who are in classes meeting later in the morning. This was true of all but one school,—a school of poor boys who rose early and worked before going to school. This group made the greatest improvement in the early morning class (25). Robinson (18) confirms Winch in his conclusion that there is a noticeable warming-up effect at the beginning of the morning session,—most noticeable in older children. But this warming-up is only a phase of a large variation in efficiency for different hours of the day,—a variation which shows itself in a rise in efficiency to about 10.30 A. M., in a drop to 12.30 P. M. and a rise again till the close of school at 2.00 P. M. Robinson also confirms previous work in finding that a recess of 10 to 15 minutes is of decided value but that longer periods cause a loss of efficiency in the work immediately following. The same was found true regarding the length of periods devoted to gymnastics and singing.

Lagrange (9) reviews the subject of fatigue from the physician's standpoint and discusses the proper use of exercise and rest in the cure of fatigued patients.

A year ago Wells[1] reviewed the first two sections of Bogardus's work. In the third section (2) we have presented: (1) facts which go to show that "there is a rise in the number of accidents during the forenoon, a decided fall after the noon period of rest, and another rise in the afternoon hours." Also, that with the exception of Monday there is a steady increase in the number of accidents as the week progresses. But on Monday there are more accidents than on the next three following days. Evidently, Sunday recreation unfits workmen for steady work on Monday. (2) Various judicial decisions respecting fatigue. (3) A general conclusion: "Uninterrupted work is accompanied by muscular inaccuracy which increases irregularly and at a rate dependent on the rate of activity and on the relative difficulty of the given work for the given individual." In other words, "Fatigue is a cause of industrial accidents." (4) A list of methods to prevent fatigue, hence accidents.

Monotony is generally viewed as a cause of fatigue. Münsterberg (14), however, holds another view. From observation and experiment he concludes that "there are persons who after they have received an impression are unable immediately to seize the same impression again. . . . But there are evidently other persons for whom, on the contrary, the experience of an impression is a kind of inner preparation for arousing the same or similar impressions."

[1] F. L. Wells. Fatigue. Psychol. Bull., 1912, 9, 416–420.

The former group rebel against the monotony of a job, because it is an effort to seize each succeeding presentation, while the latter group, having no such difficulty, do not find fault with their work. He urges the use of experimental tests as an aid in the vocational guidance toward monotonous or non-monotonous tasks. Münsterberg also devotes some attention to the factor of noise as related to fatigue. Noises, such as conversation, and those of a rhythmical nature, can very often be prevented.

Lehmann (10) raises the question as to the relationship between mental work and the waste-products of the body. From various experiments he concludes that "mental work of a determined kind and amount has with the same individual a constant increase in the amount of exhaled CO_2 and corresponds to a constant energy measure just as does physical work." Also, that the production of CO_2 will be throughout so much the greater, the greater is the difficulty of the mental work as measured by the exertion of the attention. According to Hellpach (8), who reviewed the discussion that followed Lehmann's paper, Exner contended that there were many involuntary muscular movements, as well as organic changes, which Lehmann could not take into account and states that only an examination of the waste-products of the brain itself can be used to settle the question. Hellpach feels that this is not necessary, as the organism is a unit, so that no organ can act independently of the whole organism. Hence, a measure of brain activity must include not only its own activity but that of all the organs which are stimulated by its activity.

Dodge (4) pleads for a measure of mental work in terms of some organic change. If work is measured in terms of time or of amount of performance, many factors are not taken into account which undoubtedly play a rôle in the total situation. Previous investigations have shown that muscle-work may be measured in terms of metabolism and expressed in thermo-dynamic units through calorimetric determinations; also, that changes in pulse rate are closely correlated with changes in metabolism. Dodge has by means of a very ingenious technique found it possible to correlate various types of physical and mental work with the pulse-rate, and in this way to determine that the mental work of multiplication, for example, is closely approximated by the raising once every four seconds of a one-pound weight from the relaxed position of the arm hanging vertically to the horizontal position of the forearm. Urban (22) in reply contends that, even if all experimental difficulties can be

removed from such determinations, we shall not even then have a measure of mental work, but only a measure of the physiological changes correlated with the psychical processes.

Lorentz (11) reports that the use of Weichardt's antikenotoxin actually resulted in an improvement in both muscular and mental work. He suggests that its use may be of great advantage in the school-room at the end of the day. The writer is not, however, personally convinced that the experiments were conducted with sufficient care to be conclusive.

Starch (20) had four groups of subjects employed in a substitution test for a total of 120 minutes each. The first group worked 10 minutes at a time, twice a day for 6 days, the second group 20 minutes at a time once a day, the third group 40 minutes on alternate days, and the fourth group worked 120 minutes at a stretch. The first group accomplished the most, with the second group a close second. Both accomplished considerably more than the other two groups. Pyle (17) objects to this work on the ground that the two factors "length of working period" and "interval between them" were varied at the same time. From using another form of the substitution test he concludes: (1) that a working period of 30 minutes a day is more favorable for improvement per time consumed than are periods of 15, 45, or 60 minutes a day; and (2) that *daily* work is superior to either *alternate day* work or to *twice a day* work. The second practice on the same day is not quite so beneficial as the first practice in the early stages of learning but in the later stages the second practice becomes useless.

Wells raises a number of interesting problems regarding practice and fatigue in continued work,—problems of great interest to those who are attempting vocational guidance on the basis of psychological tests. His work-periods lasted, however, but five minutes. In the first article (23) he raises the problem as to whether a high initial efficiency is the result of (1) greater previous practice or (2) greater ability to profit by a given amount of practice. If the first is true we should expect that further practice will bring about a relatively smaller amount of improvement than shown by one who had a low initial performance; if the second is true, the reverse should be the case. He concludes from his experimental results that "the ability to improve" is a more important influence than "the amount of practice" in determining the amount of gain which may accrue from practice. In another study (24) of the same experimental data, Wells points out that the general effect of practice upon endurance

periods in addition is a favorable one. "That is, the subject does not lose so much by fatigue in the later stages of practice as in the earlier ones." But in the number-checking test there is no such effect.

Forbes (7), following Sherrington, studied the cause of rhythmic responses which follow the combined effects of excitatory and inhibitory stimuli. He suggests that the situation is analogous to a stream of air passing out from a tube under water. It is a fact that the deeper the mouth of the tube the larger and more infrequent are the air-bubbles. In the same way we find that the greater the inhibition, the more intense but less frequent are the responses from the double source of excitation. The explanation is, of course, that the inhibitory force (*A*) opposes the excitatory force (*B*) and tends to keep it pent up or potential. When *B* finally becomes greater than *A* it discharges and in doing so it proceeds until more energy is released than is represented by the excess of *B* over *A*. In this way we obtain the rhythmic condition of discharge and quiescence.

Using a plethysmograph Patrizi (16) studied the volumetric changes in the arm which accompanied the presentation of the signal "Now," followed at irregular intervals by the ringing of an electric bell. Alternately, the subject was expected (1) to offer no resistance to the vasomotor changes and (2) to inhibit them. Normal male adults were found able to inhibit such changes more than females, while both were more able in this respect than children or alcoholics. In another study (15) Patrizi obtained fatigue curves from two ergographs used simultaneously, one with each hand. During the experiment the subject was required to perform some mental task. It was found that subjects fell into two groups,—the "dynamogènes" and the "inhibiteurs." The ergographic work with the former was increased during the mental test, while with the latter the work was decreased as compared with what was normally to be expected. These two groups seemed to be constant when tested over a considerable period of time.

Culler's (3) work was reviewed by Baird in the September number of the BULLETIN and need only be included in the list of references here. The discussions by Sherrington, (19), Tait (21), and Lucas (12) are reported by title only.

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REACTION TIME

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The reaction time literature of the year consists of two doctorate dissertations and various minor papers dealing chiefly with apparatus and technique.

Poffenberger (10) attempts to isolate the synapse-time or the time lost in conduction in nerve centers. His experiments consist of an intensive investigation of reaction time to retinal stimulation at the fovea and of points 3, 10, 30, and 45 degrees from the fovea in a horizontal plane. He finds that the length of reaction times on eccentric positions is always greater than on the foveal position; that the length of the time increases as the distance from the fovea is increased; and that the reaction time to temporal stimulation is longer than to nasal stimulation. Time relations between the temporal and the nasal sides of the retina agree with the extents of the corresponding fields, with acuity relations, and with the appearance of flicker. There is a slight but significant difference in reaction time of the right and left hands, a difference following stimulation of one eye or both eyes, but no difference in reaction time with hand and eye on the same side and on opposite sides of the body. The differences between the reaction times on the direct path and on the indirect path for the two most highly practiced subjects were 3.6σ and 4.0σ. This is regarded as the time lost in conduction in nerve centers or the synapse-time in man.

Todd (11), using light, electric shock, and sound stimuli, finds that the reaction time to two simultaneous stimuli is less than to either of them alone; to a group of three simultaneous stimuli is less than to any single component member or to any pair of the group; and that when another stimulus is added to a simple stimulus or to two stimuli there is a reduction in the reaction time, the amount of the reduction being dependent upon the reaction time to the stimulus added. There seems to be no evidence that a reagent is able to select from a pair or group of simultaneous stimuli one of its members for reaction. When stimuli of medium intensities are presented with others of low intensities, there is a decrease in the reaction time. The reaction time to a light stimulus preceded by a sound and electric shock stimulus at regular intervals is longer than the reaction time to light alone.

Henri and Larguier des Bancels (5, 6) contrast the reaction times in higher animals, in which the time of cerebral processes is long and the latent time in the sense-organs short, with that in lower organisms (Cyclops stimulated by ultraviolet light) in which the time required for excitation of the sense-organs is very great in relation to the total reaction time. Thus, for a reaction time with Cyclops of 500σ, the sensory excitation requires at least 400σ.

Langier and Richet (9), using reaction time as a test of fatigue in a stenographer after from five to twelve hours of work, find a very marked increase in times and their variability. Twenty tests after five hours showed an increase in times of 49σ and 80σ, after nine to twelve hours 27σ, and after seven and a half hour of work with two hours of rest at noon 72σ.

Deuchler's (1) previous paper gave a detailed account of reactions for the individual subjects. The continuation deals at great length with common factors in (1) reactions with indefinite expectation, such as reduction in times with practice and decrease in variability, the influence of the practice series on later reactions, various modes of adjustment in experiments, variations with different senses, the effects of the foresignal, etc., (2) reactions with definite expectation with a regular change in direction of attention from experiment to experiment; (3) the influence of variation in foresignals; (4) reactions to three simultaneous stimuli with a regular change of attention to individual members of the complex. Contrary to Todd's findings, Deuchler reports that reactions to three stimuli varied according to which was apperceived.

Westphal (12) studies the changes in pulse and breathing in choice reactions to two auditory stimuli (reaction with the second finger of the right hand to the sound of a hammer and with the third finger to the sound of a bell). He compares expressive symptoms during the experiment with those under normal conditions and also the variations during the various stages into which the experiment can be divided: (1) the normal state; (2) the period from the ready signal to the foresignal; (3) the period from the foresignal to the giving of the stimulus; (4) the period from the reaction to the first breath after reaction; (5) the period from the second to the fourth breath after reaction. Among other things Westphal finds that the changes in pulse and breathing with the direction of feeling in volitional processes point to the fact that the feeling of activity is composed of partial feelings of tension and excitement.

Dunlap (2, 3) describes an apparatus for measuring association

reactions, consisting chiefly of two voice keys, an Ewald chronoscope, a master switch, and a fork of 64 d. v. with two mercury contacts. Evans (4) describes a compact and convenient arrangement of the pendulum chronoscope and accessories for reactions to light, sound, and touch. Kiesow (7, 8) describes in detail, with accompanying figures, two æsthesiometers, one for warmth and the other for contact. The æsthesiometer for reaction times to warmth consists of an electrically heated platinum coil which permits of the isolation of warmth stimuli.

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SPECIAL REVIEWS AND REPORTS

Bewusstsein und psychisches Geschehen. L. Loewenfeld. Wiesbaden, 1913. Pp. vi+94.

The author holds that the realm of the psychic is far broader than that of consciousness. Psychophysical parallelism and inference from behavior both force us to assume the existence of a psychic subconscious. After the usual citation of facts from normal and abnormal psychology which support this hypothesis comes an inquiry into the nature of this "night side of the soul." We must not conceive it as a second ego, or identify it with the activities shown during hypnosis and in secondary personalities, for these show the same separation between conscious and subconscious phenomena that is evident in normal states. Rather we must think of it as containing the same sorts of processes that are, under other conditions, material for consciousness. The subconscious underlies and supports consciousness, it is the source of many moods, feelings, sympathies, and aversions. It varies in its range with the individual and with the period of his development. In general, its relation to consciousness is that of the subordinate to whom the working out of details is entrusted. Consciousness sets up the goals of our thought, takes general charge and oversight of new operations. Old ways of thinking, paths of least resistance, are likely to be subconscious. The facts of memory, posthypnotic suggestion, and the like, are then treated at some length in the effort to demonstrate that subconscious processes are involved.

In conclusion, the author pleads for a more scientific attitude on the part of all concerned toward the problem in hand. The Freudians have given us material in this field that will be valuable when their conclusions are sifted, but not until then. The orthodox psychologist, on the other hand, has been blind to the nuggets of truth which the psychoanalyst has unearthed. Unprejudiced investigation is the crying need.

The book, while summarizing well the present status of the question of the subconscious, contains little that is new. On the whole, it is a vivid reminder that investigations in this field have not yet passed out of the anecdotal stage. In these days of increasing

emphasis on the study of behavior, it seems unfortunate that so much stress should be laid on attempts to prove the psychic nature of "subconscious" activities. We need rather attempts to bring the phenomena in question under experimental control, to describe and classify them, before we set up hypotheses as to their ultimate nature.

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PSYCHOLOGY AT THE RECENT MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (BIRMINGHAM, SEPTEMBER 10–17, 1913)

This year, for the first time, a subsection for psychology was established by the British Association. Hitherto psychological papers have been heard chiefly in the section of Physiology, which is still sponsor for the newly formed subsection. Judging by the large attendance at the meetings, the considerable number of papers, and the interest aroused, it is highly probable that the new division will soon demonstrate its claims to independence.

The meetings occupied five days, and were ably presided over by the chairman of the subcommittee, Prof. J. H. Muirhead, while Mr. Cyril Burt acted as recorder. Plans were laid to continue the subsection at the next meeting, which is to be held in Australia, and it is confidently expected that the 1915 meeting at Manchester will be even more successful than the past occasion has been. Two joint meetings were held, one with the section of Physiology and one with the section of Education.

Some thirty-five papers, covering a wide variety of topics, were read. Of these applied psychology had the chief share, with some nineteen titles, of which twelve were in educational psychology.

Among the papers which dealt with general and systematic problems may be mentioned the following: (1) H. Wildon Carr, *The Absurdity of Psycho-physiological Parallelism even as an Hypothesis.* The speaker's thesis was that since consciousness is not of the nervous processes with which it is correlated, but of the whole physical world which brings about the nervous activities, therefore it is absurd to assume that the part (or cortical processes) is equivalent to the whole physical universe of which consciousness makes us aware. (2) William McDougall, *A New Theory of Laughter.*

Laughter is a protective reaction, occasioned by minor distresses which would have a cumulative depressing influence were it not for the acquired capacity to drain off the nervous energy thus aroused through the channels of the laughter reaction. The typical expression of pleasure is not laughter but the smile, which is of a different order and appears earlier in childhood. (3) H. J. Watt, *Some Main Principles of Integration.* This paper dealt with the possibility of proceeding on the basis of sensation through integrative stages to the higher mental processes. (4) Carveth Read, *The Condition of Belief in Immature Minds* (*Children and "Savages"*). The main point of this discussion was that all beliefs have their fundamental ground in perception. The imaginative beliefs arise largely in minds which lack a definite logical test for truth, but it is wrong to suppose that they are as profound as those based upon perception. Their utility has kept them alive, but there is no justification in tracing scientific ideas to them. (5) G. J. Stokes, in his paper on *The Relation of the Emotions to Motor Discharge*, advanced the theory that the nervous correlate of emotion might be sought in the nervous processes which connect the sensory and motor centers of the cortex.

In the field of experimental psychology, C. S. Myers reported on *Experiments in Sound Localization* now being conducted in the very carefully constructed sound-proof room of the Cambridge laboratory. Results seem to indicate that the localization of sound in the median (sagittal) plane are, at best, very inaccurate, and that learning to localize is primarily dependent upon loudness and timbre. Tactual impressions felt by the subject upon the face and head appear upon analysis to be illusory. R. M. Ogden reported upon *The Spatial Localization of Visual Images.* The complete report is published in the September issue of the *Psychological Review.* Miss Mary Smith read a paper on *Two Forms of Memory and their Relation*, which reported a series of experiments undertaken to test the validity of Bergson's distinction of the two types of memory. Five tests were used. Two dealt with mechanical associations in nonsense syllables and motor activities, while three involved recognition, analytic ability and intelligence. A high degree of correlation was established between the tests of each group, while the correlation was low between tests of the two groups.

"Imageless thought" came in for a share of the discussion in the paper of Miss S. S. Fairhurst (read by C. S. Myers) on the *Analysis of the Mental Processes Involved in Spelling.* Her investigation indicated that "imageless" spelling is an important factor, which

involves a distinction between the knowledge of the facts of spelling and mere reference to imagery. Also in the paper on the *Conditions which Arouse Mental Imagery in Thought*, C. Fox reported experiments in which the meaning-process aroused by a series of statements, true and false, was introspected. Mental images were found to be absent in about 50 per cent. of the reports, and when present they seemed to be occasioned by some delay or hindrance in the process. It was of some interest to note that the acceptance of imageless contents appeared to arouse no serious opposition.

The Freudian psychology was debated in connection with a paper on *Psycho-Analysis* by William Brown, in which the Freudian theory was summarized, and in *An Analysis of Some Personal Dreams with Special Reference to Current Theories of Dream Interpretation*, by T. H. Pear. The last-named speaker discussed dreams illustrative of the dramatizations, condensations and displacements which the Freudian views have made familiar. A second paper by T. H. Pear and one by Stanley Wyatt dealt with the psychology of testimony in normal and defective children.

Among the papers which bore upon educational psychology may be mentioned Miss I. Suddard's *Investigation into Spelling in the Fielden Demonstration School*, which indicated the appearance of the "spelling disease" with the beginning of free composition, and the possibility of lessening its evil effects by postponing free composition and keeping the work under the teacher's control until proper spelling habits had been formed. Miss S. S. Fairhurst, whose work, mentioned above, formed the basis for two reports, found that the articulation of letters was of no direct aid in spelling, but that the articulation of syllables, which constitute the phonic units of spelling, when simultaneous with the writing of the word, is probably the best method of learning to spell. Her results indicated further that spelling efficiency is independent of the imaginal type of the speller.

Sir William Ramsay found the occasion of these reports emphasizing the difficulties of learning to spell opportune for a few remarks in support of the English movement to reform spelling by making it phonetic.

C. W. Valentine reported some experiments on the *Method of Teaching Reading*, which indicated that the phonic method is preferable to the "look and say" method.

E. O. Lewis reported some experiments in learning of unfamiliar words and pictures, which substantiated previous indications that the

method of learning by wholes is better than that of learning by parts, although in the case of unfamiliar words the syllabic unit was found to be economical.

A mass investigation on *Practice Improvement in Immediate Memory in School Children* was reported by J. L. McIntyre. The tests were made with meaningless syllables, and the results showed the marked superiority of girls over boys, and of town over country children. It was also shown that a considerable amount of improvement of ability gained by memorizing syllables was available for ordinary school work.

Miss A. L. Rogers reported upon the *Application of the Binet-Simon Tests to Normal Children in Scotland*, which was made in conjunction with Dr. McIntyre. The scale was found to be too easy for the early years and too hard for the later years, but on the whole reliable. More exceptional boys, both gifted and deficient, were found than girls.

R. C. Moore's paper on *Tests of Reasoning and their Relation to General Ability* (read by C. Burt) and W. H. Winch's paper on *Additional Tests for Reasoning Suitable for the Mental Diagnosis of School Children* indicated the feasibility of such tests. Mr. Moore's analogies, syllogisms and arguments showed a higher correlation with teachers' estimates than do the average Binet tests, while Mr. Winch's ingenious problems seemed to furnish a natural means of testing reasoning ability unrelated to school work. Mr. Cyril Burt's mass investigation on the *Mental Differences between the Sexes* indicated that the differences grow progressively slighter as one proceeds from instinctive to acquired capacities. The females showed superiority in skin discrimination, memory, reading, writing and finding opposites; the males in tapping tests, addition, multiplication, argument and syllogistic exercises.

Space permits but brief mention of the remaining papers which were presented. C. W. Valentine reported an ingenious test of *Color Perception and Preference in a Three Months Old Infant.* Nine colored wools were presented to the child in pairs for two minute intervals and the time in which each color was attended to was recorded. The results indicated the following order of preference: (1) yellow, (2) white and pink, (3) red, (4) brown and black, (5) green and blue, (6) violet. The brightest colors were in general preferred but the marked difference in preference between red, green, blue and violet, all of which were equally bright, is noteworthy.

Godfrey Thompson's paper on *Variations in the Spatial Threshold*

reported upon experiments which indicated a sharp fall in the threshold during the first twenty judgments, followed by a slow rise to about forty, after which it became erratic, but often fell again at the end of the sitting. The speaker concluded that the average threshold is a matter of mathematical definition and not a psychological experience: that for psychology no real threshold can be established.

Only one paper was read on animal psychology, *A Note on Habit-Formation in Guinea Pigs* by Miss E. M. Smith, in which the speaker described two tests now being used in the Cambridge laboratory with the aim of studying the inheritability of such characters as learning, practice, accuracy, retentiveness, etc.

Shepherd Dawson's *Simple Method of Demonstrating Weber's Law* was the only title which suggested the technique of apparatus. Mr. Dawson's method consists in rotating white and gray disks punctured upon a radius with equally sized holes against a black background. The relative brightness of the rings thus produced tests the law by the simple procedure of counting the number of rings which can be seen on each disk.

A mass investigation on *The Relative Fertility and Morbidity of Normal and Defective Stocks* showed greater fertility and morbidity for the defective than for the normal stocks.

Two papers bearing upon fatigue were read, by Miss Mary Smith: *Some Experiments on Recovery from Fatigue*, and by J. H. Wimms: *A Comparative Investigation of Fatigue Tests*.

Dr. Auden read the report of the Committee of the Education section on *The Relation of School Books to Eyesight*. The Rev. J. Knowles addressed himself to *The Need of a Common Alphabet for the Vernacular Languages of India*. *A Plea for Research in Education* was made by C. W. Kimmins and supported by brief remarks from C. S. Myers, J. J. Findlay, J. A. Green and C. Burt. A paper on *The Excessive Use of Suggestion in Education* was presented by Mrs. Meredith, while the concluding title of the program was *Contrast as a Factor in Psychological Explanation*, by W. G. Smith.

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SOCIOLOGY AND PSYCHOLOGY[1]

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The methodological conceptions which should guide investigation in ethnology, anthropology and sociology have been for several years past a subject of lively discussion. It would be well if the psychologists took an active part in these discussions, since the conceptions urged by the innovators ascribe to psychology a place in those sciences denied to it by the older views.

In sociology the attack of those who realize that a purely objective, non-psychological method is inadequate has been directed chiefly against Durkheim. In anthropology the main object of criticism has been the so-called "evolutionary method" which greatly minimizes the influence of the psychological factor in the development of culture.

I criticize below Durkheim's methodological ideas and take that opportunity of illustrating the function of psychology in the study of certain social facts.

Durkheim holds that the origin and development of religion are exclusively a concern of sociology. "It is thus a corollary of our definition that the origin of religion is not to be found in individual feelings or emotions but in states of the *âme collective*, and that it varies as do these states. Did religion arise out of the constitution of the individual, it would not appear to him in a coercitive aspect. . . . It is consequently not in human nature in general that one must seek for the determining cause of religious phenomena, it is in the nature of the society to which they belong; and if they have

[1] The larger part of this article has appeared in a somewhat different form in a paper published in the *Amer. J. of Sociol.*, November, 1913.

varied in the course of history it is because the social organism itself has changed."[1]

Societies are governed, we are told, by laws necessarily proceeding from, and expressing the nature of these societies. Such laws are different from the laws of individual psychology because the social is not the same as the individual constitution. Why resort to introspection when we know that most social institutions are transmitted ready made? How could we by questioning ourselves discover the causes from which these institutions arose? Moreover, we do not always know the real reasons for our actions, neither do we know all of them. And, for the rest, each individual plays but an infinitesimal rôle in the formation of the group life.[2]

The discussions which have arisen on the appearance of *Les règles de la méthode sociologique* suffer, I fear, in several instances from the lack of a clear differentiation between individual psychology and a psychology of conscious individuals as they are affected by, and as they affect, the group to which they belong, *i. e.*, social psychology. Individual psychology includes the topics usually dealt with in the psychological manuals of the kind now termed "structural." It deals with the attributes of sensations, the threshold of stimuli, the discrimination sensibility, the relation of sensation to the pleasant and the unpleasant, the connections of sensations; with the laws of recall, the psychological and physiological conditions of attention, etc.,—all this without reference to the particular influence exercised upon mental life by the existence of other conscious beings. The recent psychology commonly called "functional" has an inherent tendency to pass into the field of social psychology which is primarily concerned with the effects wrought in individuals by the consciousness of the group to which they belong, and with the common behavior prompted by the consciousness of the group.

In the writings from which I quote, Durkheim does not once mention *social psychology*. But he opposes throughout "individual psychology" to "sociology." He writes, for instance, "even though individual psychology had no longer any secrets for us, it could not give us the solution of any of those problems [the problems of sociology], since they refer to facts of an order outside the range of individual psychology." I would not dissent from this statement, provided "sociology" means or includes the psy-

[1] "De la définition des phénomènes religieux," *Année sociol.*, 2, 24.

[2] Preface to 2d ed. of "Les règles de la méthode sociologique."

chology of groups of individuals, in so far as they affect the social body and are affected by its presence. But if this and other similar passages should mean that sociology is not concerned with the interpretation of social action in terms of consciousness, that it can dispense with the introspective method, *i. e.*, that sociology must limit itself to the observation of the external activities of man, then the astonishment and the opposition which the methodological writings of Durkheim have inspired are, it seems to me, legitimate. "Sociology" may, however, be used by him as a brief synonym for *social psychology*, or at least as including this branch of psychology; if so, his position becomes, to me, unobjectionable. Unfortunately, even after the explanations provided in the preface to the second edition of *Les règles* there remains ample cause for perplexity.

That sociology and individual psychology have little in common, I fully admit. The question I wish to consider is not the relation of sociology to individual psychology, but to social psychology. *Can the origin and the nature of religious practices and beliefs be fully understood when observed from the outside, as overt actions, without the assistance of a psychological interpretation of the states of consciousness which they express?* Ceremonies are the outcome of more or less clear mental processes taking place in individuals, under the influence of other conscious agents feeling, thinking, and acting as a unit. The so-called "social" forces before which the believer bows come to him as ideas, feelings, impulses, desires. I maintain therefore that the full understanding of social life demands not only the observation of the external outcome of the collective life of conscious beings, but also its interpretation in terms of consciousness, and I shall now attempt to point out the need of psychological investigation in the study of religion.

Whether one holds (as I do), or not, that the proper use of the word *religion* involves belief in unseen, hyperhuman powers, usually personal, the genesis and development of the god-ideas constitute one of the important problems of the origin of religion. Primitive gods are in many instances ancestors deified. But how and why have ancestors been deified? What are the needs which prompt to deification and what are the mental operations involved in the process? These questions require psychological answers. It is but the beginning of a solution to say, for instance, that the gods of any particular tribe are water-gods because the tribe's life is dependent to an unusual degree upon the ocean. Fish are altogether dependent upon water, yet they have no gods.

In questioning civilized persons, one discovers that certain of them live in a world peopled by invisible beings and others are entirely free from that belief. This difference appears not infrequently between persons brought up together in the same family. One member of the family has rejected gods, angels, and demons; another has incorporated them in his social group. There are individual psychological affinities and immunities. The sociologist who would go to the bottom of the question of belief and creed must perforce inquire not only into the external influences to which these diverging persons are equally submitted, but he must turn psychologist and examine the individual causes of the observed divergences.

God-ideas may arise in several ways in addition to the direct deification of great chiefs: in naïve attempts to explain certain facts of common observation (dreams, trances, swoons, etc.), in the personification of striking phenomena (thunder, vegetation, etc.), in answer to the problem of creation.

How shall one get in any particular instance to the origin of a god-idea? One cannot question those who first gave it form; they have gone forever. And if one questions the existing savage, one finds usually that he cannot give a satisfactory account of his belief and behavior. Nevertheless, much has been learned from the savage's own account of himself. The psychologist may supplement the knowledge thus secured by an examination of the child's mind. And he may further by self-introspection secure much that may serve in the interpretation of the behavior of primitive man. Durkheim's remark that we do not always know the true reasons, nor all the reasons, for our actions is evidently true. But it is just as true surely that we usually know some of them and that a study of actions considered objectively does not more exactly or fully reveal all the motives of behavior. By getting introspective descriptions from many persons of the causes of the same actions, one has as good a chance, it would seem, to make a full and exact discovery of causes as by an external method. *In any case, I do not know why one should neglect either of these methods when searching for the genesis of the god-ideas.*

Another set of problems with which the sociologist must deal in collaboration with the psychologist treats of the effects of religious institutions upon society. The tonic value of the belief in benevolent gods; the use made of them for securing physical goods or subjective qualities with which gods have been endowed by the

very persons desiring these qualities; the peace, the assurance, the joy that are the most common fruits of the ethical religions; the sense of divine presence; the transformations, at times marvelous, happening in many persons under the influence of religious convictions,—these and other similar problems demand descriptions and explanations which cannot be provided altogether by psychologists or by sociologists working independently of each other.

The influence of ethical needs and purposes upon the development of religion is obviously very great. Most religious reformations have had as starting point ethical demands. Would it not be preposterous in an investigation of these transformations to refrain from turning to the introspective data which reformers have left us, and from interpreting in the light of our own consciousness of ethical relations their autobiographies, letters, didactic writings, etc.? Are not these writings a unique source of information as to how these individuals apprehended social life and why they rejected certain of its beliefs and practices while they struggled and even died in order to introduce others?

Is there, for instance, nothing of importance to be learned in a psychological study of Luther's life, of his temperament, of his ethical and æsthetic sensibility, by the sociologists desirous of understanding the causes of the transformation of religious institutions in which he was the chief individual instrument? The day is indeed past for believing that an individual, however mighty, can cast society in any mold shaped by his fancy. We know now that the men who have left their impress upon society have been privileged to do so because they were the instruments of communal forces. But the brilliancy of this discovery should not blind us to the share belonging to the individual in the social work. Why is it that Luther and not some other one of the millions of his fellow-countrymen became the Reformer? Is it merely because he alone was placed in just those external circumstances which would make of a man the reformer that he was? The external influences which acted upon Luther were, without doubt, indispensable, but must not Luther himself be considered an original center of energy? Do not Luther's internal struggles with certain passions, his consciousness of sin, and the final triumph of faith under peculiar circumstances, throw a light upon the Lutheran doctrine of justification by faith which cannot be shed by a merely external study of the behavior of the reformer and of the doctrines he set forth?

Expressed in more general terms, my contention is merely that

individuals do more than reflect social life; they modify it, for they are centers of creative energy. Identical circumstances acting at the same moment upon two persons will not produce identical effects, for no two men are identical.

When an economist tells us that a study of economic conditions covers whatever need be known in order to understand and predict the number of suicides, he forgets that there are other factors affecting man's life besides poverty. Are there not men who delight in want and privation, who voluntarily seek poverty and starve their bodies, not to destroy but only to rule them? What definite and exact relation would there be between suicide and poverty in a community possessed by the ascetic's ideal to which I allude? And is it not well known that ideas are contagious, particularly in certain persons and in certain circumstances, and that there are epidemics of suicide, the partial cause of which is to be found in individual suggestibility?

The place belonging to the introspective, the psychological method in the study of social life is indicated by the character of social facts—a character recognized by Durkheim himself; they consist, he wrote, "in ways of thinking and acting." Since the units of the social groups are conscious beings, the ultimate explanation will have to be given in psychological terms, *i. e.*, sociology is a psychological science of which the observation of social institutions is merely the starting point.

SPECIAL REVIEWS

SOCIAL PSYCHOLOGY

The Doctrine of Evolution and Anthropology. CLARK WISSLER. *Amer. J. of Psychol.*, 1913, 6, 223–237.

Anthropologists no more than sociologists are agreed as to the methodological conceptions by which their investigations should be guided. The "English School" accepts the so-called "evolutionary," while the "American School" adopts the "historical" conception. In this connection the significance of the two terms is apparently not exactly understood by all anthropologists. Dr. Wissler, in this address, endeavors to define these conceptions and to show their relation to biological evolution and to culture.

According to the evolutionary theory, as the author understands it, the social and psychological development of man proceeds along with, or is caused by, a biological development. In opposition to the "somewhat naïve" assumption "that the advance in culture is part and parcel of an advance in morphology," our author holds that the human individual is "born with a full equipment of instincts to develop and participate in any culture he may happen to be born into," but not with any instinct, or psychophysiological mechanism for the production of *particular* cultures. There is, for instance, no inherited aptitude to acquire a particular language, although "there doubtless is an instinct to form a language—a human innate character common to all men."

It should be understood, however, that when the historical anthropologist opposes the evolutionary method, he "is not for a moment denying that cultures evolve or grow, he is only denying that this growth is an integral part of biological evolution." He affirms that that which in any particular case determines the appearance or the order of appearance of social phenomena is not a biological, a morphological evolution taking place in a uniform order in the whole human race, but that external circumstances such as geographical environment, density of population, proximity of different groups, etc., are the causes of cultural development. Since these factors are not the same for each group of men, cultures cannot be expected to follow identical lines. As a matter of fact

ethnologists have discovered that the uniformity demanded by the evolutionary conception was not always to be found, and that in many instances the same stage of culture was produced by different causes. When one dissociates the course of culture from biological evolution, one is left with the alternative of accepting the historical theory according to which not biological, but other factors direct cultural changes.

The historical method holds that "there is a history of cultural activity for each particular group of mankind, and that the culture of any given moment is only to be interpreted by its past." The term "historic" used in this sense is not altogether satisfactory to our author; he suggests replacing it by "cultural."

Religious Chastity. JOHN MAIN. New York: (publisher's name not given), 1913. Pp. xii + 365.

A mass of information regarding the customs centering about widows and sexual relations scattered until now in hundreds of books and journals is gathered in this book and classified in an illuminating manner. The volume possesses, moreover, the distinction of a vivacious and often elegant style.

The preface opens with the words "In Ethnology as elsewhere evolutionary theory has been running amuck." The fallacy of taking differences in culture to mean differences in mind is due, the author declares, to a failure to push analysis of custom far enough back, and we are offered this psychological key to the varieties of customs which regulate the behavior of widows: "In one society, widows shave their heads, or scarify themselves; in another they are burned or stabbed or strangled to death; in another, they live to care for the grave or cherish the memory of the dead; *but in all, they do what they think the dead would most like.*" One of the main purposes of this book is to establish this thesis.

Many otherwise puzzling customs are readily understood when one keeps in mind two groups of well-known facts: (1) The departed husband is still at times at least actuated by needs and desires characteristic of mortals; he remains in communication with, and his thinking is of the same sort as that of, the living; whether the widow and the tribe are still attached to him by affection and admiration, or whether he is looked upon as evil and dangerous, in any case uncertainty and mystery attach to much of his behavior. (2) Since, after all, the ghost does not actually discharge the duties which fall to the living—whether toward his widow or the tribe—

and does not return to plague his widow and the second husband, increase in experience generates increase of resistance to the demands of the ghosts. Some of these demands are so uneconomical or painful that they come to be replaced by customs less wasteful of life or wealth. By various subterfuges the belongings of the dead at first burned or buried with him, probably in fear "lest they might entice him to fetch them, and later that they might prove useful to him or redound to his credit in the habitat which had come to be imagined for him," are saved, first in part and then in totality. Similarly, the luxury of widow immolation is replaced by many different customs, "for the widow is too valuable an inheritance for the poor man's heir to forego;" or the widow is saved and performs various services for the God and the temple—services by which the living are benefited.

Religious chastity will be particularly profitable reading to those who are still hampered by the so-called "evolutionary" conception of anthropological development. They will find here both identical customs proceeding from different desires (for instance, cannibalism, p. 78) and different customs arising from one and the same desire.

This book will be also valuable to those anthropologists and sociologists who have not fully realized that the complete understanding of human society cannot be obtained by the objective method alone. The explanation of behavior demands reference to principles of social psychology.

With a few exceptions each chapter opens with a proposition which is then justified and illustrated. For instance, "exorcism or propitiation is necessary to ward off specific outbursts of ghostly malice or to get immunity from a generalized danger from the dead." (The haunted widow.)—"Perhaps the most general and certainly the most consequential guarantee against ghost walking is . . . the gratification of the proprietary sense of the ghost." (The immolated and suicidal widow.)—"Where dead men become ghost-gods, their devoted widows readily become their priestesses." (The widow-priestess.)—"Despite human ingenuities the gods are not patient polyandrists. They are apt to discard the makeshift of marriage by proxy, and to insist upon exclusive proprietorship—theoretically at least. Their demand is met by the priestess-wife." (The priestess-wife.)

A bibliography containing about 650 titles gives some idea of the thoroughness with which the author has ransacked literature in order to make a complete picture of chastity and unchastity in their relationship to religion.

The Social Significance of Myths. W. H. R. Rivers. *Folk-Lore*, 1912, 23, 307–331.

The author had suggested in a previous publication that the various forms of social organization found in Australia are the outcome of a blend of peoples. In the paper now reviewed, he offers an argument for the same opinion, taken from the frequency among the native Australians of certain kinds of myths. I reproduce in outline this interesting argument.

In order to account for the particular kinds of things which become the subjects of myths, he suggests this principle: "It is not the especially familiar and uniform which becomes the subject of myth . . . for this purpose there is necessary such an element of variety and of apparent, if not real, inconsistency, as will attract attention and arouse curiosity." As social customs and organizations are among the most familiar and constant experiences of primitive man, one should not expect to find many myths explanatory of social custom or organization. As a matter of fact, narratives of a mythical kind which serve to account for social conditions occur but seldom among the records of savage peoples—so seldom in fact, that this class of myths is not even mentioned by most anthropologists.

When one turns to the Australians, one is startled by the fact that most of their myths deal definitely and explicitely with social conditions. It turns out further on investigation that these myths refer chiefly to the totemic side of their organization and not to the dual organization found in combination with totemism throughout Australia. Now, if the Australians are not a homogeneous people, if they have arisen from a fusion of different tribes, one can readily understand the presence of myths explanatory of social organization. One need only suppose that some of these tribes were organized according to the totemic clan system. This system would then call to itself forcibly the attention of the tribes which merged with those in possession of the totemic system.

There are many difficulties in the way of a successful application of the principles here formulated. Several of them are considered and satisfactorily disposed of by the author.

New Religions Among the North American Indians. Alex. F. Chamberlain. *J. of Relig. Psychol.*, 1913, 6, 1–49.

Both anthropologists and social psychologists will find much to interest them in this historical paper in which are listed and char-

acterized, besides a number of others, no less than 21 "new religions" of the North American Indians.

The account begins with the Pueblo new religion and revolt of 1680 and proceeds chronologically up to the Ghost Dance religion which began about 1890. Brief as these descriptions are, they set forth forcibly the motives of religious fervor among the Indians. These motives are of two kinds, racial or patriotic and ethical. They either aim at deliverance from the yoke and influence of foreigners or they seek to uproot moral evils and to establish higher habits of life; more usually they seek both autonomy and a higher morality. These two classes of motives, it will be observed, express fundamental human needs and are therefore present in all religions that have reached a certain stage of development. Of Handsome Lake, the Seneca chief, we are told, for instance, "His precepts and teachings, based largely on the ancient custom and faith, but recast to adjust them to the new conditions, contemplated the regulation of family life by pointing out the respect and duties that should subsist between husband and wife, and between parents and children, and the need of chastity and continence and by the inculcation of industry and thrift" (p. 14).

In these movements, the influence of the missionaries is plainly visible, yet one may find also abundant indication of an originality with which savages are not always credited.

Visions and trances play a conspicuous rôle in the establishment of these religions. Their teaching is offered as a revelation from other worlds. One singular feature of many of them is that dancing is their chief means of expression, and, therefore, of propagation.

J. H. L.

Race Psychology: Standpoint and Questionnaire, with Particular Reference to the Immigrant and the Negro. W. I. Thomas. American Journal of Sociology, 1912, 17, 725–775.

The author states that the plan for viewing and collecting materials here given is one that he has used in investigating the peasants of Europe and the Negroes, and is offered "not as a contribution to theory, but as a tool." However, there is a definite and comprehensive conception of mentality presented which may be said to characterize a considerable body both of field workers in anthropology and of theorists. The standpoint employed has points of affinity with that outlined by Dewey and Boas some years ago, and with that of F. von Luschan's recent article in Spiller's

Inter-Racial Problems, but the method of interpretation is distinctive because of a certain breadth of sympathy which suggests Bergson's description of the gift of intuition which comes from a long living with a fascinating subject matter. In the writer's *Sex and Society*, the social-psychological standpoint was used to determine the conditions explaining likenesses and differences between the mind of woman and the mind of lower races. In his *Source Book for Social Origins* a more extended field was covered. Extracts from standard writers, comments, and an extended bibliography on economic environment, education, invention, marriage, art, magic, religion, myth, morals and the state were presented. In this syllabus the same fields are reviewed with reference to the problem of race.

The standpoint used in the work of Professor Thomas is summarized as follows: "Without ignoring economic determinism or denying the importance of specific race characters, I have assumed that individual variation is of more importance than racial difference, and that the main factors in social change are attention, interest, stimulation, imitation, occupational differentiation, mental attitude, and accessibility to opportunity and copies. In other words, I have emphasized the social rather than the biological and economic aspects of the problem."

The main concepts employed are habit, crisis, control, and attention. Each of these is given a broad meaning. Habit includes social coördinations, the *mores* of groups, crisis is any slight or violent disturbance in the individual-social organization, and attention covers the whole process by which fundamental life problems are grappled with. Within the socio-individual conflict-situation the various processes of consciousness emerge. Motor tendencies antedate feeling and ideational processes. The mentality of peoples should be judged in relation to their distinctive problems and specialisms, not in relation to some imputed standard set up by a group animated by a protective egoism. There are no "pure races" in Europe, and the supposed superiority of some is due to an accumulation of tradition, technique, and abstract formulas. But accumulated culture may be assimilated by mediocre minds and is not to be confused with mentality proper, the power to cope with serious problems. As regards perception, memory, inhibition, and abstraction, the savage shows no inherent deficiency when we estimate his mentality in relation to its context of occupation, technique, and customary run of attention.

Excerpts from sources relating to the various topics, selected references, directions for carrying on observation and organizing anthropological data, and a list of suggestive questions for the guidance of students are included in this valuable article.

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The Will of the People. WILLIAM MCDOUGALL. The Sociological Review, 1912, 5, 89–104.

Both Rousseau and his critics have failed to clear up the ambiguities in the doctrine of the general will. This has been due to an inadequate conception of collective psychology. The intent of the article is to define the nature of volition according to lines mapped out in the author's *Social Psychology*, and to determine by analogy the characteristics of collective volition and collective action as contrasted with lower forms of collective striving and acting. "Individual volition is essentially distinguished from lower forms of acting and striving by the fact that, in some peculiarly intimate sense, the striving is governed and maintained by self-consciousness: it is distinguished from acting which issues directly from desire or impulse or from a conflict of desires or impulses, by the fact that the idea, the thought, of one's self plays a dominant and decisive rôle in the process."

This conation has an existence and organization of its own distinct from the secondary system of ideas; an idea moves us when it awakens, excites or is associated with specifically directed conative tendencies. The linking of an idea with latent dispositions is the process of forming sentiments; these by organization and elaboration constitute character. Chief among the sentiments is the sentiment for that object of thought which we call the self. This "self-regarding sentiment" essential to the higher form of volition may be amalgamated with concrete objects, as one's dog, or with abstract objects, as benevolence. An important item for social psychology is that man normally acquires sentiments for the highly complex objects constituted by groups of persons, large or small,—such as family, party, or college. The essential conditions of the formation of sentiment for a group is (1) that the group be permanent enough to be recognized as such by men in general, (2) that each member thinks of himself as belonging to the group, (3) that "the group shall be one that lives among other similar groups, maintaining and asserting over against them its corporate existence,

and made by them the object of judgments of value, of praise and blame, approval and disapproval, of friendly and hostile feeling, of emulation, rivalry, or opposition."

The self-regarding sentiment, originally directed toward the individual self, thus becomes extended to the degree that man identifies himself with his family and with larger groups. "In so far as such a complex dual sentiment grows up in the minds of each member, the group-spirit is powerful, the group has a true collective self-consciousness, and is capable of a truly collective volition." When unmediated impulses which are present in lower forms of striving are controlled by group-sentiment aiming at the common good, we have a case of collective volition.

The parallel between individual and collective volition is this: "The individual volition is governed by individual self-consciousness, *i. e.*, by the self-regarding sentiment of the individual or by the impulses and desires that are awakened within this sentiment. Collective volition is governed by collective self-consciousness, *i. e.*, by the impulses and desires that are awakened within the collective self-regarding sentiment, the extended self-regarding sentiment which makes each member regard the good of the group as his own good."

From the standpoint of the analysis summarized above Professor McDougall suggests that the doctrine of Rousseau should be corrected in three respects: (1) The genesis of the collective self is not voluntary association, but is the development of the sentiment for the nation in the minds of citizens by the gradual evolution of institutions, tradition, and intercourse. (2) A collective self is possible in a large community, as distinguished from Rousseau's requirement of a small deliberative body; small groups, reciprocally acting, are essential if a truly collective deliberation is reached in large modern states. (3) Rousseau's doctrine of the common good is ambiguous, and is most applicable to the highest form of collective volition in which common purpose, tradition, memories, participation in crises, and harmonious action have developed the notion of a group which determines individual conduct. In lower forms of collective striving the object aimed at is the good of all, since here the private good of the several members of the group is most urgent, not the good of the whole.

The distinction between the good of all and the good of the whole is applied finally to the national life. Real patriotism or nationalism is identified with the highest form of collective striving.

"And the nation is capable of truly collective volition only so far as the organization it possesses, in the form of institutions and traditions, enables it to deliberate collectively for the good of the whole as such, such deliberation and action being moved and sustained, not by the desire of every man for his own private good, nor yet by the desire of every man for the good of all, but by the desire of every man for the good of the whole, a desire which is rooted in and springs from the collective self-consciousness, the collective self-regarding sentiment *of* the whole *for* the whole." National sentiment must be cultivated, the writer urges, in order that there may be stimulus for moral effort to take the place of the supernatural sanctions which are now losing their hold on the population.

The article has been outlined at some length because it reveals a significant tendency operating in the development of social psychology. It is a hopeful indication for the future of the new science if it insists upon proceeding pragmatically: Dr. McDougall's method of dealing with national problems from the approach of psychology is evidence of this insistence. There is a statesman-like quality in the spirit of Bentham and the Utilitarians which ought not to die, however inadequate their mechanical assumptions now appear. Professor McDougall's contribution adopts the social outlook of the Utilitarians while fundamentally it is a criticism of Bentham's main theses. Wallas and Bligh also display the same pragmatic interest, the latter anticipating the gradual increase of a body of experts in social psychology who will utilize the principles of human nature in planning and directing individual and national improvement-enterprises, somewhat after the manner of the Freudian practitioners.

In one respect, however, the article is not quite satisfactory. As noted before, it pleads for a collective volition or nationalism. The author contends that the object, *humanity*, is too vague to elicit devotion. But one of the excellent points urged is that no group forms a wholesome group attitude without the correction and opposition of other groups. Consequently, in order that a national, patriotic consciousness may develop it is necessary that coincidently a consciousness of the wider group comprehending the various nations shall evolve. The international consciousness is not to be identified with the vague abstract entity humanity, as seems to be implied.

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INDIVIDUAL RELIGIOUS PSYCHOLOGY

Mysticism

Never before, perhaps, have so many scholarly psychological publications appeared on religious mysticism as during the last few years. This activity is a natural consequence of the recent extension of psychology in certain abnormal fields. When phenomena of a non-religious significance, but somewhat similar to those of mysticism, had been investigated in hysteria and elsewhere, and had received an explanation according to theories of the subconscious, the striking experiences of the mystics could not be expected to escape longer the curiosity of the psychologist.

The psychological studies of mysticism may be considered to have begun with Murisier's *Les Maladies du Sentiment Religieux* published in 1898. He was followed in chronological order by Recéjac, Leuba, Poulain, Delacroix, Pacheu, Von Hugel, Maréchal and others.

The non-transcendental point of view and certain conclusions of most of the writings of non-Catholic authors have aroused the Roman Catholic world to a defence of the supernatural in mystical experiences. There have appeared in the reviews for 1912, notably in the *Rev. de Philos.*, published under the direction of a professor of the *Institut Catholique* of Paris, a number of articles with a marked polemical character. The abstracts of the papers of Pacheu, Maréchal and Huc will show what points are the storm centers of the discussion.

Mysticism; a Study in the Nature and Development of Man's Spiritual Consciousness. Evelyn Underhill. London: Methuen & Co., 1st ed., 1911. Pp. xi + 600.

The library success of this large volume (three editions were published from March, 1911, to January, 1912) following close upon Baron von Hugel's work in two volumes, *The Mystical Element in Religion*, is a token of the lively and widespread interest in psychological studies of mysticism as well as a tribute to the literary, and, I must add, semi-popular qualities of this work. It cannot be compared in point of scholarship and of psychological penetration, with von Hugel's book, and still less with Delacroix's *Etudes d'Histoire et de Psychologie du Mysticisme*. This the author would readily admit, for she modestly informs the specialists that her book is not for them.

In the course of the two parts of this book, called respectively The Mystic Facts and The Mystic Way, almost every topic belonging to mysticism is discussed or at least touched upon. The first part deals with the relation of mysticism to vitalism, psychology, theology, symbolism and magic. It is preparatory to the second part which is "avowedly psychological," and consists essentially of an analytical description of the mystical ascent to God. The author's relish for the mysteriousness and picturesqueness of the "mystical adventure" is in evidence throughout. Her success in conveying the tang of the various phases of mystical experience by the quotation of apt phrases is admirable.

One of the most interesting chapters is the one on Mysticism and Vitalism. She indicates in it broad similarities between the conception of the nature of reality of the scientific Vitalists and of such philosophers as Bergson and Eucken. According to her, we see in the Great Mystics "the highest and widest consciousness to which the human race has yet attained" (p. 532). She has no doubt that in that consciousness man possesses Ultimate Reality, God. It is unfortunate that writers on mysticism do not start with experience and define their terms with reference to it. They begin instead with a highly abstract notion of the Ultimate Reality derived from philosophy and freighted with weighty implications, and then turn to mysticism for a description of this reality. Under these conditions they cannot help reading into that experience much more than really belongs to it.

According to our author the apprehension of Ultimate Reality proceeds from, or is by means of, "the organ of man's spiritual consciousness." This "organ" or this "sense," as she also calls it, seems to be either identical with, or a part of subconsciousness. "Transcendental matters are, for most of us, always beyond the margin; because most of us have given up our whole consciousness to the occupation of the senses, and permitted them to construct there a universe in which we are contented to remain. Only in certain occult and mystic states: in orison, contemplation, ecstasy and their allied conditions, does the self contrive to turn out the usual tenants, shut the 'gateways of the flesh,' and let those submerged powers which are capable of picking messages from another plane of being have their turn" (p. 67). The author finds proofs of the supernatural character of the mystical life in strange places. The fasting of the Italian Catharines who "whilst fasting, were well and active," and who were made ill during these fasting periods

by every attempt at eating, seems to her one of the "unsettled problems of humanity" (p. 71). Acquaintance with the psychophysiological investigation of Agostino Levanzin[1] during his recent thirty days fast, and with the effect of suggestion, especially in a temperament like that of the two women in question, would it seems rob her of this, to her delightfully attractive, wonder.

Quelques réflexions sur la méthode en psychologie religieuse. JULES PACHEU. *Rev. de philos.*, 21, 371–391.

The respective provinces and tasks of literary criticism, scientific criticism, and philosophical or "interpretative" criticism are described in a general way. The main purpose of the author appears to be to enforce the recognition of the right of psychology to examine the facts of consciousness, whatever they are, and of the right of philosophy to complete the work of science by interpreting its findings.

It seems to the author "infinitely probable" that the problem peculiar to mysticism cannot be "exhausted" by scientific study. This signifies that mystical experience includes in all probability facts pointing to a superhuman intervention in consciousness, facts not explicable scientifically. It is not out of place to observe that the Roman Catholic cannot relinquish this conviction without renouncing his church. Such a position is dangerous for a scientist however robust may be his love for truth.

Sur quelques traits distinctifs de la mystique chrétienne. J. MARÉCHAL. *Rev. de philos.*, 21, 416–482.

The author of this long paper, professor at the *Collège Philosophique et Théologique* of Louvain, is evidently well qualified to deal with his topic. After a few preliminary pages he passes to a brief survey of the most important phenomena of the mystical life. It is shown to be characterized by a number of negative traits belonging as well to the Christian as to the non-Christian mystic, and to complete itself, at least in the higher forms of Christian mysticism, by a positive phase. These negative features are the disappearance of discursive thinking, of special imagery and the loss of self-consciousness. They result from "a very narrow internal concentration, supported by a very intense affective movement."

Abnormal "somatic and psychophysiological" manifestations

[1] This journal, February 15, 1913, pp. 83–84.

delay the author only long enough for him to acknowledge these phenomena to be the natural result or accompaniment of the excessive mental tension to which the mystic is subjected. "The psychophysiological concomitants bear merely an accidental and a variable relation to the state of inner prayer (orison)." Thus, in common with the best informed Roman Catholic scholars of the day, he surrenders to the natural order phenomena which not very long ago were regarded in the same quarter as supernatural.

His survey of mysticism leads him up to "a very delicate psychological problem," "the true problem of ecstasy." When spatiality, images, and the idea of the conscious self are abolished, what remains of the intellectual life? Multiplicity has disappeared, but what is the Unity which takes its place?

According to our author, three solutions of this problem have been offered: (*a*) *The absence of multiplicity, of discursive thinking in ecstasy is merely apparent.* That which some mystics describe as total absence of consciousness is really a very vague state of consciousness, in no way different in kind from ordinary consciousness. If one were to examine these states narrowly, one would discover in them imagery and spatiality. This interpretation does not satisfy Maréchal. for, as he points out, the great mystics place the state of Union far above any spatial or temporal intuition. They speak of it as something incomparable with ordinary conscious states. They have a conviction of a radical difference between Union and any ordinary state of consciousness. This judgment of the mystics Maréchal chooses to accept as valid.

(*b*) *Ecstasy is total unconsciousness.* This opinion seems to the author legitimate from a logical point of view. "The alternative is unavoidable: either multiplicity of conscious contents, however slight, or total unconsciousness." But though Maréchal would not blame a scientist for accepting this second alternative, he himself cannot do so because the mystical description of their own condition (briefly reproduced above) does not permit of that solution. He remarks that there are several kinds of unconsciousness. "The only kind of unconsciousness admissible in the explanation of ecstasy would be in any case 'a polarised unconsciousness,' the religious value of which is not a negligible quantity."

(*c*) The solution which the author makes his own is that "*ecstasy is the synthesis of an empirical negativity and of a transcendent positivity.*" That is, on the one hand ecstasy separates itself by the negative characteristics mentioned above "from the psycho-

logical states, normal or abnormal, of ordinary life," and, on the other hand, "the suspension of conceptual thought is not total unconsciousness, but on the contrary, an enlargement, an intensification, or perhaps even a higher form of intellectual activity." In this higher phase of ecstasy "intelligence instead of constructing, according to analogy and approximately, its object with material secured from the senses" may "reach that object in an *immédiate assimilation*." That is the positive and superhuman side of ecstasy.

At this point, the psychologist is asked to yield his place to the theologian and to the philosopher, who, combined in the person of Maréchal, write the concluding ten pages of the essay.

The writer of this summary against whom the crucial criticism of the paper is chiefly aimed will choose another and a more appropriate place for an answer.

Névrose et Mysticism. Sainte Thérèse relève-t-elle de la pathologie? A. Huc. *Rev. de philos.*, 21, 5–32, 128–154.

This article is summarized sufficiently for our purpose in the following abstract of its last paragraph. "We have analyzed the soul of St. Theresa and we are compelled to conclude that all the characteristic traits of her soul are opposed to all the known nosological symptoms of neurasthenia. From this follows clearly that to derive the mystical facts from 'a morbid process' because in mysticism are found states analogous to those present in certain forms of neurosis, is attempting to explain the normal by the abnormal; it is gratuitously to ascribe a greater effective force, and a greater richness to the latter than to the former. . . . If neurosis and mysticism may bear to each other a relation of concomitance, they cannot bear a relation of causality."

I do not think that any of the psychologists who have recently written on mysticism would attempt to derive religious mysticism from "a morbid process." I have myself contended against that interpretation in the *Rev. philos.* for 1902. But the point which the author has chiefly at heart and in the defence of which he chiefly writes, namely, the action in the mystic of "an external and sovereign force," is in no wise substantiated by the demonstration of the normal nature of the essential characteristics of mysticism.

MISCELLANEOUS

Le sentiment religieux a-t-il une origine pathologique. DR. L. PERRIER. Paris: Fischbacher, 1912. Pp. 62.

One would like to believe that this is a last echo of the obsolete opinion that the roots of religion are pathological. The author classifies the "pathological hypotheses" and discusses them adversely. There is nothing new in this effective refutation.

Unless one should regard the belief in ghosts, spirits and gods as an indication of abnormality, I do not see how religion could be considered abnormal. It may of course be influenced by a pathological condition of individuals, as for instance of certain mystics.

One regrets the use to which the word "sentiment" is put in this essay. Religion is not a sentiment. No one who claims the attention of informed readers should allow himself the very careless identification of any sentiment whatsoever with religion.

Adolescence and Religion. THEODORE SCHROEDER. *J. of Relig. Psychol.*, 1913, 6, 124–148.

Mathias the Prophet. THEODORE SCHROEDER. *J. of Relig. Psychol.*, 1913, 6, 59–65.

Mr. Schroeder has attempted to show in several articles the intimate connection which he thinks exists between religion and the sexual instinct. In the *first* paper he returns to his favorite topic. After offering a large number of facts gleaned from ancient history and from recent accounts of more or less primitives peoples (chiefly concerning ceremonies of initiation), he produces the thesis maintained by several other writers that "the acquisition of religion is a distinctly adolescent phenomenon." This conclusion once set down, it follows, if one accepts the recapitulation theory, "that the psychic phenomena of religion made their first appearance in the mind of man at the period of racial adolescence; that is, at that prehistoric stage in the evolution of man when his consciousness first seized hold of the facts of sex-functioning, for a part of its recognized furnishing, as an experience that arrested attention and demanded explanation." Two earlier conclusions of the author are thus, if one could believe him, happily confirmed: "Among the historically known objects of worship, the first must have been the sexual organs." "All religion in its beginning is a mere misinterpretation of sex-esstacy, and the religion of today is only the evolutionary product, essentially unchanged, of psycho-sexual

perversion. This is the psychological interpretation of "the mystery of love," which finds such frequent and serious discussion in religious literature. Thus, literally, may we say "'God is love'—sex-love."

Evidently Mr. Schroeder is enamored of simplicity and like all of us is directed in his search after facts by his theories, and therefore the facts which he chooses to mention do not contradict his theories. But if he shares this weakness with us all, he distinguishes himself by the most unusual single-mindedness in pursuing the facts relevant to his purpose.

In my opinion, there are other roots to religion than the sex instinct. Man comes to life with other instincts besides this one, and they all may and probably most of them do contribute to the establishment of religion. The instinct of self-preservation, for instance, leads a man to seek to ward off danger and secure help. Could not Mr. Schroeder find indications of the action of this instinct in religion as early as he finds the presence of the sex instinct?

In the *second* paper, Mr. Schroeder describes one of the historical roots of Mormonism. It is a distinctly erotic and abnormal root. The relation concerns a certain Pearson who called himself "Elijah, the Prophet," and his "Holy Club." Its members professed celibacy, but set much store by "spiritual spouses." The Club was suspected of gross lasciviousness.

Robert Matthews appeared in this circle when sixteen years old. He soon won the name of "Jumping Jesus," but he preferred to call himself "Mathias, the Prophet." He seems to have been dominated by the sex impulse. He taught that baptism, to be effective, must be accompanied by circumcision, and in his first period he denounced women and the command to increase and multiply. Ascetic abstinence ended, however, when he met a Mrs. Folger and found that they were "spiritual mates." Her husband, who was also thinking of a spiritual mate, was persuaded to free his wife who was maintaining more than spiritual relation with the Prophet.

The theological system constructed by Mathias "subsequently passed on to Joseph Smith, to be perpetuated in Mormonism."

The Religion of One Hundred and Twenty-six College Students. Josiah Morse and James Allen, Jr. *J. of Relig. Psychol.*, 1913, 7, 175–194.

This is a tabulation with brief comments of 126 answers to a set

of questions given to 350 men and 50 women students. A serious deficiency of this investigation—a deficiency which is shared by nearly all psychological researches by means of *questionnaires*—is that only a part (not even one third) of those addressed answered. The result of this unintended selection is to deprive the statistical information obtained of most of the value it would have if all were represented in the result. It is, for instance, hardly illuminating to one who already knows that some students pray and some do not, to be told that 100 pray and 26 do not, when he is left in the dark concerning the 274 who did not answer. One can say nothing more definite regarding the prevalence of prayer among college students after than before such an investigation. The same remark is of course true of the questions as to church attendance, religious experiences, immortality, and most of the other questions of this syllabus. Statistical investigations fail of their purpose unless they include every member of the particular group under examination. When this is not possible, the returns may serve as illustrations, or as so many facts to be analyzed, compared, and classified, but their value for statistical purposes is negligible.

Another defect which might, it seems, have been easily avoided appears in the fact that although we know from these returns that the problem of immortality caused uneasiness to 50 and no uneasiness to 75, we do not know how many of the first and how many of the second lot believe in personal immortality. Moreover, although we learn that 100 pray, we are not told how many of those who do pray believe in a personal God who hears and may answer prayer, and how many pray only because "it is a good spiritual exercise." This defect results without doubt from attempting to cover too many subjects in one *questionnaire* which cannot then include all the questions that should be asked on each topic.

The complete indifference to immortality of many of these students gives a flat denial to the theologian's affirmation of the universality of the desire for immortality. I cull from the appendix an instance of aversion for, and one of indifference to a future life.

"Male, 22, junior, Presbyterian: I have thought about immortality considerably, but it does not cause me any uneasiness at all. I shall be content to die, absolutely dead, and pass off into nothing,—beautiful, blessed, peaceful nothing,—when I do die. Of course I love life, and shall live with a vim as long as I can, but I do not desire to live forever. I want to be unconscious, and not even know that it is 'I' who am resting."

"Male, 22, senior, Methodist: The problem of immortality has caused me no uneasiness. I feel that if I get through this life I will be doing pretty well. And so I let God take care of the future. If I deserve eternal life, He being a just God, as I believe He is, will take care of the future, and give eternal life; if I do not deserve it, then I sin when I ask for it."

A Modern Pilgrim's Progress. (Introduction by H. S. BOWDEN.) London: Burns and Oates, 1st ed., 1906. Pp. 1–284.

This book constitutes a *document* of value to the student of individual differences and, in particular, to the student of the psychology of religion. It is a detailed autobiographical account of fundamental affective and ethical needs and of the relation which they bear to the search for logical truth in a person in whom both reason and feeling insist upon gratification.

The anonymous author belongs to a good English Christian family. Very early she began to question the Christian dogma. From that moment her life became an ardent search for the truth. She pondered over volumes of theology, philosophy and science; she read—in a rather desultory manner, to be sure—the great modern philosophers, and also Strauss, Renan, Darwin, and Huxley; she visited, in search of light, leading churchmen. Lack of mental training and of guidance made her reading somewhat unprofitable. She was "swayed by every book . . . —a cork driven hither and thither" (p. 70). For a while, a materialist, then a deist, and once again for a time, a Christian. Thus passed not only her adolescence, but, it seems, several subsequent years, until at last she found shelter and peace in the Roman Catholic Church.

One should not confuse the conversion by which a moral wreck finds regeneration in Christ, with the passage of our author from Protestantism to Roman Catholocism. She never was a "lost sinner" in any other than a theoretical sense, and it seems probable that her life would have been no less respectable, though not so happy and profitable, had she never found the "truth."

None of the authors and preachers whom she read or interviewed could provide her with the logical assurance she wanted for her moral needs. Most men who have doubts on the "eternal questions" of the meaning of life, and of the whence and whither of man, manage to live happily even though no satisfactory answer comes to them, or they accept certain beliefs without uncomfortable fastidiousness. Our author could do neither. She "neither could nor would share

the utter loneliness of Clifford's Godless existence;" she neither could nor would accept any teaching that "jarred" with the sense of her personal immortality (p. 158).

But what did she want? "My whole nature demanded a personal God, and do what I would, I could not believe this desire to be vain" (p. 132). "My eternal future was to me the question of supreme importance" (p. 132). "I needed a religion, not merely as an answer to intellectual problems, but as a comfort in sorrow and as a guide in daily life" (p. 135). No one has felt more keenly than she "that dull gnawing ache, that vague hunger of the soul for *One* to hear and understand, that need of an infinite Personality" (p. 279). That yearning had made permanent materialism impossible to her, and pantheism but as "a shadow of her desire" (p. 279).

But why does she not find in Protestantism the assurances she needs? Because she wanted certainty in her belief and relief from even the possibility of doubt. She argues thus: If God has revealed himself, he must have done it so that man need not be led astray (p. 202). "At no time," writes she, "have I been able to see in a church which teaches contradictory doctrines the organ of truth; now it was absolutely impossible for me to think that a church which taught High, Low and Broad Church doctrines, and whose official representatives contradicted each other at every turn, was the teacher sent by God to teach me the truth" (p. 139). She knew by her studies in philosophy that in all ages philosophers "had craved, and craved in vain, to find unity in variety" (p. 182). The Roman Catholic Church answered her need for unity and authority.

There were obstacles in the way of her passage to the Catholic Church. First of all, her spirit of independence. The idea that any one would have the right to say "thou shalt" or "shalt not" made her recoil as if every nerve in her body tingled in revolt (pp. 184–5). But this difficulty and others concerning doctrine could not stand against her clamorous desire for peace.

She had never been a disinterested searcher after truth; from the first she had wanted to satisfy her reason of the truth of the beliefs she cared for. The longer she sought, the more impatient she became of logical opposition. The time came when she simply threw overboard whatever proved an obstacle to her precious beliefs: "the fact that Clifford denied the immortality of the soul made him no teacher for me. I had groped my way by painful

steps to the explicit belief in, and realization of truths I could not relinquish" (p. 156). "Mr. Spencer had taught me that, viewed as a whole, human life was good because it ever tends to the good of the race, but what cared I for generations yet unborn? I cared nothing. I wanted life to be good for me and those dear to me, and I wanted our lives to last forever" (p. 158). At this point of her development her search was clearly no longer, even in pretence, one for truth; it was a struggle for life. The conditions of life being for her as they were, the Roman Church was her logical refuge. A series of minor circumstances contributed to invest that church with a mysteriously attractive halo. Whenever she enters a Catholic Church she "seems to live in another world, to feel the presence of an unseen power" (p. 164). She is like an animal in sight of a fascinating light. In the presence of Cardinal Newman she is "affected by his strength and reserve power as never before by any man." He left aside controversy, and though she cannot tell exactly what he said she knows that he made her see "proofs of the truth of Christianity." She was awed into silence, and all her difficulties seemed to vanish (p. 220). The great cardinal knew that it is unnecessary to argue with persons in the condition of this harassed woman; the most effective way to convince them is through the feelings and emotions. A little later on she went to Paris and followed the daily instruction of a priest. One day at church, during the Eucharist service, she was favored with an illuminating ecstasy that broke down the last resistance.

Le Problème de la Personalité dans la psychologie religieuse. TH. RUYSSEN. *Année psychol.*, 1912, 18, 460–477.

This is one of the *Revues Générales* which the *Année psychologique* devotes from time to time to writings on the psychology of religion. The books considered (Höffding, Gourd, Segond, Reinach, LeBon, Guignebert) belong only in part to psychology and then only in the more general sense of the term.

Ruyssen thinks it would be profitable to consider religion from the point of view of personality. Since religion is an attitude or a reaction towards the Creator or the Whole, this attitude or reaction must vary with the personality of the respondent. The author knows, however, that "personal, subjective experience is only a fragment, the most characteristic fragment of religious life to be sure, but not the most obvious, nor even the most constant." He differs from a well known school of sociologists who altogether

disregard that fragment, for it seems to him, and quite justly in my opinion, that the action of personality upon religious tradition constitutes an interesting and an important problem. The books to which he refers are for him a source of significant illustration in formulating this problem.

Grundlinien zu einer Phänomenologie der Mystik. H. ASCHKENASY. *Zsch. f. Phil. u. phil. Kr.*, 1911, 142, 145–165; 144, 146–165.

This study is offered as a contribution to the relation of religion to the other forms of conscious life, to science, to art, and to morality. The author limits himself to that particular religious form called mysticism, because this form offers a much more striking contrast to the other life activities than do the more ordinary forms. The first article is devoted to selecting the proper method of attack—the phenomenological method—and to a justification of it.

The larger part of the second article deals with religion as value. The theory of Münsterberg is discussed. The article closes with a brief section on the task of the history of religion.

The only comment I am inclined to make takes the form of an exclamation. How far removed from that which in history bears the name religion are the discussions of religion by metaphysicians! Not religion, but certain highly abstract conceptions, known only to the philosopher, are their subject matter.

J. H. L.

Rousseau et la Religion. H. HÖFFDING. *Rev. de mét. et de mor.*, 1912, 20, 293–320.

This is a detailed critical consideration of the writings of Rousseau with a view to noting the relation between his religious concepts and his own personality and experiences. The contrast in all Rousseau's work between feeling on the one hand and intelligence and will on the other is pointed out. The sincere, though inconsistent views by which he was successively dominated are ascribed to the influences to which the passive character of his emotional life exposed him. Höffding describes the times when Rousseau felt himself possessed of a great fervor by reason of communion with the Great All. "The sense of solidarity at such times was the personal religion of Rousseau." Other topics discussed are: the psychological similarities and differences between Rousseau, the Vicaire Savoyard and Julie; Rousseau's need of independence and solitude; his love of "nature"; his theories of *amour de soi* and *amour propre;*

his treatment of the problem of evil; his views on the discord between nature and civilization; his relation to Christian tradition—in fact his entire "natural theology." At the close of the article comes an interesting comparison of the conceptions of Hume and Rousseau.

L. I. STECHER

La Philosophie Religieuse de J. J. Rousseau. D. PARODI. *Rev. de mét. et de mor.*, 1912, 20, 275–293.

In this exposition Parodi has reconstructed very sympathetically Rousseau's religious ideas and related them to his diverse social, moral and literary theories. Parodi emphasizes the place which religious beliefs held in the life of Rousseau and points out the development of these beliefs under various influences during his life. The article succeeds in disentangling from the varied writings of the French philosopher a religious system of considerable unity. In his anathema against civilization, the arts and sciences, all the works of human reason, as in his eulogy of ignorance and natural simplicity, one discovers his prevailing moral interest. This is also the foundation of his love of "nature" which means to Rousseau not only simplicity of life but also obedience to the infallible inspiration of conscience, "l'assentiment intérieur." From man's freedom and his consequent liability to sin come all the disorders of the social organism. The love of order, however, authorizes the belief in the final happiness of virtuous men, immortality. Morality, moreover, cannot exist without religion. In the contemplation of natural beauty, which is an attitude of mystical identification with the Creator, the religion of Rousseau finds its highest expression.

L. I. STECHER

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NOTES AND NEWS

THE twenty-second annual meeting of the American Psychological Association will be held at New Haven on December 29, 30, and 31, under the presidency of Professor Howard C. Warren. At the joint session with the American Philosophical Association, which meets at the same time and place, the subject for consideration will be "The Standpoint and Method of Psychology."

A NEW quarterly magazine, *The Psychoanalytic Review: A Journal Devoted to an Understanding of Human Conduct,* has recently been started in New York under the editorship of William A. White, M.D., and Smith Ely Jeliffe, M.D. The editors "aim to make it a complete and true reflection of the work being done along psychoanalytic lines in all departments of thought, not only in medicine, but in various other fields, wherever such work has any bearing, direct or indirect, upon the problems of psychopathology."

A NEW French journal is announced, to be entitled *Étude de Psychologie.* It is to be edited by A. Michotte, and published by Félix Alcan. The subscription price is 7 fr. 50.

A PROSPECTUS of a new German periodical is at hand, which is to be published by Karl Krall in the interests of the Elberfeld investigations. It is entitled *Tierseele: Zeitschrift für vergleichende Seelenkunde.* For foreign subscribers the price is M. 14.

AT the Seventh Annual Convention of the Illuminating Engineering Society held at Pittsburgh on September 23, Dr. C. E. Ferree, of Bryn Mawr College, read a paper on "The Efficiency of the Eye Under Different Systems of Illumination:—The Effect of Variations in Distribution and Intensity."

THE present number of the BULLETIN, dealing especially with social and religious psychology, has been prepared under the editorial care of Professor J. H. Leuba. An expression of special indebtedness is due to Professor Leuba because of the fact that, owing to unavoidable circumstances, the editorial responsibility was assumed unexpectedly and at an inconveniently late date.

THE following items are taken from the press:

THE Herbert Lecture at Oxford was delivered on November 7 by Professor C. Lloyd Morgan, F.R.S., professor of psychology at the University of Bristol. The subject of the lecture was "Spencer's Philosophy of Science."

PROFESSOR SHEPHERD IVORY FRANZ, scientific director and psychologist of the Government Hospital for the Insane, Washington, D. C., on November 15 addressed the Medical Society of St. Louis, on the subject of "Psychological Factors in Medical Practice."

MR. A. G. STEELE has been appointed head of the department of psychology in Temple University, Philadelphia, Pa.

INDEX OF NAMES

Names of contributors are printed in SMALL CAPITALS, and the page numbers of the contributions in **Full Face Type.** In the case of authors reviewed or summarized the page numbers are in *Italics* and in the case of mention in the notes and book lists they are in Roman Type.

INDEX OF SUBJECTS