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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

GENERAL PROBLEMS; MIND AND BODY

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The most prominent subject in the current discussion of the foundations of psychology is the formulation and limitation of the psychologist's problem. Is psychology purely a study of behavior, or is it solely a study of mental states and processes, or does its problem lead to research in both fields? Probably the majority of psychologists, especially of American psychologists, reply that both types of research are properly psychological; but there remain two able and energetic minorities who take respectively the extreme standpoints. Of these the behaviorists especially are attracting attention. In two articles Watson (17) (18) states and defends their doctrine most explicitly; and perhaps nowhere is there to be found a clearer and briefer formulation of their doctrine than in his introductory paragraph to the first of these two articles. "Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. The behaviorist, in his efforts to get a unitary scheme of animal response, recognizes no dividing line between man and brute. The behavior of man with all of its refinement and complexity, forms only a part of the behaviorist's total scheme of investigation." He attacks current psychology directly as having "failed to make good its claim as a natural science. Due to a mistaken notion that its fields of facts are conscious phenomena and that introspec-

tion is the only direct method of ascertaining these facts, it has enmeshed itself in a series of speculative questions which, while fundamental to its present tenets, are not open to experimental treatment." On the other hand, the science of behavior will "have to neglect but few of the really essential problems with which psychology as an introspective science now concerns itself." Angell's two articles (2) (3) bear directly upon Watson's argument, although the former was written before Angell had read Watson's first article. Though heartily in sympathy with the behaviorist in his constructive views and though agreeing "that in theory all and in practice much of our mental life might be stated in terms of objective behavior," Angell points out that introspection affords information not to be gained elsewhere. As a result it is futile to discard it. "Refine it, check it, train it, but do not throw away a good tool until you certainly have a better in hand. And do not forget that in much which offers itself as objective method, introspection is really involved either directly or indirectly."

Related to the views of Watson but reached by different ways are the views of Singer, Woodbridge and Perry. Singer (15) returns to the topic of an earlier article bearing the same title and answers especially a question put to the behaviorist by Miss Washburn, "What are you going to do with a being who thinks, but who exhibits no behavior for the very reason that he thinks? What are you going to do with the passive, the utterly passive thinker?" Woodbridge (20) finds the present theoretical confusion in psychology to be due chiefly to one unfortunate preconception. "This preconception consists of the very current belief that there are such things as 'sensations' which form a kind of elementary component of a stream of consciousness or of a mind." The discussions of "introspection" indicate that the method of introspection is really neither an important nor a genuine method of psychology. Indeed if we turn from this and similar discussions regarding the epistemological foundations of psychology and inquire regarding the actual performances and achievements of psychologists we find that behavior and not consciousness is "the thing which the psychologist does, as a matter of fact, investigate. To my own mind the psychologists who have used the concept of behavior rigidly have passed at once from theoretical confusion to theoretical clearness." In his recent book Perry (14) includes a chapter entitled A Realistic Theory of Mind. In this he discusses two major subjects, the method of introspection and the method of general observation. Introspection does not reveal

a manifold in itself either "peculiarly mental" or "peculiarly mine." Rather the elements of this manifold are "neutral and interchangeable." It is on the contrary in their grouping and interrelations that these "elements of mental content exhibit their peculiarity." But what are these groupings and interrelations? The answer will not be found "until we abandon the introspective method and view mind as it operates in the open field of nature and history." And this is no less true if the content derives its mental character from mental action, for "the nature of mental action is discoverable neither by an analysis of mental contents nor by self-intuition." If we employ general observation we learn that "elements become mental content when reacted to in the specific manner characteristic of the central nervous system," and since the action of the nervous system, like the organism, exhibits "the control of interests, we must add to our physiological account of the action of the mind a moral account." Thus Perry draws the conclusion: The content of mind "is that portion of the environment which is taken account of by the organism in serving its interests." Otherwise expressed, "as mind appears in nature and society, it consists primarily of interested behavior." Adams' article (1) is concerned in general with the realistic psychology of James, Woodbridge, and Perry. He believes that both absolute idealism and the new realism discard as illusory or as confused and valueless all introspective reports about conscious processes, and that they both defend a relational theory of consciousness. In particular, Adams defends the belief that there is a non-observable mental activity. Realism presupposes wrongly that "everything real can be *found* to exist," that is, can be observed; whereas the solution of the problem of mind seems to require "the conception of consciousness as possessing a character, a dimension, which does not fit entirely and without remainder into *any* complex of objectively found or findable entities." This non-objective dimension of mind is to be identified "with activity in some sense." For example, feeling and the consciousness of meaning are not describable as facts "on a level with presentations and describable contents."

The extreme position of the behaviorist and realist in America seems as yet to have called forth no marked response from European psychologists and philosophers. The issue with them seems to lie rather between the extreme introspectionist and the upholder of both types of research. Anschütz (4) defends experimental and objective psychological research against the extreme position of

Lipps, that psychology is the observation of one's own mental life. He claims that psychology cannot be divorced completely from philosophy (as Külpe has urged) because psychological problems lead the psychologist directly to philosophical ones and because philosophy in its turn is directly dependent upon psychological doctrine. Krueger (9) writes: "natural science must construct a conceptual system of *objective* reality, *as if* it were quite independent of any individual's consciousness." Psychology, on the contrary, is obliged to complement this conscious one-sidedness. "And though psychology, like natural science, is a law-seeking science, it cannot reach its goal so directly and so immediately, for it must include also a genetic theory of civilization." In short, it is "confederated not only with the natural, but also, potentially at least, with the humanistic sciences." Souriau (16) finds the older delimitations of the field of psychology (*e. g.*, the non-spatiality of the mental, the privacy of the mental, and so forth) quite inadequate and false. The mental differentiates itself from the physical by being teleological.

The general problem of the evolution of mental life is studied in a book of great importance by Morgan (11). The discontinuity observable everywhere in physical, biological and psychological evolution alongside of the demonstrable continuity of parts and their special functions seems explicable only on the assumption that the whole is really more than the mere sum of its parts taken in isolation. That is, the combination of parts as such introduces new characteristics or properties. Hence arise the new properties which come in chemical synthesis, hence the new characteristics which differentiate the living from the lifeless. Hence come those new characteristics which, arising in the course of biological evolution, we call instinct and consciousness. Conversely, to start with the highly complex organism and explain it by assuming in the simpler organism all its characteristics is futile. For example, this is what the panpsychist naïvely does, since he accounts for the origin of mind by assuming that the organisms which we know to have consciousness must have evolved from organisms that already were conscious! Related to Morgan's problem is that of Jacks (8). He attacks the method (*e. g.*, of Caird) of explaining the evolution of consciousness by representing the mind to begin with "as neither totally unconscious nor completely conscious of the ends to be evolved. A doctrine of betwixt and between is set up, according to which the mind, along with a clear consciousness of the stage already reached, has a dim consciousness of the stages to come." It is the psycholo-

gist's fallacy. It treats "a consciousness of what is dim as though it were a dim consciousness of what is clear, a consciousness of an evolving world as though it were the evolving consciousness of a world."

Ogden's presidential address (13) in part discusses the relation of psychology to philosophy. In particular, he regrets the tendency present in the new realism to divorce completely philosophy from psychology. He believes that the results of recent research in the field of thought processes bears directly upon the solution of philosophical problems including the issue between realism and idealism. In general, he believes that psychology can be made "a peculiarly fitting propædeutic to the problems which modern philosophy has before it." To make psychology such would be to revive for psychology "something of that prestige which was accorded it in the preëxperimental days of the British empiricists."

McDougall's book, *Body and Mind*, seems to have led to a renewed interest in the problem having this name. An important paper by Nunn (12) analyzes the bearing of the principle, the conservation of energy, upon the relation between mind and body. He examines briefly the historical development of the principle and shows "that the principle has appeared historically in three phases or forms, so different from one another that every argument which assumes the truth of the principle must be ambiguous without a specification of the form intended. The three forms may be called respectively the mechanistic, the physical, and the 'energetics' phase." This last phase (*e. g.*, Ostwald, Duhem) "is simply irrelevant to the question whether interactionism is or is not an admissible psychological theory," and it is the phase of most importance to psychology. Latta (10) urges against McDougall that there is no entirely independent system of either matter or mind except in abstraction. These abstractions are not realities. Mechanical parallelism presupposes that they are, and is rightly rejected by McDougall. But McDougall does not see that that complex concrete entity, both mind and body, should be interpreted on the basis of observed fact leaving the metaphysical problems open. Watt (19) defends parallelism in its broad view against McDougall's book. Fusion has a neural correlate. For example, Watt urges, "it seems possible to correlate completely the complex unity of binocular vision, fused according to the particular laws of psychical fusion, with the complex physical unity of binocular stimulation and response, coördinated according to the particular laws of neural coördination."

Harris (5) argues directly from physiology in favor of interaction. Emotions have physiological effects which must be ascribed to the emotions as such. For example, "one of the latest discoveries in connection with suprarenal capsules is that, in the dog, violent emotion—anger, terror, etc.—can produce a marked increase in the output of the internal secretion of those ductless glands." Similarly, experiments show that emotion is "an absolutely essential link in a chain of neural events with food at one end and a flow of gastric juice at the other." Heymans' paper (6) is also one of the group called forth by McDougall's book. He defends "psychical monism," believing that this postulate would explain all that McDougall believes animism enables us to explain. In particular, he argues, first, that psychical monism is not a metaphysical but a genuinely empirical hypothesis, second, that McDougall's objections to it are not well founded, and, third, that it is better fitted than is animism to explain the alleged facts of psychical research. Finally, Horn (7) in a long and elaborate article reaches the conclusion already drawn, as he points out, by Hartmann, Benno Erdmann, and others, that the problem of the relation between mind and body is to be solved by assuming a phenomenalistic dualism based upon a monistic but unknowable ground underlying these phenomena. "Psychical causality remains a postulate, a logical demand of our thought precisely as is the mechanistic causal-nexus. An intuition, or a perception of it, is out of the question. At best it can be inferred or deduced." That is to say, it is at least probable that there is a genuinely psychical, as well as physical, causation. In short, Horn's view of psychical causation results in a double aspect theory that is practically a thoroughgoing parallelism.

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CONSCIOUSNESS AND THE UNCONSCIOUS

BY H. W. CHASE

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Is the term "consciousness," like the term "soul," to fall into disuse? The philosophers, as Angell (1) reminds us, "have been for a long time pointing out the spurious character of its claim to an unique position in the universe." Bode (2) roundly asserts that "the doctrine that consciousness is a peculiar kind of existence, alongside of, yet 'separated by the whole diameter of being' from physical reality, is rapidly passing into history."

However doubtful the philosopher may be as to the unique nature of consciousness, he is none the less persistent in his efforts to define the term. Bode, in the paper just quoted, holds that definitions of consciousness must neglect neither behavior nor the object with which behavior is correlated. Consciousness for him is to be identified with James' "fringe," provided this is considered as a "total

character" with which behavior is correlated, a total character "which is in the nature of a reference or relationship that faces the future." Fite (4), on the other hand, identifies consciousness with apperception, "or, in James' figure, with the focus rather than the fringe." But, since consciousness is a matter of degree, the fringe must not be altogether excluded.

Boodin (3) takes issue with the assumption that minds are isolated, only to be known through analogy. Mechanical theories have been obstacles in the way of a more correct conception of consciousness. We now know, however, of one type of energy—electrical—which is not material, and to which molecular theories cannot be applied. The concept of mind, likewise, must be set free from physical analogies. "As electrical energy rides on material energy . . . so we may conceive that mental energy rides on electrical energy and yet establishes its own immediately intuited continuities." In our own bodies, it travels on the electrical energy of the nervous system; why not then on "the material vehicles with which our nervous system is continuous"? We must think of mind as "a field of energy with its vague penumbral edges or spreadings and its more or less focalized and shifting center of activity." This conception he applies to the study of the social mind.

The philosopher, whatever his desire to change the sense in which the term consciousness is used, still feels a deep respect for the term itself. Not so Watson. "The time seems to have come," he says (9), "when psychology must discard all reference to consciousness; when it need no longer delude itself into thinking that it is making mental states the object of its observation." Enmeshed in such studies, psychology has failed to make good its claims as a natural science. Its present state is "chaotic." The way out is of course to give up the study of consciousness; "never use the terms consciousness, mental states, mind, content, introspectively verifiable, imagery, and the like." Psychology will then become in a real sense the science of behavior. In a later article (10) the same point of view is reasserted and further developed, with especial reference to current doctrines of imagery and affection.

Angell (1) marks out a compromise position. While sympathetic with the increasing emphasis on the objective study of behavior, he feels that psychology is in no position to dispense with the study of consciousness. Our concepts of consciousness have indeed been at once too specific and too vague, and have led to endless confusion. But "after all is said and done, something corresponding to con-

sciousness in its vague common meaning does exist and it is within its compass that the problems of science arise." We must then take care that in seeking better means of knowing human nature in its entirety "we do not in effect commit the crowning absurdity of seeming to deny any practical significance to that which is its chief distinction."

Loewenfeld's (6) discussion of the subconscious I have already reviewed.[1] It need only be said here that his book is built on the usual lines of the treatises advocating a pyschic conception of the subconscious. Stewart's treatment of the problem (8) is also conventional.

Ribot (7) strikes out a somewhat new line. Every state of consciousness, he argues, contains as its stable portion, its "skeleton," a group of kinæsthetic elements. This thesis he defends in some detail by a consideration of mental processes: perception, association, the image, attitudes. On the affective side of consciousness, motor elements are likewise essential.

This conception is utilized for a discussion of the nature of the unconscious, as distinguished from the sub-(co)conscious. We are nowhere told, however, how the two are to be differentiated. The unconscious must not be conceived as a thinking, cognitive reality. This is to ascribe to it qualities which are of the essence of consciousness itself. Nor can it be conceived in terms of feeling; feeling is meaningless without its basal motor tendencies. What then remains? Simply motor tendencies, and in terms of these must the unconscious be described. It is "a mass of kinæsthetic residues, isolated, grouped, associated according to the past experience of the individual, empty of content, but capable of reinstatement as content of consciousness." While the field of consciousness is necessarily narrow, that of the unconscious is not. Processes of entirely different characters may go on simultaneously. Activity here proceeds by leaps and bounds; it is not subject to the methodological rules of reflective thought; processes may interfere, check each other, sometimes work out new conclusions, as in the oft-quoted cases of unconscious creativeness. Structurally, then, the unconscious is composed of psychic residues, once in consciousness. Functionally, it differs from consciousness especially in its lack of order and unity. And, finally, its mission is to accumulate energy which is expended by consciousness.

Jung (5), stressing the importance of the psychic activities that transpire in the unconscious, points to the sudden outbreak of com-

[1] This journal for November, 1913.

plicated systems of delusions as evidence of the reality of its work. In general, his doctrine of the unconscious is that of the orthodox Freudian school, from which in many other points he seems to be breaking away. He would, however, make the motive force which finds expression in both conscious and unconscious activities, a unitary stream of psychic energy, the libido, which is thus broadened from its sexual meaning to one almost synonymous with interest, as Claparède suggests. As in all the Freudian literature, the importance of unconscious wishes and forces in both health and disease is insisted on.

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TERMINOLOGY

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Ruckmich (5) has made a comprehensive examination of the meanings given to the term *function* in 15 psychological text-books in English published within twenty years. Aside from the mathematical use he finds four different applications: (I.) Service. (*A*) The function serves one or more other processes or functions. (*B*) The function serves the whole organism, (1) defensively; or (2) it is "the expression of an individuality, the assertion of the ego over against its environment" (p. 103). (II.) Activity; function here

implies an "active relation to the organized system: the assigned task of the function is an end in itself" (p. 103). The notion of expressive relation (I., *B*, 2) is rare. "The majority of writers use the term function in the sense of activity [Class II.]. . . . There is, in addition, an underlying tendency to instill into every other meaning of the word an active principle of some sort" (p. 122). The notion of purpose or end is prominent. "Mental and bodily structures are described from a teleological aspect." Few of the writers examined employ the term with entire consistency.

Grüner (3) notes that the term *psychoanalysis* is comparatively new. It originated with Freud and is not found in any of the dictionaries. The implications of this branch of research make the term more appropriate than *comparative individual psychology* which Adler has recently proposed. The adjective "comparative" conveys too broad an implication, and "individual psychology" is ambiguous. Grüner points out that whereas the older psychology analyzes certain functions of consciousness such as sensation, feeling, etc., and their intensity, quality, etc., psychoanalysis attempts to establish a causal relation among the phenomena of consciousness and to exhibit them as members of a sequence.

Watson (6) and Angell (1) propose independently the word *behaviorist* to denote the behavior psychologist. The science itself is called *behaviorism* by Watson (p. 166). Bechterew (2) uses the term *objective psychology*, which is less descriptive but more fluent. *Behavior psychology* seems preferable to either.

The French philosophical vocabulary edited by Lalande (4) is continued from O to Personnel and includes Objet, Observation, Ontogénèse, Panpsychisme, Parallélisme, Paramnésie, Parole intérieure, Passion, Pensée, Perception, and Personnalité, which are of interest to psychologists.

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TEXT-BOOKS AND GENERAL TREATISES

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Several psychological treatises which differ widely as to method and purpose have been published this year. It is a piece of good fortune for all those psychologists who do not read Russian that Bechterew's *Psychologie objective*[1] (2) has recently been translated into French. They can now become acquainted with the views of the famous scientist upon all the important psychological questions and methods of investigation. Bechterew does not believe that psychology should be restricted to a study of facts of consciousness, but that it should include all psychic phenomena, conscious or not, and all facts connected with the psychic life and the biological foundation of their manifestations. As the title suggests, for him there is only one way of approach for a psychology that claims to be a science and that is by the expressive method of investigation. While introspection may serve certain purposes it remains purely subjective and can add nothing to an objective science. This does not debar investigations upon memory, etc., for the author includes the spoken and written words in the reflex arc, the three processes of which are reception, association and reaction. The reader will find, however, no mention of imagery nor any description of the manner in which thought and feeling are represented in consciousness. The author proposes, in order to avoid all misunderstanding, to replace the term psychical phenomenon by neuro-psychical phenomenon. So we find those processes which involve the higher centers spoken of as "réactions neuro-psychiques."

Space does not permit of more than a mere indication of the vast amount of material and of the original manner of its presentation. The book is divided into two parts. In the first the nature of the different processes, the manner of reaction and the physiological condition of the same as well as the central localization of the neuro-psychic reaction are discussed. There are the internal reactions, such as those of the vaso-motor system and the external, such as the motor reactions. The latter are divided into two classes, those favorable and those unfavorable to the organism. Much importance is attached to this distinction throughout the book. The effective states are classified as the positive and negative tone or attitude.

[1] A critical review by Professor J. B. Watson will shortly appear in the BULLETIN.

The last chapters are devoted to the association processes and their anatomical foundations. The second part deals with the reflexes, from the simple reflexes through the instinctive reflexes, the neuropsychic reflexes, the expressive reflexes and the symbolic reflexes to the reflexes which form the personality of the individual. The subjective description of instinct as an action with no consciousness of goal must be abandoned. Under the name of instinct one understands a reaction which takes place like a reflex but which is determined by the needs of the organism. In the chapter on the neuropsychic reflexes much space is given to memory investigations and to association experiments. Not only is language, but also the manner and condition of sensory reactions and of sensory thresholds considered under the symbolic reflexes. The latter, it is suggested, may be determined by the associated reflexes. Studies in attention are included under the chapter entitled "Les Réflexes de la concentration nerveuse." Throughout there are numerous descriptions of work done in the author's laboratory, covering almost the entire field of psychology and evidently never before published.

Schmied-Kowarzik's *Analytische Psychologie* (17) is the other extreme from the psychology just mentioned. The author does not oppose the empirical psychology but places the analytical coördinate to it. "General psychology is partly a descriptive science that portrays the causal connections in the psychic and between the psychic and the physical . . . partly a general descriptive and analytical psychology." The use of the word descriptive should not be misleading. The present book is in no wise similar to a descriptive psychology such as Titchener's, from the fact that empirical psychology is not the basis of description. It is strongly emphasized throughout the book that the particular problems involved cannot be solved through empirical experiment and induction. For a clearer idea of the difference between the analytical and empirical psychology analogy is made with the relation of geometry to the natural sciences. It is an arm-chair psychology in the strictest sense, an introspection of one's own consciousness being all sufficient. The adjective "new" in the title refers to the viewpoint and not to the material presented. The method follows that of Hume and Kant and is new in that the analysis is not merely used in a greater or less degree, but becomes the sole aim of the treatise. The book is strongly influenced by the teachings of Wilhelm Dilthy of whom the author is a pupil.

The first quarter of the volume deals with the nature of analysis. Here is found the relation of empirical to analytical knowledge and

an historical development of this distinction, a discussion of analytical psychology as the foundation for all analytical sciences and a description of empirical and analytical methods. Then follows the author's psychological system. The analysis starts with consciousness as a whole and a definition of the ego and the immediate present. Consciousness is then divided into the three elements of reality: sensation, feeling and will. About forty pages are devoted to the nine different classes of sensations, each of which is treated separately. Under vision, for example, quality and intensity are briefly defined and most of the remaining space is devoted to the construction of a color octahedron, which, it might be mentioned, will continue to have very little more than schematic value until empirical science has determined the relation of all its sides. The remainder of the book is devoted to feeling, to will, to space and time perceptions, to a discussion of the opposition of subject and object, to imagery and lastly to the thought processes. It will readily be seen that this is not a book to interest those searching for facts, but rather those interested in artificial construction and epistemological considerations.

Parmelee[1] (12) tells us that in his books he has "summarized most of the fundamental facts and principles of modern biology and described briefly the behavior of the lower animal." He has given "some of the most important facts and principles of neurology" and covered "the whole field of psychology in a concise fashion." The book ends with chapters devoted to social evolution and the factors concerned in social development. The genetic nature of the treatment is maintained throughout, the general form of society being traced from the insect society through those of the lower vertebrates to man. We are informed that a genetic method such as is described in the book must be adopted by psychologists before their discipline can become a full-fledged science. In the part devoted to psychology the author is consistent with his definition of behavior, which includes mental or subjectively observed behavior. This section deals with instincts and their neural basis, the nature of intelligence, consciousness and personality. The author has aimed to make the book useful as a text-book in comparative psychology and in biological and epistemological sociology. There is a partial bibliography covering ten pages.

Three books have appeared on evolution. Semi Meyer's (11) treatment of the development of mind is philosophical and epistemological. It is not genetic in the sense that the development is along

[1] Reviewed by F. L. Wells in the BULLETIN for July, 1913, pp. 280–281.

anthropological and biological lines. It is rather a synthesis of the mind as such with no excursions outside of the purely mental. Meyer does not believe in evolutionary continuity. The reader is told that to approach the book without prejudice he must be convinced of one fact, "Dass in der Welt wirklich etwas enstehen kann," that is, something non-derivable from previous evolutionary stages. Among the subjects treated are the influences of memory, instinct and practice upon the development of the mind, the growth of the will and its nature as a motive form, consciousness of objects, and the space and time problems. Concerning the last named topic, it is dogmatically stated that the time sense is a strictly human possession. The author's own conclusions are not always clear, but he reminds the reader that problems and not solutions are here unrolled.

The opposite point of view in regard to evolution is taken by Ingenieros (7) in his discussion of the principles and methods of biological psychology. For him the evolutionary process is a continuous one. Thought processes are infinite. They differ not in essence but in grade. They are progressive stages in a continuous science and should be studied phylogenetically. One may also say there is a continuity between sensation, images, judgments and those higher thought processes which are the foundations of ideals. To understand the mental functions which constitute the personality of an individual one must consider both inherited tendencies or temperament and the effects of education and environment on habit formation. Introspection and experimentation are only auxiliary to such a genetic biological investigation as is advocated by the author. His treatment of his subject is most general and though he defends his views at some length, they contain, on the whole, little originality.

Schmucker[1] (18) has written a popular account of evolution which as he says is "an attempt . . . to give to people whose training is other than scientific some conception of this great story of creation." In simple language the underlying idea of evolution, together with a history of this concept before and during the time of Darwin and Wallace, is given. Numerous illustrations are employed from animal life to show the manner of development, the horse being used as a special example for more complete treatment. The account ends with present theories such as the mutation theory of de Vries and a forecast of future development. The psychologist will notice the absence of a treatment of mental development. The book may be used as a first orientation to the problem.

[1] Reviewed by H. E. Walter, *Science*, 1913, 38, 779.

Of more general nature are the books by Campbell (4) and Carus (5). Believing that psychologists have never had the ability to analyze the human mind itself, Campbell in his little book has attempted to do so for us. He wishes to prove his mechanistic doctrine but becomes so entangled in epistemological problems that it is impossible to follow him. Carus in his monograph on mechanical and non-mechanical principles of life defines his position as one between the mechanistic scientist and the teleological thinker. The natural laws are the thoughts of God. The laws of form determine the uniformity of nature. Furthermore these laws and the machine are one. More than half of this little book is devoted to extracts from other authors, principally from the philosophies of Mark Twain and La Mettrie.

Space does not permit a detailed account of the long paper by Stearns on the psychological methods of mental examination, the paper by Marbe upon the relation of psychology to the other sciences and practical life, and of the descriptions of the forty-five papers read before the Fifth Congress of Experimental Psychology, all of which are contained in a report of the meeting edited by Schumann[1] (19). This biennial report is of inestimable value to those psychologists who wish to keep in touch with the latest activities of the German psychologists. In fact it is a book few experimentalists can afford to be without. Besides the report there is also a very useful account of the instruments displayed and a catalogue of the exhibition of the Institute of Applied Psychology.

Three conventional text-books may be mentioned. The eighth and ninth installments of Dürr's continuation of Ebbinghaus's *Psychology*[2] (6) have appeared, thus completing the second volume. They deal largely with problems of esthetics. The many sides of the problem of speech are also thoroughly considered.

Although Major (10) has not adopted a system for his text-book in that his treatment is at times functional and at other times structural, yet on the whole the book is built on conventional lines. He remarks that his chief sources are James and Titchener. The latter is very copiously quoted and in arrangement of topics is followed closely by the author. Among the differences may be mentioned the presentation of many sketches of the nervous system and the omission

[1] The several papers will undoubtedly be described in the different summaries appearing in the BULLETIN throughout the year. It is mentioned here merely to call attention to this valuable collection as a whole.

[2] The two volumes will be reviewed as a whole by Professor F. P. Boswell in a subsequent number of the BULLETIN.

of theoretical discussions. There is also practically no reference to experimental investigation, the reader merely being directed to several well known text-books. The book is meant to be very elementary. The more difficult problems are avoided. It is written in an almost popular style and will no doubt be appreciated by the immature pupil.

Magnusson's (9) book is an attempt to present the psychological facts which are essential to education and to show how they are applicable. It is not a treatise on experimental educational psychology. Short notice is given to sensation, the main portion of the book being devoted to perception, memory, feeling, will, habit, the subconscious, etc. One is also told how to teach art, science, etc. The book is elementary in nature and lacks system and will probably not interest the laboratory psychologist.

Of books on the history of psychology Baldwin's (1) is the most important. In his two little volumes he has attempted to trace the development of the concept of self from the earliest times to the end of the nineteenth century. It is not a narration of particular facts but a sketch of the development of fundamental concepts. The history strongly reflects the individuality of the author and will be most welcome to those in sympathy with his personality and point of view.[1]

Brett (3) announces in his history that the book contains other matter besides strictly psychological data in the narrow sense of the term. In the words of the author, "The nature of man is regarded as forming the center of three great lines of interest, namely, the study of human activities as a psychologist sees them, the study of human life as a doctor looks at it, and the growth of systematic belief as reflected in philosophy and religion. The union of these and their historical development seems likely to yield what might be called the autobiography of the human mind." This development is traced from primitive thought through the Greek philosophy to the doctrine of St. Augustine. Special attention is paid to Plato and Aristotle and consideration is also given to Eastern theories. To those who desire a full, well-written description of the development of theories of the soul in the speculative period of the science the book will be very welcome.

In 1897 the first edition of Piat's (14) book entitled *La personne humaine* appeared. A second revised edition has just been published. The only essential difference is the addition of a long preface in which the author states that nothing in recent years has caused him to change his fundamental views on the unity and indivisibility of the

[1] A special review will appear in an early number.

ego, his contention that the chief characteristic of human intelligence is the faculty of abstraction and his opposition to the theory of transformation and the Spencerian theory of evolution. Renouvier's (16, 15) *Les principes de la nature* and his *Psychologie rationnelle* have been reprinted without change. The form of the new edition is very satisfactory. A second corrected edition of Paulhan's (13) *L'activité mentale* and a fifth edition of MacCunn's (8) book on the educational aspects of ethics have also appeared.

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APPARATUS

BY C. E. SEASHORE

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A very interesting and ingenious device for simulating the working of a nervous system is described by Russell (9) who summarizes his account of the apparatus as follows: "We have demonstrated a mechanism that will simulate in its various forms the working of nervous discharges. With it, as in a nervous system, we find that as a result of individual experience, changes take place so that with the same signals as before the responses have changed and vice versa we find the same responses when the signals have changed. We have a mechanism that can be trained, that can acquire habits, that will move either forward or back at a given signal according to experience, that will make one, two or three responses to a given signal according to experience. In other words we have shown a practical arrangement of mechanical transmitters and receivers that will respond to signals and control movements like a nervous system and that possesses associative memory as it can learn by experience. For, quoting Dr. Loeb again, 'If an animal can be trained, if it can learn, it possesses associative memory.'"

Those who are interested in the graphic recording of sounds and movements such as are found in heart action will find the improvements in the Crehore method of recording made by Dr. Austin (3) valuable. He has devised a time marker with a signal and developed methods of making simultaneous tracings, tracings from the exposed heart, and records from the heart sounds.

Psychologists who are installing equipment for the 110-volt D.C. in a laboratory will find the description given by Dr. Jackson (6) ingenious and helpful, although, as the author states, there is nothing really new about his system which consists of a resistance bank and various contrivances for distributing the current to different tables and adapting it to various needs. Martin (8) alsd describes an installment of this kind and makes suggestions regaroing color wheels and color disks.

Hürthle (5) describes an instrument consisting of a manometer and a speed timer with accessories for the direct observation and the recording of the arterial pressure and the rate of flow of the blood.

Schackwitz (10) describes an apparatus for the recording of eye movements in reading, which consists essentially of a soft rubber

capsule which rests on the upper eyelid and is connected with a Marey tambour or a Marbe flame in such a way as to make a graphic record of the movements of the eyeball. While it is not well adapted for the recording of extent of movement, it would seem to be a simple and unobtrusive means of recording the time of the principal eye movements.

The "Komplikationsversuche" have played an important rôle in the Leipzig laboratory. We therefore welcome from this laboratory Wirth's (12) account of the new model of the "complication-apparatus" made by Zimmermann. He describes (13) one particular modification of this apparatus for use in the study of the personal equation in reactions which would seem to be a desirable permanent piece to have in a laboratory.

Ach (1, 2) describes various arrangements of apparatus for the recording of serial reactions. In the main he uses a slit disk for exposure, a membrane voice key, and a chronograph. Various alternatives are suggested such as timing the chronograph and the use of the carbon ribbon instead of smoked paper on the drum.

Dunlap (4) has devised a method of computing the mean variation with the aid of a calculating machine.

Wohlgemuth (14) has designed a "Thermophor" for the study of warmth spots and a "Crypophor" for the study of cold spots, both acting on the principle that, if two strips of metal such as copper and bismuth be soldered together so as to make a ring, heat applied at one joint will set up an electric current in the ring. The opposite joint may then be used as a stimulus point and the temperature may be registered in terms of galvanometer readings.

The color-triangle described by Luckiesh (7) is made by placing a red, a green and a blue tungsten lamp into the three corners of a triangular case with ground glass face. This face is said to display the actual colors in their various combinations.

Urban's (11) audiometer rests on the principle that the strength of the tone emitted by a fork may be varied by turning the fork. The sounding fork is driven tandem with an interrupting fork and the amplitude of vibrations is measured by a pointer on the prong. The apparatus is built by Zimmermann.

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SPECIAL REVIEWS

Outline of a Study of the Self. R. M. Yerkes and D. W. La Rue. Harvard University Press, 1913.

By this *Outline* Professors Yerkes and La Rue furnish both incentive and guide to that scientific study of self which Stern has named psychography. The *Outline* is in fact a set of detailed directions to be followed by individual students in constructing such autobiographies. "The purpose of the study" the authors say, "is three-fold: to help you to understand yourself . . . ; to help you to understand . . . other persons . . . ; to arouse your interest in the facts of heredity and environmental influence. . . ." The scope of the work is best indicated by a summary of its contents.

I. "The Ancestral History of the Self" is to include a family tree, a "record of family traits" following the schedule of the Eugenics Record Office of Cold Spring Harbor (which is given), and a "description of the environment and of the physical, mental, moral and social characteristics which seem to have determined the success and happiness" of great grandparents, grandparents and parents.

II. The second section on "the development or growth of the self" suggests headings for an account of (1) the "conditions of prenatal life," (2) "the self in infancy," (3) "the self in childhood" and (4) "the self in adolescence." Under the second and third of these topics the following points are stressed: (*a*) "Environmental influences; (*b*) physical development; (*c*) mental development; (*d*) temperament and character; (*e*) vocational suggestions; (*f*) habits of special importance; (*g*) social relations and tendencies."

III. The account of the self of to-day is to "exhibit it (1) as an expression of heredity . . . , (2) as moulded by environment . . . , (3) as a functioning organism, influenced by and influencing the world—animate and inanimate."

IV. In the final section, the writer of the scientific autobiography which is here outlined is to consider "the significance [(1) vocational, (2) marital, and (3) social] of the characteristics of the self." In other words, he is to consider the results of this study of his ancestry, his environment, and his own endowment and acquirements in

their bearing on the problems (1) of his vocation; (2) "of congeniality in wedlock and the welfare of offspring"; and (3) of his duties as a member of social groups.

Under each of the headings of this summary the authors suggest specific questions and topics of which the following are selected at random, as examples only: "(The Self in Childhood) (*a*) Was your childhood spent in the country or city? (*b*) What relation has your weight usually borne to your height? (*c*) When did you enter school? . . . Could you best remember the exact words or the general ideas of a lesson? (*d*) Did you consider yourself a 'good' or a 'bad' child in comparison with your mates? (*e*) What was your childhood attitude toward your father's vocation? Why? III. (The Self in Adolescence) . . . (*c*) The following outline is suggested in sfudying your mental development: Sensations: discrimination, range. Imagery: type and effectiveness. Chief likes and dislikes: food, persons, clothing, natural phenomena, *etc.* Apperceptive tendencies. . . . Memory. . . . Thought: concepts most readily formed; judgment; best in what direction? Reasoning: were you logical, broad-minded, fair? Emotions: which kind strongest? Were they quick or sluggish? Did they over-influence your reason? Sentiments. . . . Will: greatest strength and weakness; far-visioned or immediate? Obstinate or conciliatory? IV. (The Significance of the Characters of the Self. Social) (*a*) What bearing has your physique upon your social duties? (*b*) Are your morals strictly personal, or do you consider them applicable to every human being?"

The writer of this review limits herself to two general comments. It seems unlikely, in the first place, that many people will be found with the combination of leisure, capacity and inclination necessary for so complete a study of self. But every student would be benefited by the understanding, to be gained through this outline, of what such a study involves; and parts of the work might profitably be undertaken without attempting the whole.

In the second place, the reviewer wishes to call attention to the fact that only a psychology treated in the way in which Yerkes and La Rue treat it, as a science of self in relation to environment, could ally itself in this fruitful fashion with biology and sociology.

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COMMUNICATIONS

AN HISTORICAL NOTE

To the Editor of the Psychological Bulletin:

There was at one time a very lively discussion whether or not psychical states, especially sensations, are quantities. The discussion arose about Fechner's assertion that sensations are measurable magnitudes, or quantities, *i. e.*, the sums of certain numbers or sensation-units, a proposition which is fundamental for his doctrine. At present the consensus of opinion seems to be that the negative side, represented by Delboeuf, Tannery and J. v. Kries, carries the day and that Fechner is wrong. A very interesting and exhaustive presentation of this controversy is given in Titchener's *Manual*, Vol. II., Pt. II., pp. 48–68 of the Introduction. It may be remarked that the question is mainly one of historical interest, since psychophysics of the present day does not make any such assumption.

It is a curious and interesting fact that the whole controversy was anticipated several years before the *Elemente* appeared in print. The following lines contain a translation from A.-A. Cournot, *Essai sur les fondements de nos connaissances et sur les caractères de la critique philosophique*, which was published in 1851. Cournot says that writing this book took him ten years and that the first plan was made twenty years before its completion. He, therefore, was some thirty years prior to Delboeuf and Tannery, and Fechner could have found a complete refutation of his system, had he but known the *Essai sur les fondements de nos connaissances*. However, considering the stubborn fight which Fechner put up, it is not at all likely that he would have surrendered to the arguments of Cournot. Neither may we blame him for not knowing the writings of the French philosopher, whose high position in the government service militated against the success of his ideas, for there is no sign that Delbouef and Tannery appreciated the argument of their fellow countryman. This is a sign of the unmerited oblivion which was the lot of the ideas of this deep thinker.

(P. 396) "According to the popular definition everything capable of increase and decrease is called a quantity. There are, however,

many things which may be increased and diminished, and even increased and diminished continuously, that, nevertheless, are not magnitudes and, therefore, not quantities. A painful or a pleasant sensation may increase or diminish or go through different stages of intensity without a sudden transition from one phase to the other, so that one can not fix the precise moment when it comes into consciousness or disappears therefrom. This is the way in which things doubtlessly take place in a great number of cases. When in other cases a pain seems to begin or end abruptly, to increase or diminish in jumps, we may reasonably believe that this discontinuity is apparent only (as in the case of an impact which suddenly changes the motion of a body), and that the phenomena are always continuous, although we identify different phases, their succession escaping us owing to the imperfections of the inner sense which we call psychological consciousness. *The sensations of pleasure and pain, however, and the mathematical notions of magnitude have nothing in common. One can not say that a more intense pain is the sum of several fainter ones.* Although a sensation frequently goes in continuous steps from pleasure to pain, or inversely from pain to pleasure, thereby passing through a neutral state (what in several respects may be called the vanishing of certain magnitudes when passing from positive to negative values) (p. 397) *one can not regard such a neutral state as resulting from the summation of pains and pleasures which balance.*

"By the study of anatomy and physiology we succeed in understanding how a continuous variation in the intensity of a pleasant or a painful sensation may be related to the continuous variation of certain measurable magnitudes and depend on the inherent continuity of time and space. For we understand that the bigger a tract of nervous fibres is (taking into account for the determination of the cross-section the sections of elementary nerve-fibres only, disregarding the tissues which surround and protect them), the more painful is the sensation produced by straining the tract. Other conditions remaining constant, there is for every size of the area of the cross-section a certain corresponding painful sensation, *but this correspondence has not the character of a mathematical relation for although the area of the cross-section is a measurable magnitude, sensation is not.*

"If you put your hand in water of forty degrees and leave it there a sufficient length of time, although the temperature of the water does not change, your first sudden sensation of heat gradually and without leaps grows fainter so that one can not assign any particular moment when it disappears. Other conditions being equal, the

intensity of the sensation depends on the time elasping since the immersion of the hand, and (p. 398) the continuity of time explains sufficiently the continuity of the variations in the sensation produced. This sensation, however, is not a measurable magnitude which by reference to a unit could be expressed numerically.

"Since the vibration-rate of a sounding body or of the ether is a measurable and continuous magnitude, we understand that passing from one tune to another, or from one color to another color should be continuous, but this is no reason for the existence of assignable numerical relations between the sensations of sound and of color, such as exist between the corresponding vibration-rates. *The sensation of the note* SOL *is not equivalent to one and a half times the sensation of* UT, *merely because the vibration-rate of* SOL *is one and one-half that of* UT. *Nor is the sensation of orange five-sevenths or any other fraction of the sensation of violet, because the vibration-rate of ether for orange light is about five-sevenths of that for violet rays.*

"Continuity in the variations of the intensity of attention or of sexual desire may be explained by continuity in the variations of certain physical quantities, as for instance the velocity or oversupply of blood, the electrical charges or the temperature of certain organs which have, or may have, an immediate influence on other vital forces. From this one must not conclude, however, that the attribute of being a measurable quantity belongs to these vital forces or to the phenomena determined by them."

The circumstance that Cournot uses the term "sensation of pain," where most writers of his period would have said feeling of pain, makes this passage sound quite modern. As a matter of fact there is very little that could be added to his argument, which is as precise as one could wish.

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ANNOUNCEMENT

A prize of One Hundred Dollars ($100.00) is offered for the best paper on the Availability of Pearson's Formulæ for Psychophysics.

The rules for the solution of this problem have been formulated in general terms by William Brown. It is now required (1) to make their formulation specific, and (2) to show how they work out in actual practice. This means that the writer must show the steps to be taken, in the treatment of a complete set of data (*Vollreihe*), for the attainment in every case of a definite result. The calculations should be arranged with a view to practical application, *i. e.*, so that the amount of computation is reduced to a minimum. If the labor of computation can be reduced by new tables, this fact should be pointed out.

The paper must contain samples of numerical calculation; but it is not necessary that the writer have experimental data of his own. In default of new data, those of F. M. Urban's experiments on lifted weights (all seven observers) or those of H. Keller's acoumetrical experiments (all results of one observer in both time-orders) are to be used.

Papers in competition for this prize will be received, not later than December 31, 1914, by Professor E. B. Titchener, Cornell Heights, Ithaca, N. Y., U. S. A. Such papers are to be marked only with a motto, and are to be accompanied by a sealed envelope, marked with the same motto, and containing the name and address of the writer. The prize will be awarded by a committee consisting of Professors William Brown, E. B. Titchener, and F. M. Urban.

The committee will make known the name of the successful competitor on July 1, 1915. The unsuccessful papers, with the corresponding envelopes, will be destroyed (unless called for by their authors) six months after the publication of the award.

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ALEXANDRE–BISSON, JULIETTE. *Les Phénomènes dits de matérialisation.* Paris: Alcan, 1914. Pp. xx+312. 12 fr.

PYLE, W. H. *The Examination of School Children.* New York: Macmillan, 1913. Pp. 70. $0.50.

GEMELLI, AGOSTINO. *Il metodo degli equivalenti. Contributo allo studio dei processi di confronto.* Firenze: Libreria Editrice Fiorentina, 1914. Pp. 344.

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NOTES AND NEWS

AT the recent meeting of the American Psychological Association at New Haven Professor R. S. Woodworth (Columbia) was elected president for the coming year. Professors S. I. Franz and G. M. Whipple were elected to membership on the Council. Professor R. M. Ogden (Tennessee) was made secretary-treasurer for three years.

THE Southern Society for Philosophy and Psychology has elected the following officers for the year 1914: president, Professor J. B. Watson (Johns Hopkins); vice-president, Dr. Josiah Morse (South Carolina). Professor W. C. Ruediger (George Washington) continues as secretary-treasurer.

THE American Philosophical Association has elected Professor J. H. Tufts (Chicago) president and Professor W. H. Sheldon (Dartmouth) vice-president. Professor E. G. Spaulding (Princeton) continues as secretary.

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THE PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-SECOND ANNUAL MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, NEW HAVEN, CONNECTICUT, DECEMBER 29, 30 AND 31, 1913

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

The American Psychological Association held its twenty-second annual meeting at Yale University, New Haven, on Monday, Tuesday and Wednesday, December 29, 30 and 31, 1913, in affiliation with the American Philosophical Association. About eighty members were in attendance.

Although two-fifths of the members of the Philosophical Association are enrolled as members of the Psychological Association also, the two societies had not convened at the same place for four years past, which is a sign of current trends. Indeed, before the meetings, a mild apprehension had existed in certain circles lest the temporary renewal of the old affiliation should result in crowding the psychological program with an inordinate proportion of merely theoretical contributions, at the same time interfering with the deliberations of the philosophers. Such apprehensions had small ground. Papers of a general and theoretical nature, although more numerous than at the Cleveland meeting, formed less than a third of the psychological program: fully one half of the forty-four contributions read were reports of research in the realms of normal human, animal, educational, and applied psychology; while six extremely interesting papers in physiological and abnormal psychology brought to a close on Wednesday a varied but fairly well balanced program.

The joint sessions of the two societies were among the most notable features of the convention. Monday evening the members of both associations met to hear the presidential address of Professor

McGilvary, on Time and the Experience of Time. The next evening they came together again for a banquet and a smoker at the Hotel Taft. On this occasion, Professor Warren, the president of the Psychological Association, delivered his address, on The Mental and the Physical. A joint program on Wednesday forenoon was devoted to an able and stimulating debate on The Standpoint of Psychology, the leading speakers being Professor Creighton, Professor F. M. Urban, Professor Dewey and Professor Münsterberg. Following this program, a joint business meeting was held, to hear the report of the committee appointed to ascertain the facts regarding the resignation of Professor Mecklin from the faculty of Lafayette College. The report of the committee was presented by its chairman, Professor A. O. Lovejoy, and was heard with the keenest attention. After discussion regarding the most judicious and effective action demanded by the astonishing facts disclosed in the report, it was voted, on motion of Professor Spaulding, that the report be accepted and printed at the expense of the two societies and that copies be sent to all members of these associations, to the editors of scientific journals who may care to publish the report, and to such other persons as the executive committees of the two associations in conjunction with the members of the committee may determine. [The report has been printed in full in the *Journal of Philosophy, Psychology and Scientific Methods* for January 29, and, somewhat abbreviated, in *Science* for January 30.]

Among the incidental features of the Psychological Association program, an informal round-table conference on psychological tests of college freshmen had been announced, with the thought that possibly as many as a dozen members might care to come together to exchange experiences and to confer regarding plans. About fifty persons attended the conference so that it at once assumed a formal aspect which tended to check spontaneous interchange of ideas. Professor Woodworth, who presided, described the aims which had guided the testing of freshmen at Columbia and explained that the abandonment there of the long-established practice of giving freshman tests is only temporary, pending the completion of a needed revision of the tests employed. Professor Whipple spoke a warning against the attempt to combine scientific and practical aims in the same tests, and also enumerated certain criteria of good tests. Professor Haggerty, Dean Porter, Professor McComas and the writer of this report made contributions gleaned from their limited experience in testing students at Indiana, Clark,

Princeton and Dartmouth. Dr. Wells and others added pertinent cautions and criticisms, compared the merits of individual and group measurements, and pointed out the necessity for tests of traits and abilities in realms other than the intellectual. As an outcome of this somewhat hazy and groping beginning, perhaps there will follow next year a more elaborate symposium, with papers reporting the results of current research and clearly defining the various aims and problems, possibilities and limitations, of freshman psychological tests.

Members had responded generously to the secretary's request for an exhibit of sample outlines, syllabi, examination questions, laboratory directions, and other aids to teaching. Even a cursory glance over the collection left a definite impression that teachers of psychology are applying the principles of their own science. This was evident in the tendency to make study assignments definite, and study problems numerous, specific, and vital. On the side of mere devices, one noticed the rapid spread of the use of "completion-method" ten-minute tests. Laboratory outlines showed a trend toward devoting an increasing fraction of the course to experiments in action, learning, association, and other dynamic aspects of mind.

The exhibit of new apparatus included a test object for pattern discrimination in animals, by Dr. H. M. Johnson; improved forms of puzzle-box and of instruction-box for use with human subjects, by Dr. J. W. Hayes; a test apparatus for speed and accuracy of movement, patterned after the telephone switch-board, by Professor Warren; an inexpensive portable tachistoscope, an adjustable form board, and a time clock for group experiments, by Professor Whipple; reaction and control keys, and an improved d'Arsonval chronoscope, by Dr. Dunlap; a new blood-pressure gauge, the barhemeter, by Professor G. V. N. Dearborn; a new form of dynamometer recorder, by Professor McComas; photographs of distinguished psychologists, by Professor Kirkpatrick; a psychological spectrum, by Professor Bentley; simple and double weight æsthesiometers by Rupp, exhibited by Professor Porter; and Zimmermann's new portable smoked-paper recorder without drum, adapted, after Gutzmann, for making speech tracings, exhibited by the Dartmouth laboratory. Mr. Stoelting was in attendance, with a display of standard laboratory equipment and supplies.

The ample and convenient quarters of the Yale laboratory provided an admirable place for the apparatus exhibit, for the formal

sessions, and for the informal visiting which, quite as much as the program of papers, gives value to these annual gatherings. Professor Angier, Professor Cameron and Dr. Frost, the hosts, were most generous with their personal hospitality and most efficient and foresighted in providing for the comfort and convenience of the members.

Next year the annual meeting will be held in Philadelphia with the American Association for the Advancement of Science, unless it is found that the societies with which our interests are most closely allied are to meet in affiliation with the American Society of Naturalists elsewhere. In that event, which at present seems unlikely, the Council will take up afresh the question of the place of meeting. St. Louis has been mentioned by officers of the Naturalists as a possible alternative for Philadelphia.

No final action was taken with reference to the proposal made a year ago, to hold a meeting in San Francisco in August, 1915; but the council instructed the secretary to communicate with the members before next December, to ascertain how many of them could and would attend such a meeting.

Transactions at the Annual Business Meeting

The officers were elected according to the plan adopted a year ago upon recommendation of the special committee on methods of electing officers. Professor J. R. Angell, chairman of the committee on nominations elected at the Cleveland meeting, presented the following report: For president, Professor R. S. Woodworth. For member of the Council to succeed Professor A. H. Pierce, Professor G. M. Whipple. For member of the Council to succeed Professor S. I. Franz, Professor S. I. Franz.

The recommendations of the committee were adopted and these officers elected.

Upon nomination of the Council, Professor Robert Morris Ogden, of the University of Tennessee, was elected Secretary-Treasurer for a period of three years.

Professor E. B. Twitmyer, of the University of Pennsylvania, was elected representative of the Association on the council of the American Association for the Advancement of Science.

Professor H. C. Warren, Professor E. L. Thorndike, and Professor J. R. Angell were elected members of the committee on nominations for the coming year.

On recommendation of the Council, the following persons were

elected to membership in the Association: E. Stanley Abbot, M.D., McLean Hospital, Waverley, Mass.; Edwina Abbott, Ph.D., Newcomb College; J. V. Breitwieser, Ph.D., Colorado College; Will Grant Chambers, A.M., University of Pittsburgh; Karl M. Dallenbach, Ph.D., University of Oregon; Lucy M. Day, Ph.D., Vassar College; J. Victor Haberman, M.D., College of Physicians and Surgeons, New York City; Louis Dunton Hartson, Ph.D., Grinnell College; David Spence Hill, Ph.D., Department of Educational Research, Public Schools, New Orleans; Walter S. Hunter, Ph.D., University of Texas; H. M. Johnson, Ph.D., National Electric Lamp Ass'n, Cleveland; Thomas J. Kirby, Ph.D., University of Pittsburgh; Marion J. Mayo, Ph.D., Eastern District High School, Brooklyn, N. Y.; Garry C. Myers, Ph.D., Juniata College; Reuel H. Sylvester, Ph.D., State University of Iowa; Clifton Oscar Taylor, Ph.D., Pratt Institute; John Picket Turner, Ph.D., College of the City of New York; Stella B. Vincent, Ph.D., University of Chicago; George R. Wells, Ph.D., Oberlin College; Frederick Adams Woods, M.D., Massachusetts Institute of Technology.

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

An invitation to hold the next annual meeting at the University of Pennsylvania was presented, and it was voted to accept the invitation and to fix upon Philadelphia as the place of the next annual meeting, subject to later action by the Council.

On recommendation of the Council, it was voted that a stipend of $250 be paid annually to the Secretary-Treasurer for his expenses in attending meetings and for clerical and other assistance.

A verbal report of the work of the committee on standardization of mental measurements was presented by the chairman, Professor J. R. Angell.

The report of the committee on psychology and medical education was presented by its chairman, Dr. S. I. Franz. The report was adopted, with thanks to the committee. It was voted that this committee be continued and that a sum not to exceed $20 be appropriated to cover its expenses during the coming year.

The report of the committee on teaching experiments was presented by Professor G. M. Whipple. Samples of several printed forms were distributed, and criticisms and suggestions invited. The report of the committee was adopted. The resignation of the chairman was accepted with regret. The principle of rotation of membership on the committee was adopted, one new member to

be chosen each year. Professor E. A. Kirkpatrick was chosen to fill the vacancy caused by the resignation of Professor Whipple.

The Council reported that an effort would be made in future years to increase to a still greater degree the value of the meetings through augmented facilities for informal conference. It is hoped that the local committee in charge of arrangements for the next meeting will be able to arrange for an informal dinner and smoker on the evening preceding the first formal sessions. If possible, a private dining room in the hotel headquarters will be secured where all the members who so desire may gather for their meals each noon and evening during the meetings.

Professor F. M. Urban addressed the meeting on the function of the Association in the encouragement of research, and advocated the founding of a prize. It was voted that the President select a committee of three, of which the incoming president shall be a member *ex officio*, to consider the advisability, and the means, of advancing psychology by the method of offering prizes.

It was voted that the thanks of the Association be extended to Professor Angier and our other hosts for their welcome and hospitality, and the many kindnesses they have shown us during this meeting.

On motion, the meeting adjourned.

Report of the Treasurer for the Year 1913

Dr.

To Balance from previous year	$2,920.00	
Dues received from members	272.40	
Interest from July 1, 1912 to July 1, 1913	97.84	
		$3,290.24

Cr.

By Printing and supplies	$ 125.05	
Postage	31.67	
Express and telegrams	11.44	
Reprints of Proceedings	15.37	
Clerical and stenographic aid	53.42	
Expenses of Secretary (1912 meeting)	51.25	
Incidental expenses of 1912 meeting	8.35	
Expenses of Committee on Methods of Electing Officers	26.10	
Expenses of Committee on Psychology and Medical Education	72.09	
Expenses of Committee on Nominations	7.10	
Exchange on checks	.70	
		$ 402.54

Cash on hand	9.62
Balance in Fifth Avenue Bank	109.37
Balance in Union Dime Savings Institution	2,768.71
	$2,887.70
	$3,290.24

W. V. BINGHAM,
Treasurer

HANOVER, N. H.,
December 27, 1913.

Audited by the Council

ABSTRACTS OF PAPERS

ADDRESS OF THE PRESIDENT

The Mental and the Physical. HOWARD C. WARREN, Princeton University.

Science is not yet ready to adopt a metaphysics of mind and matter. But some working hypothesis of the psychoneural relation is needed in order to fix the scientific status of psychology. The double-aspect view (monodualism) seems to fit the conditions best. This conception of the relationship between mental and physical becomes clear when we examine the analogous relation between surface and mass in our perception of material phenomena. If mental and physical activity are two inseparbale aspects of one series of events, then the scientific assumption of uniformity or "law" is extended from the physical into the mental sphere. The old anthropomorphic conception of choice and reason must be radically amended. In the light of modern science the presumption is that mental phenomena, including choice and reason, are as uniform as physical events. The burden of proof rests on those who deny the regularity and determinacy of human volition and human reasoning. Even teleology may be brought into line with the mechanistic processes of nature. Foresight is the conscious counterpart of purposive activity, which is due to distant stimuli preparing the response to contact stimuli by means of a complex nervous mechanism; the beginnings of this purposive activity are manifest far down the organic scale. Psychology should embrace both the inner and outer aspects of experience. It is the science of the relations between the individual and his environment. These relations may be studied either objectively as behavior, or introspec-

tively as events of consciousness. Behavior study is essential to an understanding of genetic problems; it serves also as a check on the data of introspection. Introspective psychology has disclosed uniformities among mental events; it claims recognition by science on the ground that science should include every branch which contributes to a unified view of the world. The Behaviorist himself admits that consciousness is a necessary instrument of research. Without it there would be no scientific observation or generalization. Sense perception and the logical processes require analysis quite as much as the facts and values which they reveal. Science must study its instruments as well as its data.

(This paper will appear in full in the March number of the *Psychological Review*.)

Papers read at the joint session with the American Philosophical Association

The Standpoint of Psychology. J. E. Creighton, Cornell University.

The physical sciences, based on the mechanical theory, do not describe concrete individual things, but seek to determine the *general* conditions and relations of material existence. Psychology has attempted to obtain information of the same type as those expressed in the laws of physical nature. Its laws, therefore, refer to the conditions of mentality in general, in abstraction from the *individualized* form of concrete minds. The question arises whether these abstract conditions of mentality have not ultimately to be expressed in physiological rather than in psychological terms. Is it possible to maintain that there are *existing* processes or modes of consciousness or even that there is any genuine scientific advantage in describing mental life from this point of view? Even if we grant, as it is probably necessary to do, that a psychological physiology or a physiological psychology is necessary, yet this type of science does not satisfy all the legitimate demands that are made upon psychology. There is also necessary a science of psychology, which shall deal with the concrete individualized form of experience and which shall express its results in terms of a different mode of uniformity from that of the natural sciences. Its method is teleological rather than causal, and its standpoint is that of the concrete self in its relations and functions. This type of psychology is no mere unrealized ideal, but is found in the historical systems and in

contemporary investigations. Its method of analysis is different from that of the existential psychology but not inferior either in definiteness or certainty.

Philosophic Problems of Experimental Psychology. F. M. URBAN, University of Pennsylvania.

Philosophy develops its own methods and problems independently. Its realm is the whole field of experience, part of which is cultivated by psychology the problems of which are just as much objects of philosophic speculation as those of any other science—neither more nor less. Philosophy can be of assistance to psychology by analyzing and refining the notions used in describing the phenomena of experience. The notions of introspection, probability, and the psychometric functions are used as illustrations. In trying to correlate mental states, as revealed by introspection, with definite groups of conditions one encounters the difficulty that no such group, no matter how carefully controlled, always produces the same mental processes. The judgments given on the comparison of two stimuli have the formal and material character of random events, and the question arises whether they do or do not depend necessarily on their conditions. The psychometric functions offer a problem of similar great generality, because the same question arises whenever we apply mathematical reasoning to the study of nature. The logical representative of causal connection is the idea of functional dependence. In actual application one cannot make use of the most general form of relationship, but one is restricted to certain classes of simple functions, called analytic functions. Two properties make these functions extremely valuable for our study of nature. They may be determined on the basis of a finite number of observations, and, once determined, their course may be followed up as far back or ahead as one pleases. It seems that the principle of causality is identical with the assumption that all the events of nature may be characterized by analytic functions. The way to advance the logical side of the question consists in dropping this assumption as a whole or in part and observing the consequences.

The Standpoint of Psychology. JOHN DEWEY, Columbia University.

The speaker dealt with the topic as it presents itself in the actual teaching of philosophy. Whatever may be the abstract theoretical aspects of the methodology of the two subjects, from the standpoint

of the present teaching of philosophy, the subject of philosophy is intimately tied up with the conceptions involved in the current teaching of psychology. It was pointed out that almost all the epistemological problems that are in the forefront of discussion today are what they are because of the fact that psychology is thought to afford scientific warrant for belief in a separate psychic or mental realm of existence, having its own self-contained entities, laws and systematizations, and for the belief that these psychic existences are either the primary immediate data of knowledge or else the terms and units out of which knowledge is composed. Hence such problems as whether we can know an external, material world, and if so, how; whether there is any reason for believing in such a world; whether the psychic event or "consciousness" modifies the real object in the act of knowing it; how mind and body are connected in acts of knowing and willing; whether a psychic existence can have physical efficiency; whether it falls under the law of causality applicable to physical existences, etc. The genuineness of such problems and the significance of the philosophy that deals with them is absolutely dependent upon the standing of the primary conception brought over from psychology. It was pointed out that if the "behavior" movement made much headway in psychology students (and future teachers) of philosophy would approach philosophy with such different preconceptions as radically to alter the subject-matter and method of philosophical discussion. In conclusion, the question was raised how far the fundamental assumption of current introspective psychology had itself grown up within psychology on the basis of its own scientific data and how far it was a heritage from the philosophy of Locke and Descartes. If it should turn out to be the latter, the circle of relationship between current psychology and current philosophy would be complete; so that however distant from the ideas of the seventeenth century philosophers prided themselves upon being, they would still be inquiring into their topics from the standpoint set by those ideas.

The Standpoint of Psychology. HUGO MÜNSTERBERG, Harvard University.

The speaker started with an account of the recent, much discussed declaration of protest of one hundred and six philosophers in Germany. They demanded that the faculties and governments create special professorships for experimental psychology, instead of

filling the chairs for philosophy with psychologists. They insisted that psychology is a special science which is nowadays detached from philosophy. The pamphlets of Wundt, Marbe, Hillebrand, take the opposite stand. Psychology and philosophy belong together, or, in more extreme form, philosophy is to be made dependent upon psychology. We have here in America the same contrasting views. The fundamental condition for bringing order into this chaos is the recognition that there exists not one psychological standpoint, but two, and that the two kinds of resulting psychology stand in very different relation to philosophy. The causal psychology must remain the psychology of our laboratories, but no causal psychology of logical or ethical processes can be a substitute for philosophy. Moreover no psychophysical research can contribute to the solution of the fundamental problems like the right or wrong of introspection, of psychical causality, of parallelism, of the subconscious. Every special fact of observation can be interpreted in either of the opposing theories. They must be settled beforehand by epistemology. The other standpoint of the psychologist is that from which mental life appears as the expression of a meaning. The resulting psychology is purposive. While the background of the causal psychology is a naïve dualism, the background of the purposive psychology must be a naïve realism. Every element of human experience can be treated from both standpoints. The biological behaviorism also allows both forms. The bodily action may be looked on as the substratum of the causal mental process or as the bodily expression of a purposive self. Only the purposive psychology speaks of that mental life of the individuals for which norms exist. It is therefore the only psychology which is directly related to philosophy. Yet the standpoint of the philosopher cannot be identified with that of the purposive psychologist either. He ought not to be interested in those mental acts by which the individual submits to the norms, and that is to the values, as this submission involves the acknowledgment of a realm of absolute values, the subjects of which are not individuals but an overindividual will. While causal psychology leads to no philosophy, teleological psychology leads to relativistic philosophy only. The analysis of the idealistic philosopher, who deduces the validity of the absolute values from the postulate of reality, precedes both and guarantees their definite rights in the system of our overindividual tasks.

Studies in General and Social Psychology

Images and Ideas. Knight Dunlap, Johns Hopkins University.

Images are not contents modally resembling the special sensation of vision, audition, etc., but are muscular sensations. They may therefore be observed directly only by introspection, although other means of observing the total complex (muscle contraction), of which the image is a part, are important for the investigation of the conditions of thought. "Introspection" as here used signifies nothing more than the observation of images (muscle sensations) and feelings. Perceptual consciousness is conditioned by the arc reflex from non-muscular receptor to muscle; consciousness of pure feeling by the reflex from receptor to gland. The reflex from striped muscle to striped muscle conditions directly the consciousness of muscular action, and derivatively the thought of the object given originally by the perceptual reflex whose *terminus ad quem* is the *terminus a quo* of the thought-reflex. The idea is therefore the derivative content of the thought consciousness, and does not include the immediate content, or image. The image, as it is conventionally described, masquerades in plumage stolen from the idea.

Cannot Psychology Dispense with Consciousness? Eliott Park Frost, Yale University.

The present paper attempts an explanation of what is usually ascribed to consciousness, on a strictly physiological basis. How can we explain the fact that things not only are, but that they get reported? If we consider "awareness" as a physiological and not a psychological term, a start will have been made.

"Awareness" shall then characterize the response of neural mechanism to stimulus. Iris reflex is a simple illustration. Such a sensori-motor arc may be called an "alpha-arc." An alpha-arc shall then characterize any simple, single, sensori-motor path initiated by a peripheral stimulus, and resultant in some end-effect. When alpha-arcs involve higher cortical centers, a further neural beta-arc *may* be aroused in the association centers. Beta-arcs are then like alpha-arcs, save that they take for their objects, just prior alpha-arcs, and the end-effect is modified by complication in terms of previous neural experience.

Such beta-arcs the writer terms "consciousizing processes." Their biological significance is to allow of the modification of ordinary reflex behavior in terms of the past experience of the

organism. No arcs, alpha or beta, are self-sensing, but any arc (beta, gamma, etc.) may become aware of any previous arc (alpha, beta, etc.). Such awareness is what is commonly termed "consciousness."

Alpha-arcs not arousing beta-arcs are called "pre-consciousizing processes" (reflexes); while arcs that once aroused such beta-processes, but no longer do so, are called "consciousized processes" (habits). Behavior would appear to be completely and most simply explained by the mutual functioning of groups of alpha- and beta-arcs, without the confusion of the hypothetical "consciousness."

"Sensations" then are not "first things in the way of consciousness," but the second. There must always be at least two physiological processes, successive in time, for one to be a consciousizing process, or "sensation." The iris can never get a sensation. An alpha-arc might give "red-awareness"; the subsequent beta-arc, if aroused, would then give "sensation-of-red." Can either introspection or logic demand any further characterization of "sensation-red experience" than to say that a nervous impulse has passed through the cortex and there aroused a second impulse which takes it as its object?

Physiological processes are not the *vehicle* of the psychic, but *are themselves* just what and all we can mean by consciousness. Neither introspection nor logic can demand any further "elementary psychic process," or "knowing function."

The Aufgabe and Intellectual Inefficiency. MARGARET F. WASHBURN, Vassar College.

An essential characteristic of an idea which assumes the function of a directing idea or *Aufgabe* is that it associates with itself a bodily attitude which may be called the activity attitude. The *Aufgabe* may drop out of consciousness and still influence associative processes if the organic-kinæsthetic fusion resulting from the attitude remains in consciousness. The *Aufgabe* recurs to consciousness, after an interval during which it has ceased to act, through the spontaneous tendency of the activity attitude to recur or perseverate; the recurrence of the attitude recalls the *Aufgabe* associated with it. There is a purely physiological factor, unrepresented in consciousness, which helps to determine whether or not, at a given moment, a given idea shall be associated with the activity attitude and become an *Aufgabe*. The unpredictable character of this factor, depending on the physiological condition of the organism,

is responsible for the illusion of free-will in the acceptance of *Aufgaben.*

The activity attitude tends spontaneously to relax sooner or later. Its duration is in part determined by physiological conditions, but is influenced also by a psychological factor. The relaxation of the activity attitude is hastened by too much attention given to the sensory accompaniment of the attitude: to the attitude of working rather than to the work itself. Three types of intellectual inefficiency may be explained on this hypothesis as to the nature of an *Aufgabe:* the lazy person, the spasmodic worker, and the fickle worker. The lazy person seldom assumes the activity attitude. The spasmodic worker quickly releases it, although he may recur to the same task repeatedly after intervals of relaxation. His activity attitude relaxes too soon, partly at least because he gives too much attention to the attitude itself and thus lowers the threshold of fatigue. The fickle worker is characterized by long-continued single periods of activity, but when he has once dropped a task he tends not to recur to it. His activity attitude has been so long continued that the unpleasantness of extreme fatigue associates itself with the ideas of the *Aufgabe,* so that subsequent recurrences of the activity attitude fail to recall effectively this particular task.

An Historical Survey of Psychological Methods. CHRISTIAN A. RUCKMICH, University of Illinois.

Four different interpretations are found in the usage of the word "method" in a study of more than a score of systematic works in psychology: (1) general mode of investigation of phenomena, *e. g.*, "experimental method," "introspective method"; (2) a specific type of procedure for purposes of control or treatment of data, *e. g.*, "method of impression," "statistical method"; (3) point of view taken or intention assumed in an investigation, *e. g.*, "genetic method," "descriptive method." These three are methodeutic, but the last is logical in nature: (4) the type of reasoning involved in the pursuit of any of these three or in the systematization of the results obtained, *e. g.*, "inductive method," "synthetic method." The use of the first three classes of method is traced through the history of psychology from Aristotle to the beginning of the nineteenth century by interpretation of the works of representative psychologists and from that time to the present by a classification of the expositions of method as given in the systematic treatises of the leading authorities. The most important feature of the develop-

ment of method is its derivation on the one side from casual observation and occasional experiment, and, on the other, from the functions of the "inner sense." A constant shift of emphasis on one or the other of these factors is marked. The final movement toward experimental procedure took place soon after Kant's refusal to admit psychology to the rank of a science. From that time on, with the refinement of experimentation, the use of "method" was broadened to include the second meaning in addition to the first and third. The modes of investigation, however, also received critical treatment and became more sharply defined. The establishment of psychology on an empirical basis as a science took two directions: (1) the widening of the scope of psychology to include comparative and physiological aspects, and (2) the application of quantitative methods. At present, the main differences between the various systems which grew out of this development of the science lie in the several senses in which the principal methods are used, and in the several evaluations of the methods. Uncontrolled introspection, for example, is considered by one group of authorities as a method which may contribute facts to the science, by another, as wholly useless to the science. Again, some authors maintain that experiment can control conditions affecting both introspection and general observation of organic movements, while others declare that its realm is psychophysics, physiology, or the simpler mental processes and complexes.

It is essential that systematic writers come to terms on the evaluation and interpretation of the various methods, and also on the usage of the word "method."

An Historiometric Study of Eminent Scientists. Frederick Adams Woods, Massachusetts Institute of Technology.

This investigation was designed primarily to furnish an objectively derived working list of the leading names in the history of the natural and exact sciences. Three leading encyclopædias have been utilized, as a standard for inclusion,—the Encyclopædia Britannica, La Grande Encyclopédie and Meyers Konversations-Lexicon. Out of these the 1,300 most prominent scientists have been selected from each encyclopædia so that three lists contain the names of those to whom the greatest amount of printed space is allotted. About 300 names appear in all three lists, and are called Class A. Class B consists of about 450 who appear in two of the three lists. Class C those who appear in but one of the three lists

(about 2,100). The rise and fall of scientific activity can then be measured. The most significant changes are the rise in Germany during the nineteenth century and the decline in France. These changes are probably due to environment and not to heredity, but the cause of the change is not quite evident. There is apparently little bias of the editors of the encyclopædias towards their own countrymen as regards scientists of the highest eminence, or men long dead. This bias is much stronger towards living men and less eminent men. In historiometric work some triangulation or other method of objective proof is necessary. Confirmation from various points of view, and convergence of results will lead towards increased certainty, and a progressive inductive science.

Some Characteristics of Judgments of Evaluation. H. L. Hollingworth, Columbia University.

In most of the numerous studies by the method of relative position the method has been used chiefly as an instrument in the investigation of some specific problem, such as family resemblance, interests of children, value of advertisements, measurements of school progress, distribution of eminence, etc. Little attention has been paid to the characteristics and behavior of the judgments themselves. When the various studies are considered together a number of interesting problems arise concerning the judgments themselves. The paper points out some of these problems, and reviews the available material, suggesting tentative conclusions and further problems. Among these problems are the following: (*a*) The relative advantages of the strict order method, the method of paired comparisons, and the group method. (*b*) The variability of judgment in different parts of an experimental series, and the reasons therefor. (*c*) The certainty of individual preferences and aversions, as indicated by the variability of judgment. (*d*) Group variabilities and differences in likes and dislikes, as indicated by the unanimity of judgment. (*e*) Measurements of personal consistency and of judicial capacity, as indicated by individual variability and agreement with the group average. (*f*) Personal consistency in different situations, individual differences in this respect, and the problem of general consistency. (*g*) Judicial capacity in different situations and the question of general or abstract judicial capacity. (*h*) The relation of variability of judgment to the length of the experimental series. (*i*) The various quantitative criteria of the subjectivity of judgments, and the relations between these various

criteria. (*j*) The amount of agreement between diverse groups of observers.

(This paper will appear in full in No. 29 of the *Archives of Psychology*.)

Composite Group Judgments. WALTER DILL SCOTT, Northwestern University.

In social psychology we discuss the causes of group action so far as it is affected by social contact. If we are to retain the introspective method it must be the introspection of the individual member of the group. The students in our classes are members of groups whose action can be readily studied. Each student is a member of a group that selects electives in the course of study and in which the selection is dominated by social contact. Each student is a member of a college community that attributes prestige to individuals of the group. Each student is also a member of a home community that bestows respect on certain members of the community. About 200 students in social psychology applied the method of Order of Merit to each of the three following classes of data:

Rank in order of importance the motives which determine the election of studies by your 1,000 fellow students. (10 motives specified.)

Rank in order of importance the qualities that give prestige to the 1,000 college students (provided with a list of 8 such qualities).

Who is most respected in your home community—the *successful* business man, lawyer, minister, physician, or professor? Rank the five in the order in which they are regarded in your community.

The attempt to answer these questions is not only a good exercise for the student in social psychology but the answers are illuminating to the professor in charge.

On the Psychology of Having Friends. GEORGE A. COE, Union Theological Seminary.

Friends' mutual enjoyment of each other offers for analysis a social experience that is easily accessible to the psychologist, and that is rather promoted than hindered by reflection upon it. The naïve understanding of this experience asserts: (1) That what each friend enjoys is the other friend, not merely goods to be mediated by him, and (2) that the reason why a giver is valued above his gift is that a giver has experiences. Apparently, then, we value objects not only as experienced but also as experiencing.

What has psychology done with data like these? In general, it has investigated social intercourse from the standpoint of the mechanism of the process, and from the standpoint of knowledge, but in only minor degree from the functional standpoint. Particularly, the kind of value realized when a friend simply "has" his friend, and the kind of adjustment therein achieved, have received scant attention. *A.*—Something has been done with specific phases of social intercourse, as suggestion and imitation. *B.*—Genetic study has shown that the process of attaining self-consciousness is at the same time the process of defining our social objects. *C.*—Eight kinds of answer have been given to the question "How do I know that any other mind exists?" They range from "I see and hear my friend," through "I infer by analogy," "I postulate," "I intuit," all the way to "There is continuity of substance between minds," and even "Individuals overlap." None of these theories gives a sufficient account of the kind of value involved in "having" a friend, or of the relation of this value to the "having." *D.*—Psychology has determined that other-regard is not merely refined self-regard. This is one step toward a psychology of social values. *E.*—Psychology has raised the question, what is the "psychological" point of view with respect to such multiple experiencing as friendship asserts itself to be? No decisive answer has been given. If I as psychologist consider myself and my friend merely as content of experience-in-general, conversation being treated as internal discourse, and conversers as merely slower parts of the conversational flow, I am unable to construe "having a friend" in any sense that I can recognize as true description when I enjoy the experience itself. It does not appear that psychology can either deny or translate into anything else the naïve assertion that I enjoy a second experiencing.

Punitive Justice and the Social Consciousness. Ellsworth Faris, State University of Iowa.

In the tribes of the Equatorial Congo there are large numbers of the population who are not subject to any form of punishment. This fact has a bearing on the theories of the origin and future of punishment.

The reaction of the group toward a criminal may be one of three: it may be an immediate and instinctive resentful attack; it may be a social attitude in which the interests of the offender are still considered identical with those of the group; or it may be an inter-

mediate attitude in which the offender is an enemy to some of the group and a friend to others. The first of these reactions is war, the second is one of relatively complete socialization with no place for punishment, while the third alone offers the possibility of punishment.

The primitive group is founded on heredity. To a large number of the tribe there are only two classes into which all the race is divided: kindred and enemies. A harmful act on the part of enemies or strangers is the signal for attack. It is an immediate and instinctive reaction of revenge and retaliation whose object is the destruction of the enemy. The attack goes beyond and often is opposed to self-interest. Neither the state of mind nor the overt reaction is a genuine punitive situation.

It is equally impossible to punish those who are within the group. The interests of the members are identical. If an offence occurs there may be and is expressed disapproval, but no punishment.

Punishment arises when the group becomes complex, when the bonds are not too strong to be broken and when the offence is not serious enough to break it entirely. Only when the offender remains within the group is he punished, otherwise he is destroyed.

Since punishment is taking of vengeance by part of the group, modern criminal practice is coming to discard the category. The most enlightened procedure is an attempt to bring back the offender to a place within the group.

Intoxication in Religion. JAMES H. LEUBA, Bryn Mawr College.

This paper attempts to establish three theses: (1) In all, or nearly all, non-civilized peoples states of intoxication are looked upon as religious states *par excellence:* they are designated as God-possession. (2) In the religions of civilized nations, and in particular in Christianity, similar states, *i. e.*, ecstatic trances are likewise looked upon as union with the divine. (3) The reason commonly offered for the identification of intoxication and trance states with divine possession, namely, the apparently superhuman character of these states (visions, anæsthesias, etc.) and the alleged superhuman powers and knowledge which come to a man when in this condition, does not account adequately for the amazing attractiveness of intoxication. This is apparent in the fact that intoxication retains its hold upon a man when it ceases to be regarded as divine.

In an analysis of intoxication consciousness, the author uncovers the more fundamental reasons for the place secured by intoxication in religion.

Three methods of producing religious intoxication are described, the chemical (various drugs: pegoth, soma, alcohol) the mechanical (rhythmic dancing), and the psychical (as in the Yoga practice and in Christian mysticism).

Studies in Experimental Psychology

The Influence of Distractions on the Formation of Judgments in Lifted Weight Experiments. David Mitchell, University of Pennsylvania.

The investigation involves the problem of attention and attempts to answer questions, similar to those raised by Münsterberg, Titchener, Wirth and others, by the use of a technique and methodology much more refined than these workers had at their disposal. The judgments in experiments with lifted weights, obtained and treated by the method of Constant Stimuli as developed by Urban, are the basis of this discussion. Two kinds of distraction were used: (1) While the subject gave all attention to the judgment of the weight a distracting sound stimulus was presented. (2) At the same time that the subject lifted the weight he had to count discrete sounds, that is, a second mental operation was carried on. During the investigation approximately 75,000 judgments were made and on the basis of these the following conclusions are given.

First: Contrary to the traditional view, distractions (*a*) increase the precision of judgment, that is, the subject's judgments are more consistent, and (*b*) cause an overestimation of the weight, or in other words, with a decrease of attention there is an increase in sensation intensity.

Second: With distraction the sensitivity of the subjects is increased, the upper and lower difference thresholds being nearer together.

Third: The current division of attention into voluntary and involuntary may not be valid, the method used here suggesting a more satisfactory way of evaluating such psychical processes.

On a Reduction of the Practice of the Method of Constant Stimuli. Samuel W. Fernberger, Clark University.

It would seem that the labor of the calculations of the method of constant stimuli has been reduced as much as possible. Any further reduction of the practice of this method, therefore, must consist in a shortening of the experimental technique by means of which the

empirical data are acquired. This may be accomplished in either of two ways: by being satisfied with a smaller number of judgments upon each comparison pair, or by a reduction of the number of pairs. The number of pairs which should be used has been settled chiefly for reasons of convenience, and the usual number for experimental studies has been seven pairs.

The present study is an attempt to determine, experimentally, the effect of the elimination of the two extreme intensities of the comparison stimuli. Two series of lifted weights were employed; one, an extended series of seven pairs of stimuli; the other, a reduced series of five pairs. These were mingled in such a way that the results from both were taken simultaneously. The space errors were eliminated and the time errors were kept constant. Six thousand judgments were taken from each of three subjects. The averages for all three subjects, of the values of the interval of uncertainty for the extended and the reduced series, show a difference of only 0.07 gram. The point of subjective equality shifts somewhat; being 0.34 gram lighter for the reduced series than for the extended series. Hence it would seem that the elimination of the two extreme values of the comparison stimuli makes practically no variation in the determination of the sensitivity of the subject. Such an elimination, obviously, reduces the time and labor necessary for the acquiring of the data upon which the calculations are based by nearly one-third.

A complete series, under exactly similar objective conditions, was taken from a fourth subject, but his results were of such a nature that they must be treated separately. In one series of twelve hundred reactions, he failed to give a single equality judgment; so that, in this case, the determination of his interval of uncertainty is zero. Hence we conclude that the subjective attitude, as well as the objective conditions of the experiment, constitutes a factor in the determination of the interval of uncertainty.

The After-Effect of Visual Motion. WALTER S. HUNTER, University of Texas.

The visual motion was produced by black and white strips rotating about a horizontal axis. The motion was viewed through a screen with an aperture $4 \times 7\frac{1}{2}$ in. Six subjects have been used.

The author has obtained results which require an interpretation upon the basis of eye-muscle strain due to inhibited tendency to follow moving lines. This is the same factor which experimenters,

Carr in particular, have found effective in producing the motion in the autokinetic illusion. The following facts may be given in support of the above: (1) The after-movement (a.-m.) is in general in the same direction as this strain. (2) The appearance of the a.-m. may be inhibited by vigorous straining of the eye muscles in the fixation during the real movement. (3) Eye movements, confined to central area of drum, plus winking and general muscle strain will prevent the appearance of the a.-m. even though a negative after-image of the aperture is obtained. (4) If a mirror be placed below the rotating drum so that the motion is seen going in opposite directions, eye-muscle strain may prevent the appearance of all a.-m., or it may control the a.-m. either on the drum or in the mirror. Often the a.-m. which opposes the direction of strain is controlled while that going in the same direction is unaffected. (The last three points indicate methods of "covering up" the strain incident to control of the "follow tendency." Such methods inhibit the a.-m.) (5) If one eye is stimulated by the movement, an a.-m. may be seen with the other eye either on the stationary drum or upon a printed page. No negative after-image of the aperture appears in the unstimulated eye. This a.-m. is not sharply localized and can be accounted for on the basis of the harmonious action of the muscles of the two eyes. (6) The stationary drum may be made to appear to rotate either up or down by straining any eye muscles in the corresponding directions. (These two points show the isolated effect of eye-muscle strain.)

It is not contended that the muscle strains alone are the effective conditions of all a.-m. Both the fading of after-images and association factors are influential as shown by data accumulated. Wohlgemuth has opposed the after-image theory on the ground that constant stimulation soon results in uniform fatigue. If this were true, no *movement* could be seen, as is evident from rapid rates of rotation.

Absolute Pitch Memory. J. W. Baird, Clark University.

Absolute pitch memory is subject to wide individual variation; when the eighty-eight tones of the piano were presented in irregular order, our nine observers made the following percentages of correct identifications (264 or more judgments by each observer): 99, 97, 89, 73, 62, 51, 41, 32 and 26. Tones from the middle region,—the once-accented and the twice-accented octaves,—are most accurately identified, and tones from the sub-contra octave are least

accurately identified. Relatively few errors are made with piano tones; then follow, in order of increasing difficulty, pipe organ (diapason, reed, string, flute qualities), flute, clarinet, forks, voice (tenor, contralto, soprano, bass). A determination of the limits of pitch within which each tone of the octave (naturals only) is still identifiable shows an overlapping in every instance,—for instance, a tone of 545 vibrations is sometimes identified as *c*, sometimes as *d*. (These determinations, however, were made by means of the *Tonvariator;* and all of the observers reported that tones of this clang-tint were exceedingly difficult to identify.) All observers agree in identifying the *note* more accurately than the *octave* to which it belongs,—a circumstance which seems to support the view (Révész, Köhler) that tones possess an attribute of character in addition to their attributes of pitch and clang-tint. The testimonies of all nine observers agree in asserting that absolute pitch memory is not a product of deliberate training and practice.

A Case of Color Hearing. Herbert Sidney Langfeld, Harvard University.

The phenomenon of color hearing of a talented musician was examined twice,—a period of seven years intervening between the two investigations. It was found that the colors agreed even to the subtler nuances. In the later investigation the colors accompanying certain chords and the difference between consonance and dissonance as regards the resulting colors were noted.

(This paper will appear in full in the March number of the Psychological Bulletin.)

The Relation between Complementary and Contrast Colors. Florence M. Kunkel and Helen D. Cook, Wellesley College.

The paper reports experiments investigating the relation between the quality of colors which pair off as complementaries, and those which mutually induce each other in simultaneous contrast. The method was that of making color equations by means of rotating disks of colored papers. Both complementary and contrast colors were formed by the usual procedure. The results agree with those of Tschermak (Pflüger's *Archiv*, 1907) in showing that the contrast color is both redder and bluer than the complementary. The discrepancy is slight for red and for green, large for yellow and for blue.

The anomaly is explained by Tschermak as being due to reddish-

blue adaptation of the eye in ordinary daylight. If this were the case, the direction of the anomaly could be changed by artificial adaptation to different colors. Experiments under conditions of artificial color-adaptation, however, show no variation in the direction of the anomaly, and only negligible variations in its amount, whether the eye be adapted to red, blue, yellow, green, gray, or to ordinary daylight. Evidently, therefore, Tschermak's explanation is inadequate, but the experimenters have no better one to offer.

Supplementary tests with complementary colors, simultaneous contrast and negative after-images, show that the anomaly for blue and for yellow is even greater in the case of the negative after-image than it is for simultaneous contrast. For a blue and a yellow that are complementary, the simultaneous contrast colors are orange and violet respectively, and the negative after-images are a still redder orange and violet.

A Corrected Color-Terminology. CHRISTINE LADD-FRANKLIN, New York City.

It is wrong for people who wish to think consistently in a scientific fashion to permit the term *color* to be used with its present ambiguity,—as both including and excluding the series of grays. The term is absolutely needed in the inclusive sense, and there is a simple means at hand by which to make it unambiguous,—for color proper, there is no reason why we should not say *chroma*. We have already all its derivatives in common use, dichromatic, achromatic, tetrachromatic (for normal four-chroma vision). The Germans already discriminate between the *toned* and the *tone-less* colors, and we should be equally exact. For the grays, including black and white, we have at present no word indicating their quality;—I propose to make use of the term *achroma*. (I find the word already in existence in the dictionaries of medical terms.) With these two names for the specific and the non-specific light-sensations, we have at once two good words for the *degree* in which each sensation-constituent is present in, say, a grayish-blue: we can speak of its chromaticity and of its achromaticity. At present we have for these two perfectly definite sensation-qualities only "degree of saturation," which is too vague, and "degree of non-saturation," which is very roundabout, and which, moreover, is a phrase that does not exist,—at present the sensation *quale*, though perfectly distinguishable, is not named.

There are four unitary colors proper, or chromas, and four series

of color (chroma) blends. The words orange and purple should never be admitted into scientific speech,—non-unitary colors should not be given unitary names. Just as there exist no unitary names for the yellow-greens and the blue-greens, so we should, in the other two series of color-blends, speak always of the red-blues and the red-yellows.

The term *brightness* has been thoroughly vitiated for scientific use by the absurd color theory of Hering;—his followers mean by it three things at once: (1) brightness in the real sense; (2) an assumed whiteness-constituent (though the color may be, for sensation, perfectly saturated); and (3) an imagined dissimilation-process which is taken to be its physiological correlate. Since it is impossible to rescue this word, at present, for its correct meaning, it is indispensable to discard it entirely. Its place should be taken by luminosity, or subjective intensity. Hering has said lately that those who can accept neither the psychological nor the physiological conceptions which lie at the base of his theory, may nevertheless be grateful for his terminology. But in fact his terminology, as regards "brightness" at least, is almost worse than his theory. His theory is, moreover, so bound up with his baseless terminology that the simple restitution of the term brightness, for instance, to its natural and unambiguous signification (subjective intensity or luminosity) would suffice, I have no doubt, completely to upset his theory. It is the surreptitious introduction of Hering's hypothesis as to the physiological substratum of brightness under this triply ambiguous term that permits one to be oblivious of the untenableness of the theory. A corrected color-terminology, therefore, far from being immaterial, is bound to have important logical consequences.

Deficiencies in the Method of Flicker for the Photometry of Lights of Different Colors. C. E. Ferree and Gertrude Rand, Bryn Mawr College.

(This paper will appear in full in the Psychological Review.)

Color Preferences in School Children: A Contribution toward Method. Mabel R. Fernald, Chicago Normal College.

This study represents an attempt now in progress to discover the main lines of color preferences in one group of 38 school children between the ages of six and eight. In a preliminary series of comparisons of the four colors of the Milton Bradley series (red, blue, green and yellow) certain results appeared which seemed to require

further evidence with control of certain factors before they could be accepted as generally valid. The most striking of these results were a marked preponderance of preference for blue when standard colors were compared, and a shift to red (pink) when the tints were under consideration. It appeared from this that hue is not the only factor to be considered in connection with color preference, since in the case of red and blue at least the preferences shifted from one to the other with a shift in brightness of the colors compared. An attempt was made in this preliminary series to discover the effect of background on the result, by the use of white, gray and black cards, but these variations did not appreciably alter the situation.

In the more careful attempt to study the factors involved the following are the main points which have thus far appeared: (1) Under the conditions under which we worked the method of paired comparisons seemed applicable to the majority of children tested, though a few failed to make consistent selections. (2) The question of the particular red or blue or other color used seems important when any given series of colors, such as the Milton Bradley, is used. For example, our experiments showed that the standard red of this series is not a representative red in the sense of being the red best liked by these children. The standard orange red is a much greater favorite and is often referred to by them as a "redder" red than the other. For purposes of æsthetic comparison with other colors, therefore, in the case of young children the standard orange red seems the better qualified to represent the red group, and we are so using it in other tests at present. (3) In the red and the blue series, each containing three tints, three standards and three shades, we obtained confirmation of the common statement that children like the more saturated colors, since the standards were most frequently chosen. Secondarily there was a selection of the tints in preference to the shades.

Various other indications of our results are now under observation with children of the same and different ages with a view to determining to what extent age and sex affect the results.

Studies in Comparative Psychology

Color Blindness of Cats. L. W. Cole, University of Colorado.

Of eight cats two confused yellow with a gray and with each of twelve colors of nearly the same flicker equivalent as the yellow. Two others confused blue with a dark gray and with four colors, one of which was a very different blue. Two other animals con-

fused green with a gray and with each of seven colors which were of nearly the same flicker equivalent as the green. Another pair of cats confused red with black and with each of nine colors. The colors and grays which were confused with red and blue varied widely from them in flicker values. This fact and most of the confusions would find a consistent explanation if the cat sees a much shortened neutral gray spectrum with its ends at or in red and blue respectively. Before a confusion area of the spectrum was reached and after it was passed through there was an area of "difficult discrimination" in which the animals required about three hundred trials in order to discriminate. Hering grays were useless for the experiments.

Two persons with dichromatic vision were asked to sort these colored papers as Holmgren worsteds are sorted. Each of the dichromates made five confusions which had been made by the cats. Both of the dichromates and the cats agreed in the matches (confusions) of two pairs of colors, and for each of these pairs the flicker equivalents were identical.

In the light of Ives's results (*Phil. Mag.*, 1912), which show that the flicker method is superior in both "sensibility and reproducibility" to the method of equality of brightness, flicker values can hardly be ignored. (The work of Polimanti, *Zsch. f. Psychol. u. Physiol.*, 1889, is also significant.)

Most of the experiments were made by two graduate students, Mr. C. J. DeVoss and Miss Rose Ganson.

A Method of Testing Visual Acuity and Pattern-discrimination in Animals. H. M. Johnson, Cleveland, Ohio.

The present work is being carried on at the Nela Research Laboratory, National Lamp Works of the General Electric Company. The purpose is to discover to what extent vertebrates can react to differences of visual detail under given conditions of illumination. The problem of size- and form-discrimination as now defined does not include this question. The method of studying that problem as standardized by Yerkes and Watson is inconvenient, owing to the difficulty and necessity of controlling other stimulus-factors than the one under study. It is also not adapted to quantitative tests on form-discrimination, since it does not permit of change by insensible gradations from one stimulus-value to another.

"Pattern-discrimination" is here used as meaning discrimination

between two visual fields equal in area, form and illumination as a whole, differing only in the respective distribution of light from them. Four elementary problems have been set: the stimulus-threshold for striation; the difference-threshold for size (and conversely for number) of strata; the difference-threshold for direction; and the difference-threshold for contrast.

For the first three problems the test-fields are prepared by superposed gratings, as suggested by Ives and built and first used by Cobb, whose mountings required no essential modification. The apparatus meets all physical requirements. It is being used with the Yerkes box and the discrimination method on the dog, the monkey and the chick. Results obtained to date are only preliminary. The dog learned in 18 days to discriminate between a plain and a striate field at a distance of 60 cm. and over. The test-bands on the striate field were about 0.25 cm. apart. The learning curve shows a quick descent, no reversals and very short plateaux after the 11th day, when punishment was introduced. This indicates that the method is practicable.

Attitudes of Appetition and of Aversion in Doves. WALLACE CRAIG, University of Maine.

Many of the instincts of birds are not overt reactions affecting simply and directly the environment. Many are attitudes, affecting the bird himself, keeping him restlessly active, trying now this and now that, until at last he gets from the environment that particular stimulus which sets off a final reaction (*end-reaction*) after which the bird appears satisfied and restful. An attitude which thus works until a certain stimulus is received, may be called an attitude of appetition. In some cases the appetitive attitude is an incipient end-reaction; in other cases it is different from the end-reaction. The stimulus sought, which is needed to activate the end-reaction, may be the stimulus of an entire situation, involving even memory factors.

Many instincts of birds are of an opposite type, namely, attitudes of aversion, which keep the bird restlessly active so long as a certain stimulus is present, but give him peace after he has succeeded in ridding himself of that stimulus.

It has been said erroneously that in animals there is no true distinction between work and play, that the animal's activities are all play. A dove may be observed to make repeated trials to overcome difficulties, enduring bodily injury, and continuing the

struggle for a long period, urged on all the while by an appetitive (or aversive) attitude tending toward a certain end-situation. This is work. Doves exhibit also conflict of attitudes, hesitation, and final overcoming of one attitude by the other. In certain cases the attitude which stimulates the agent himself, serves in certain cases to stimulate also other doves (patients) toward the same or correlative ends.

Regarded simply as observable motor phenomena (disregarding questions of intelligence, and of conscious states) these activities of birds seem to be the same as, only more simple than the behavior activated by desire, purpose, volition, in men.

Tests on Adaptive Intelligence in Dogs and Cats, as Compared with Adaptive Intelligence in Monkeys. W. T. SHEPHERD, Waynesburg College.

The paper is a report of experiments on dogs and cats to ascertain how they compare in adaptive intelligence with *Rhesus* monkeys. By the term adaptive intelligence, we designate a lower sort of reasoning: the ability to adapt to our purposes conditions more or less difficult and more or less unfamiliar.

In experiment I with the monkeys, food was suspended out of reach of the animal in the cage, but with a stick passed through the food, the end of which could be seized by the monkey and the food thereby pulled up to the cage and secured. Eleven monkeys were tested with this apparatus and all except one succeeded in the first trial. With the exception of a few trials the times of the animals were from 2 to 6 seconds. In two other experiments with the monkeys, their success was equally as marked, and the times of the reactions were similarly short.

In experiment I with the dogs, similar to experiment I with the monkeys, the results were wholly negative. The dogs scrambled about the cage, bit at the side of the cage next the suspended meat, etc., but made no effective effort to secure the food as had the other animals. They appeared to have no understanding of the problem. The dogs also failed utterly in another test where the monkeys succeeded.

In experiment I with the cats, the conditions were similar to those in experiment I with both dogs and monkeys. In brief there was a total failure to understand the problem or to secure food. The cats also failed in the other test with them wherein the monkeys succeeded.

The writer concludes that in dealing with problems of the above character, cats and dogs are very inferior to *Rhesus* monkeys. This may be owing in part to the superior motor equipment of the monkeys. However he infers the general inferiority in adaptive intelligence of the former.

Types of Learning in Animals and Man. JOHN F. SHEPARD, University of Michigan.

Thorndike's theory of reasoning and the tendency to look for higher mental processes in the mere presence of centrally aroused stimuli are equally consequences of the attempt to reduce everything to associations in the sense of one process re-arousing another together with something like Thorndike's Law of Effect as a means of establishing association. This view seems inadequate to explain certain experiments with men and animals.

When a normal person has learned a labyrinth and then this labyrinth is modified at some point, the person ordinarily definitely distinguishes the change and adapts to it. If he is confused as to the exact difference, he will probably make other errors in the neighborhood with or without going into that part of the old path which is now blind. Under similar circumstances the rats and cats show similar behavior, the abler requiring only one trial if the change is simple. Ants (when olfactory stimuli are ruled out of both learning and testing) continually go along the old path and require more repetitions to adapt than were required for the original learning.

Furthermore, ants and at least most rats and cats learn the labyrinth in general backwards from the food-box even though they have learned several different forms previously. Normal people learn rather more rapidly from the beginning than from the end.

Whether in terms of peripherally or centrally aroused stimuli, there is some difference in organization which gives the ant, the rat and cat, and the person different types of control of behavior.

It is suggested that the theory which gives association a character of inhibition as positive as excitation may be a possible explanation of this organization.

STUDIES IN EDUCATIONAL AND APPLIED PSYCHOLOGY

A Contribution to the Question of "Quick Learning, Quick Forgetting." R. S. WOODWORTH, Columbia University.

The contradictory results obtained according as retention is measured by the saving in re-learning or by the amount recalled

make it desirable to introduce further variations into the study of the above question. One variation consists in avoiding the matter of individual differences, and examining the learning and retention of *single associations* by the same individual. In one of the experiments reported, an Italian-English vocabulary of 20 pairs of words was to be learned from auditory presentation. After one reading, the experimenter gave the Italian words as stimuli, allowing 3–5 seconds for each response, prompting and correcting, and so continuing till each correct response had been given once. Overlearning was avoided by dropping each pair from the list as soon as it was learned; but after all the responses had been correctly given, the experimenter read the whole list through once more. After an interval of 2–20 hours, the experimenter again used the Italian words as stimuli, and got the score of correct responses, and also a report of associative aids employed in remembering any of the pairs.

Under these conditions, the more quickly learned pairs were the better retained. Thus:

Of the pairs learned in 1 reading, 73 per cent. were recalled after the interval.
Of the pairs learned in 2 readings, 72 per cent. were recalled after the interval.
Of the pairs learned in 3 readings, 63 per cent. were recalled after the interval.
Of the pairs learned in 4 readings, 58 per cent. were recalled after the interval.
Of the pairs learned in 5 readings, 38 per cent. were recalled after the interval.
Of the pairs learned in 6–11 readings, 27 per cent. were recalled after the interval.

Since the aided pairs (pairs in which the subject saw some relation between the terms or developed some mnemonic to hold them together) were both more quickly learned and better retained than the unaided pairs, the advantage of quick learning probably lies partly in this association with aids. But this is not the whole story, for when the unaided pairs are considered by themselves, the quickly learned among them are better retained than the slowly learned; and, indeed, the quickness or slowness of learning makes more difference to retention where no aids are present than where they are present. We conclude that quick learning favors retention, and aided learning favors retention each independently; but that the two influences work together, inasmuch as the best aids suggest themselves promptly and promote quick learning.

An Experiment on Memorizing Versus Incidental Learning. E. A. Kirkpatrick, Fitchburg State Normal.

This is the report of a preliminary experiment to test the value of memorizing as regards the efficiency of doing. The particular

thing learned was a portion of an advanced multiplication table. Normal students and sixth grade children were subjects. The methods were (1) memorizing, then using; (2) using at once guided by a key sheet of products; (3) computing the products. The memorizing or practice was continued eight and ten days. The final test of efficiency was writing as many answers without a key as possible in two minutes. The groups that practiced computing averaged the greatest number of answers. Those that spent all the time in practice next, and those that spent part of the time in memorizing wrote the fewest. Those that spent eight out of nine days in memorizing were much behind those who spent only four or five days out of ten in memorizing. The results in this preliminary experiment suggest that the traditional practice of learning and drilling on facts such as the multiplication table, then using them afterwards is wasteful as well as wearisome.

The most significant figures are as follows. The number of answers written in the two minute test after vacation was as follows:
Normal students.

Group of men memorizing five days and practicing with key five days, 40.9.

Group of men practicing with key ten days, 46.2.

Group of women practicing with key eight days, 25.4.

Groups of women (except four) practicing computing eight days, 44.3.

School children of sixth grade.

Group memorizing eight days and practicing with key one day, 10.1.

Group memorizing four days and practicing with key eight days, 27.4.

Group practicing with key ten days, 18.7.

Group practicing computing ten days, 27.7.

A Class Demonstration of Transfer of Training. DAVID CAMP ROGERS, Kansas University.

Previously reported experiments in transfer of training require several hours for completion. By choosing a habit which is modified with exceptional rapidity and which is highly measurable, viz., the habit of moving the right hand appropriately to spatial directions, one can give a demonstration of transfer within a period of fifteen minutes to half an hour. The training takes the form of reactions of the right hand to visual directions that are distorted by prismatic

lenses. The tests, to be made both before and after the training, may include (*a*) direct tests of the training; (*b*) tests in which the stimulus is entirely different than in the training, *e. g.*, the kinæsthetic perception of the hidden left hand; (*c*) tests in which the movement made is almost entirely different, *e. g.*, reading numbers to indicate the position of the hidden left hand. The transfer which appears in each of the two last mentioned series is explained through reference to connections which are directly tested in the complementary series. These same connections can be demonstrated by an independent experiment in indirect suggestion. The experiment illustrates transfer of a type which involves no conscious ideal, consciously formed conception, or improved habit of attention.

Percentage of Feeble-mindedness That is Hereditary According to the Degree of Defect. HENRY H. GODDARD, Vineland, N. J.

Early in the study of feeble-mindedness the author was impressed by the fact that the lowest grade children were more often children of good parentage than were the high grade children. The present paper with the accompanying curve shows the exact percentages for these different grades of feeble-minded.

If we plot mental ages along the abscissa and percentages on the ordinate and then draw the curve indicating the percentage of each grade that is hereditary feeble-mindedness, we have a curve which is nearly stationary from one to four years of age mentally, begins then to rise and rises steadily to seven and at that age is again nearly horizontal to eleven, the end of the feeble-minded list, showing the much larger percentage of feeble-mindedness that is hereditary in the higher grade than in the lower. This is what was to be expected from the fact that children of a mentality of four or under almost never become parents. The only exception is that sometimes an imbecile girl with the mentality of three or four may be seduced by some more intelligent person.

Beginning at five they marry and we have more hereditary cases. At six still more, at seven and from that on marriage with these people is habitual and we get our fairly constant proportion of 85 per cent. On the theory which is in the main fairly clear that intelligence is transmitted approximately in accordance with the Mendelian law we would expect that moron parents would have moron children, imbecile parents imbecile children, and if idiots do not marry then the question arises,—how do we have any hereditary idiots? The reply is that probably these are cases that would have

been imbecile or moron but some other cause has come in to reduce their mentality. We found this positively in a few cases. That is to say, a child of moron or imbecile parents who would have undoubtedly been somewhere near the same grade of intelligence, has had meningitis which has destroyed part of the intelligence that he would have had.

The following table gives the number of cases and the percentages for each age.

Mental Age	1	2	3	4	5	6	7	8	9	10	11	12
Cases	9	31	16	12	13	28	33	37	14	10	5	0
Per cent. Hereditary	50	56.4	53.3	54.6	65	73.7	80.5	84.1	70	76.8	71.4	0

Data on the Influence of Race, Color, Nativity, and Truancy on the Answers to the Binet Tests. WALTER S. CORNELL, Director of Medical Inspection of Public Schools, Philadelphia.

The evidence furnished by the statistics quoted in this paper is mostly negative. This for the reason that these statistics were taken from examination of delinquent boys at the Philadelphia House of Detention, a class between nine and sixteen years of age and mentally of inferior grade. Under these circumstances it is not possible to demonstrate the effect of home and neighborhood environment as it does affect very young children in many cases. Nor was it possible to show the effect of truancy in a group of boys whose total mental equipment is usually the third or fourth grade at the age of 14 years, and this largely because of inherent inability to progress further in school. However, certain evidence in the case of younger children, not so detailed as the evidence in the principle group studied, is here presented.

The charts here displayed show the percentage of successful answers to the questions designed by Binet for children of 9 years, 10 years, 11 years and 15 years (Goddard's Revision). Altogether, 24 test questions were reviewed, 5 questions being contained in the group for each year except year 15, in which there are only 4 questions. Of the total of 24 questions the answers by the white native group and the white foreign group were practically alike, and therefore practically similar to the percentage for the total of all children of that age. In only five cases was there any difference and in these the difference was not marked. These five were the reasoning out of simple problems (IX 4) answered slightly better by the white native children; placing three given words in a sentence (IX 5) answered slightly better by the white native children;

arranging weights in proper sequence (X 5) answered better by the white native children; association test giving opposites (XV 4) answered slightly better by the white native children; repeating six numbers (IX 3) done better by colored children; and making change (X 1) answered after ten years of age better by the white native children, but at ten years of age by the white foreign children.

A corresponding attempt to demonstrate differences in the answers to the Binet tests in truant children compared to children of known good or fair school attendance proved correspondingly barren of startling results. In the 24 questions the answers of which were studied, 19 were answered equally well by the truants and by the boys who had been in fair or good school attendance. In three test questions, namely interpreting pictures and ability to write a message by the cypher code and giving opposites in the association test, the truants did slightly better on the average than the others. In the problem stories requiring correct conclusions the truants did slightly worse.

Turning from these negative results to a study of younger children the writer brings forward a study made on a number of small children attending the School of Observation and Practice connected with the Philadelphia Normal School. These children were all of a very good social station. Remarkably the answers to the Binet tests averaged two years above the Binet standards for age.

The two studies bring out the general truth that differences in the Binet answers due to environment will principally be found in younger children.

Preliminary Report of a Higher Scale of Mental Measurement. A. J. Rosanoff, Kings Park State Hospital.

Standards which have been made available for use in practical psychiatry do not take sufficiently into account environmental influences; the difficulty of providing satisfactory correction of resulting error might be lessened by confining proposed tests to a selected sphere of knowledge or activity in relation to a corresponding and readily measurable *sample* of environment, so to speak, rather than the environment as a whole.

Only one general environmental element available as a sample has been in any degree standardized and is at least roughly measurable, namely, the element of systematic education: our special problem thus becomes to develop a simple method whereby a

subject's mental capacity might be estimated from what he has acquired in the course of his education in comparison with the average acquisition of a large group of subjects of the same degree of education.

The method proposed consists in the employment of a free association test applied by means of the following list of one hundred stimulus words: *geography, participle, Waterloo, refraction, arithmetic, botany, isomerism, Portugal, amœba, declension, burette, physics, hyperbole, retina, coagulation, Cervantes, franchise, subtraction, metabolism, predicate, mollusc, inquisition, amphibious, decimal, hydraulic, osmosis, percentage, cerebellum, fractions, titration, carbohydrate, duodenum, cosecant, biology, Odyssey, vertebrate, gravimetric, federal, morphology, hypothenuse, Magellan, hexameter, meteor, momentum, Cornwallis, protozoon, syntax, distillation, pollen, peninsula, binomial, crustacean, Bonaparte, meridian, chlorophyll, tetrahedron, Madagascar, corolla, ventral, Belgium, tangent, dorsal, colloid, equator, judiciary, synthesis, Athens, epithelium, feudalism, coefficient, perennial, plebeian, catalytic, embryo, spectrum, continent, spore, theorem, Himalaya, Renaissance, quotient, oxidation, hæmoglobin, axiom, Amazon, isosceles, cohesion, protoplasm, centrifugal, molecule, cotyledon, abscissa, gravitation, galvanic, logarithm, calyx, polarization, cephalic, proteid, kinetic.*

The plan is to collect a large number of test records from subjects of various degrees of education and thus to develop a series of standards. The special object is to employ the test, when normal standards are available, in the study of mental capacity in cases of insanity.

A small amount of material already collected seems to indicate: (1) that the number of "appropriate" reactions is in correlation with degree of education, and (2) that, the factor of education being constant, there is great range of variation which is tentatively assumed to be in correlation with native mental capacity or at least with educability.

The Legibility of Display Numbers: An Experiment in Applied Psychology. H. C. McComas, Princeton University.

Tachistoscopic exposures of 20σ were given in three sets of experiments to determine:

(A) Whether letters or numbers are most quickly read.

(B) What arrangement of figures yields best legibility.

(C) What style of figure is quickest read.

(A) It was found that the fourteen subjects observing the number and letter series averaged 4.52 numbers for an exposure, but only 3.69 letters. When four figures in a row were compared with a letter followed by three figures, the average number of symbols read, per exposure, was 4.12 for the former and 3.49 for the latter.

(B) It was found that the following sets of combinations are legible in the following order: (1) Six figures close spaced, thus; 295630. (2) Six figures spaced by twos, thus; 29 56 30. (3) Six figures wide spaced, thus; 2 9 5 6 3 0. (4) Six figures spaced by threes; 295 630. (5) Six figures with dash between twos; 29–56–30. (6) Six figures with dash between threes; 295–630.

The shortest line with fewest spaces or dashes is quickest read.

If the six figures are in two rows of three each, thus; $\begin{smallmatrix}295\\630\end{smallmatrix}$, more figures are read than with the six in a row, 4.26 as compared with 3.87.

A Gothic style of numbers which will show when the 9, 6, 3 and 0 are superimposed by the 8 so that the 8 covers 100 per cent. of the 3, 95 per cent. of 6, 9 and 0, is obviously confusing.

The Gothic form was compared with an "Old Style" of type, which is not open to the above objection. The latter was found the more legible, 4.02 figures of the former being legible per exposure and 4.11 of the latter.

Studies in Physiological and Abnormal Psychology

Supplementary Report of the Effect of a Prolonged Fast. Herbert Sidney Langfeld, Harvard University.

At the time of making a series of psychophysiological tests upon a man fasting 31 days, a report of which was given at the last meeting of the Association, it was not possible to conduct experiments after the subject had begun to take food. A year later, however, the opportunity was given to make similar tests covering a period of six days on the subject under normal conditions. The tests used were the hand dynamometer test, the tapping test, the space threshold test, the cancellation test, memory tests and association and reproduction tests. In all of these the records were as good if not better than at the end of the fast, and it must be remembered that at that time many of the tests showed improvement. As might be expected the strength tests showed the greatest improvement, being even better than at the beginning of the fast. It seems, therefore, from these results that the fast did not have any ill effects and certain facts may indicate beneficial results.

(This paper will appear in THE PSYCHOLOGICAL REVIEW MONOGRAPHS.)

What Parts of the Brain Does Introspection Reach? E. E. SOUTHARD, Harvard University.

Mind is more than consciousness. But it is improper to call the non-conscious parts of mind by such terms as *The Unconscious*, *The Subconscious*, *The Co-Conscious*, etc., since these terms attempt to vindicate some subtle kind of consciousness for that which is *mental-but-not-conscious*. That which is mental-but-not-conscious is the will and very possibly the groundwork of emotion. Will and emotion are only extrinsically conscious, that is, when their effects are rendered in kinæsthetic, gland-æsthetic, and similar terms. This scheme thus identifies consciousness with cognition and compounds of cognition.

Original data from insane hospital laboratories were presented which go far to show a correlation between lesions of the two association-centers of Flechsig and mental disease. Curiously enough, those forms of mental symptoms which look superficially like ideational disorders (delusions, disintegrations of personality) prove to be correlated more with lesions of the anterior association-center. On the other hand, various apparently motor disorders, (catatonia, catalepsy, even epilepsy) are actually often correlated with lesions of the posterior association-center. The anterior association-center is motor, expressive, pragmatic, *but non-cognitive, i. e., non-conscious*. The posterior association-center is sensory, impressive, conscious, *but non-pragmatic, except as receiving kinæsthetic and similar records or their derivatives*. Thus delusions or false beliefs may turn out to be pragmatic disorders, without the slightest evidence of cognitive disorder; and spasms or impulsive acts may be in some sense due to cognitive, that is, kinæsthetic, disorder, with an expressive mechanism intrinsically quite normal.

A study of casualty ward records both in the literature and in hospitals available to the writer shows abundantly that the severest destructive lesions of most parts of the brain are at times consistent with the preservation of that type of behavior we term "conscious." Especially is this true in the frontal region (cf. Crowbar Case, etc.). But the parietal areas, and particularly the right parietal area, seem to be more closely related to consciousness, in this sense of self-awareness. Lesions here, if the cortex is at all extensively destroyed, seem inconsistent either with the maintenance or the recovery of what we clinically term consciousness.

Warning should be uttered that the voluntary, non-cognitive, *i. e.*, non-conscious, portion of the mind, the pragmatic part thereof, is, although non-conscious, still an organ or perhaps *the* organ of spontaneity, of novel reactions. What kind of energy or thing this may really signify remains obscure.

Some Further Observations on Physiological Effects of Fear and Rage. W. B. CANNON, Harvard Medical School.

Pain and the emotions of fear and rage are accompanied by an increased discharge of sugar and adrenalin into the blood. Pain and these emotions are associated with struggle to be free and with running and fighting (McDougall). The sugar is useful as a source of muscular energy. Adrenalin quickly restores fatigued muscle wholly or almost wholly to its original irritability. Injected adrenalin markedly increases the speed of coagulation of the blood. The adrenalin liberated in pain and the major emotions hastens greatly the clotting of blood. This reaction would be serviceable in case of injury to bloodvessels in conditions which rage and pain might involve.

The Freudian Child (and Ambivalence). G. STANLEY HALL, Clark University.

Neither paidologists nor pediatricians have ever ascribed such importance to childhood as do the Freudians. Every dream, neurosis or psychosis, if only analyzed, reveals infantile determinants. Every form of Janet's "flight from reality," autism, normal day dreams, every lapse from apperceptive to associative thought, from the abstract to *anschaulich*, is a retreat towards the state of infancy. Art, poetry, myth, religion, are largely realizations of childish wishes. Thus the first three or four years of life are fateful for health, virtue and success. The Freudians cannot apply psychoanalysis directly to infants. In fact, only two have been studied with any detail. But they construct their child from the lives of great men and from pathological cases. Ferenczi and some others find in prenatal life the basis of a solipsistic *Allmacht der Gedanken* seen all the way from magic to ultra-idealism later. We sympathize with Stern's protest, endorsed in the Breslau meeting of physicians, against turning the analyst loose on children. Now, Freud says, "*Das Unbewusste ist das Infantile*," or that part of it which is repressed. It is where complexes are preformed, and these are mainly unconscious, and psychoanalysis is only a method

of getting at them. Yet we are now told that the future of psychoanalysis rests more with psychologists of the normal than with psychiatrists. The paper then discussed (*a*) the Œdipus complex; (*b*) the ambivalent masochism and sadism, which evolves into the aggressive and the passive type; (*c*) erethic sucking, *Wonnesaugen*, *Lutschen*, which is said to predispose to the erectile diathesis; (*d*) the claim that the very first memories of childhood are preponderantly of events really sexual; (*e*) the ambivalent *Schau-* and *Zeigetrieb;* (*f*) anal eroticism, and the origin of homo- and heterosexuality. The writer protested against Jung's large use of "libido" to include even appetite for food, insisting that the autos preceded the eros, pointed out that the Freudian child was only a fragment of a child, yet the traits studied were abnormal, and that the tendency to apply them to normal children was the great error of the Freudians and that a child in whom they were much developed was *per se* abnormal, but admitted that they were fundamental for health, virtue, success, so that paidologists, with the above large reservations, might call themselves Freudians.

The Pragmatic Advantage of Freudo-Analysis. KNIGHT DUNLAP, Johns Hopkins University.

Successful psychoanalysis by Freudian methods does not necessitate the discovery of the actual association at the base of the patient's trouble, but merely the building up of a new association which supplants the old, and the final breaking up of the substituted association. The conventionalized sexual symbolism is an admirable device for the formation of strong associations, but a long period of time is necessary.

Notes on the Mechanism of Continence. GEORGE V. N. DEARBORN, Tufts College Medical School.

It is now time that academic science, especially psychology, marked out the path for the advancement of real knowledge about sexual matters among the adult public. The problems most pressing for practical solution are chiefly psychological. As analysis of contrectation (Moll) at once shows, the genesial impulse involves potentially the entire epicritic receptive field, and this cenesthesia (physiologically a deluge of afferent impulses flooding the thalamus and the cortex) provides the neurokinetic tonus of part of the voluntary behavior involving the whole brain (desire). By association among the thousands of millions of neurones, this desire is

normally in humans sublimated into love. In the subconsciousness, as well as out of it, this tonus of impulsive cenesthesia flooding the psychomotor neurones with energy, is often a powerful initiative force in the constructive behavior of young adults,—its leading motor idea, involving the whole organism more or less. Repression (Freud) by way of secrecy and false shame keeps active that which should usually be latent and makes what should be under subconscious control, on a habit-basis, often strongly aggressive, incontinent. The neurology of voluntary movement involves factors more or less like the following (as suggested in a former paper): (1) *The Nervous Circuits, Kinesthesia:* A, Between muscles and gray cord; B, Between cord and brain; (2) *The Cerebral Influences of Spatiality:* A, Ocular and other visual muscles; B, Retinæ; C, Semicircular canals; D. Active muscles of limbs, etc.; E, Local signs; (3) *The Gray Fabric of the Hemispheres:* A, Ideas of usefulness; B, Memory-images of movements, etc.; C, Awareness of ability; D, Interests and emotional tones; E, Inhibition.

Skill apparently may be considered essentially a generalized or localized voluntary control based on the current fusion (at first conscious) of the two opposed but complemental phases of kinesthesia: one actuating, vegetative, and generally unconscious, the other inhibitory, personal, and conscious. Hormones originating at adolescence, by stimulating the development of the voluntary musculature, provide with the sexual impulse the means of its control. Continence, then, appears as an inhibitory generalized skill, grace, and cleverness, based in adequate conscious correlation of the lower centers with the higher, and in extensive and intensive voluntary and habitual control not only of the skeletal muscles but of the vegetative effectors to some extent.

Continence is not wholly an ethical and an esthetic matter, but one inherently and most intimately related to (and even an index of) the most *practical* phases of life,—capability, efficiency, competency, self-knowledge, initiative, personality, manhood and womanhood. Scientifically, then, incontinence appears as an index of a lack of personal culture, as clumsiness, inefficiency, stupidity, and failure, and should therefore become unfashionable. The genesial impulse developing in the adolescent is normally safeguarded by the simultaneous development of a consciousness of general voluntary bodily control and of the surpassing efficiency of his organism both actuative and inhibitory, somatic and mental. (This experience of "finding one's self" constitutes a criterion of

physiologic age which, partly because functional rather than structural, is more significant than others so far suggested. Appropriate tests for its determination would make it as definite a criterion too as any now in use.)

Suggestions as to the Possible Neurility of Euphoria and the Sthenic Index. GEORGE V. N. DEARBORN, Tufts College Medical School.

The basal feeling-tones (euphoria and dysphoria) so far as physiological, are more or less determined by the environment of the receptors, euphoria representing relatively perfect adaptation. Three chief factors seem contributory to the euphoric cenesthesia: (A) nutritional and sympathetic influences from the intestinal villi; (B) kinesthesia proper; and (C) the epicritic (dermal) impulses. The four million villi of the intestine, rich in muscle and sympathetic nerves, probably adapt the blood's content of the nutritive "lipoids" and protein to the immediate needs of the nerve-cells, and beside may send inward sympathetic influences which in the brain become euphoric. The tonus and the active contraction of the voluntary musculature (by way of the articular, muscular, tendinous osseous, and dermal receptive fields) make variable but essential contributions to the dynamic reservoir of the central nervous system. Moreover (Bergson) kinesthesia undoubtedly adds much of euphoric trend to the cenesthesia by providing in part both intensity and extensity to the other senses. The integrated epicritic impulses appear to predominate in human physiologic euphoria, and there seem to be two chief modes of stimulation, *evaporation* and *oxidation*. A list of the more or less influential elements of the human skin would include the complex vaso-motor mechanism, afferent sympathetic dendrites, the peculiarly efficient epidermis, sweat glands, sebacious glands: Meissner's corpuscles, the terminal menisci, nerve-rings of Bonnet (?), the terminal cylinders of Ruffini, Vater-Pacinian corpuscles, free nerve-endings; heat-, cold-, pain-, pleasure-, and tickle-receptors; and the arrectores pilorum muscles. Air that is dead, *i. e.*, not moving; humid and too warm; humid and too cold; or lacking in oxygen, is a chief occasion of physiologic dysphoria. Physiologically, these conditions probably are *lacks*,—lack of movement over the skin, lack of dryness (evaporation so being lessened), lack of the physiologic temperature, and lack of dermal oxygen,—reflex determinants of respiration. As related to neural dynamics, these lacks may be deemed productive of deficiencies in the cenes-

thetic streams which support the cerebral neurokinesis—the absence of normal stimulation from the environment. Adopting for the nervous system the all-or-none principle, the actual neurology ("viatility," Morat) of the euphoric and sthenic balance becomes an interpretation of the "synaptic" relations in the action-system. Physiologic euphoria is, then, more or less determined by ample, unimpeded, and undeflected neurokinesis flooding the cerebral gray from the kinesthetic receptors and from whichever dermal receptors represent the influence of air of optimum temperature moving over the body, whenever the cerebral neurones are not short of their proper nutriment. This unimpeded flood of ample neurokinesis is a condition of a high sthenic index capable of factuating (or inhibiting) vigorously a rapid succession of motor paths.

The Articulation of the Concepts of Normal and Abnormal Psychology. JARED S. MOORE, Western Reserve University.

There is a striking difference in terminology and point of view between the literatures of normal and abnormal psychology as we find them today. Especially, the doctrine of the complex, which is so important for abnormal psychology, is disregarded by writers on normal mental processes. This is unfortunate and unreasonable, and detrimental to the student of our science. A complete understanding of mental disorders involves an understanding of the complex as a normal factor in mental life.

The psychological problem is threefold,—structural, genetic, and dynamic. Structurally, the complex is composed of cognitive and affective elements,—the cognitive elements being grouped into ideas, and these into systems of ideas. So, again structurally, personality is an integration of systems of complexes,—the individual complexes being grouped into systems, these into systems of a higher order, etc. The genetic problem is itself twofold,—the problem of the development of complexes out of their elements, and the problem of the development of the personality by the accretion of new complexes. The dynamic problem is concerned with the conative aspect and motor tendencies of the complex, and leads to the distinction between normal and abnormal psychology,—normal psychology treating of the harmonious activity of complexes, abnormal psychology treating of conflict, repression, and dissociation.

CONTENTS OF PROCEEDINGS

PROCEEDINGS OF THE NINTH ANNUAL MEETING OF THE SOUTHERN SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY, ATLANTA, GA.,

Report of the Secretary

The Southern Society for Philosophy and Psychology held its ninth annual meeting at Atlanta, Ga., Wednesday, December 31, 1913, and Thursday, January 1, 1914, in affiliation with the American Association for the Advancement of Science. Fifteen of the 56 members were present. Three sessions were held, one on Wednesday forenoon in conjunction with Section H of the A. A. A. S., one on Thursday forenoon, and one on Thursday afternoon in conjunction with Sections H and L of the A. A. A. S. The meetings were held in the chemical lecture room of the Georgia School of Technology. On Wednesday evening the members of the society and of Sections H and L were entertained at a smoker at the University Club by Dr. H. J. Pearce, the President of the Society. The President's address, entitled The Limitations of Knowledge, was given at 4:30 on Thursday afternoon.

The following items were passed upon at the business meeting held Thursday forenoon:

1. The place of holding the next meeting was left to the Council for decision. Professor Ogden invited the Society to come to Knoxville, but as the A. A. A. S. will meet at Philadelphia the suggestion was made that the Society meet one day at Washington and then join some of the sections at Philadelphia.

2. The following officers were elected: President, J. B. Watson, Johns Hopkins University; Vice President, Josiah Morse, University of South Carolina; Secretary-Treasurer, W. C. Ruediger (re-elected), The George Washington University; Council for three years, E. F. Buchner (reëlected), Johns Hopkins University, and L. R. Geissler, University of Georgia; for two years, J. C. Barnes, Maryville College; for one year W. H. Chase, University of North Carolina.

3. The following new members were elected: Dr. Edwina Abbott, Tulane University; Mrs. A. H. Arlitt, Tulane University; Dr. F. M. Barnes, St. Louis; David June Carver, Johns Hopkins University;

Edward Conradi, Florida State College for Women; Dr. Harvey W. Cox, University of Florida; Professor Ezra B. Crooks, Randolph-Macon Woman's College; Miss Lucile Dooley, Knoxville, Tenn.; James Wallace Hopkins, Tulane University; Miss Marguerite Kehr, Knoxville, Tenn.; Professor Mark Edgar Sentelle, Davidson College; Dr. E. K. Strong, Jr., Columbia University.

4. The accounts of the Treasurer, which were audited for the Council by Professor Ogden and approved by the Society, showed a balance on hand, December 31, 1913, of $82.44. Of this $15.00 was allowed the Secretary toward defraying his expenses incident to the Atlanta meeting.

5. The Secretary was authorized to frame an amendment to Section 1, Article III, of the Constitution changing the term of office for the Secretary-Treasurer from one year to three years.

The following papers were read by members of the Society either before sessions of the Society alone or before joint sessions with Sections H and L.

New Interpretations of Psychoanalytic Data. Tom A. Williams, Washington, D. C. *Correlation of Physical and Mental Measurements.* J. C. Barnes, Maryville College. *Dreams as Retrostructive Interpretations.* W. B. Smith, Tulane University. *The Master Motive in a Theory of Knowledge.* John G. Harrison, Mercer University. *Rational Psychotherapy.* Robert S. Carroll, Asheville, N. C. *Concluding from Negatives.* W. B. Smith, Tulane University. *The Correlation of School Abilities of High School Girls.* E. F. Buchner, Johns Hopkins University. *Concerning the Psychological Origin of Creation Stories.* (By title.) W. T. Shepherd, Waynesburg College. *Experiments with the "Free Association" Method.* R. M. Ogden, University of Tennessee. *A Test for Adolescents.* Eleanor D. Keller, Baltimore, Md. *Avocational Education.* W. C. Ruediger, George Washington University.

The following are abstracts of a few of the papers presented.

Psychoanalysis. Dr. Tom A. Williams, Washington, D. C.

Dr. Williams denied the significance of much of the far-fetched symbolism which the followers of Freud have introduced into mental medicine and explained most of the effects of psychoanalysis as the result of a complicated talking-out of the patient's difficulties and worries, a process seen in daily life in the comfort of a confidant. Clarification ensues. Besides, psychoanalysis takes the patient's

mind from the end result of his worry back to the mainsprings of his mental life, a study of his own motives: this is a desirable scientific attitude, which leads to greater nervous stability and more happiness and better conduct than does brooding upon worries. It is science as against false sentiment. A long course of psychoanalysis furthermore powerfully *suggests* to the patient that the performance is curative. This suggestion accounts for some of the recoveries, but these are likely to be as unstable as those of any method of suggestion, whether labelled medical or masqueraded as faith. The insistence upon any line of inquiry leads the mind of the patient toward the end sought, and human suggestibility accounts for the frequency with which those expecting it find sexual disturbances in neurotic patients and attribute the cause of their nervousness to that factor. History tells us that when convulsions and anesthesia were sought for in the days of the hypnotists, they were as prevalent as the sexuality now is among those who look for it.

Dreams as Retrostructive Interpretations. W. B. Smith, Tulane University.

1. Though long regarded as an unsubduable outlaw, the Dream is a large, undeniable, innegligible part of experience, for which room must be made in psychology, as room was made for the Imaginary unit in Algebra.

2. Freud's contention, that "the Unconscious can naught but wish," is correct only when wish is taken in the most primal sense of Impulse toward Presentation, toward establishing the antithesis of Self and Not-Self.

3. Dreams must be understood as far as possible in terms of this primitive and persistent tendency. Dreams of the normal are quite as important as of the abnormal.

4. A typical dream is analyzed and found to be a practically instantaneous interpretation (by backward construction of psychic elements) of a somatic stimulus. No wish discoverable but the aboriginal impulse to present images.

5. Two other vivid dreams are shown to have been retrostructive interpretations of somatic stimulations, employing easily recognized psychic elements. Many dreams yield to such analysis.

6. A dream of flying is shown to have started from a peripheral stimulation and to have developed into such a retrostruction.

7. Various well-ascertained facts of dream-life become intelligible when the dream is so understood.

8. A young woman's dream shown to have been elaborate retrostructions interpreting organic sensations.

9. Retrostruction may still be manifest, even when no excitant stimulus can be put in evidence. An illustration from a dream of Determinants.

11. Sharply contrasted interpretations of the same stimulus are possible. Illustration.

12. Comparison of psychic activities, dreaming and waking; also of sense-intuition and rational theory. The analogy of the dream to reckless theorizing, and its kinship with hallucination.

Concluding from Negatives. W. B. SMITH, Tulane University.

1. In the 23d Chapter of the 1st Book of the Prior Analytic, Aristotle announces the Rule of the Syllogism, that "from negative premises nothing can be inferred," but strangely does not discuss it, though expatiating on other Rules. Zeller's explanation is inadequate; it seems likely that Aristotle felt sure of the Rule but unable to give satisfactory reasons.

2. Later logicians have hardly improved on the Master. Only De Morgan's attempted proof, adopted by Keynes, seems to call for notice. The reasoning is fallacious. De Morgan's error is exhibited. The premises, No X is Y, No Z is Y yield the conclusion, Some x is z (= Some z is x), where x is not $-X$.

3. De Morgan's fallacy explained: he proceeded by Obversion-Conversion but neglected to proceed also by Conversion-Obversion. Effect of these procedures in loosening logical ties.

4. Various objections are stated and answered. The negative x (of X) is almost as important in Logic as in Algebra.

5. On introducing it systematically, the four forms of proposition A, E, I, O reduce to two E, I: No S is P, Some S is P. For these the commutative law holds as in Algebra, S and P are interchangeable.

6. There results a simplification of the Syllogism. Only three types are valid:

I. No A is B, No C is B,—whence Some a is c (Some c is a);

II. No A is B, No C is b,—whence No A is C (No C is A);

III. No A is B, Some C is B,—whence Some C is a (Some a is C).

7. All the (19) canonical moods are readily reduced to these three.

8. Considerations urged in the controversy wherein Lotze, Sigwart, and Bradley are involved seem foreign to the foregoing.

The Master Motive in a Theory of Knowledge. JOHN G. HARRISON, Mercer University.

Recognizing much value in all the historical theories, the layman feels that an eclectic theory or a master one must be the final one. Philosophy, being on the experience basis, should not shun but cultivate the analysis of experience. Concrete experience has been studied and formulated by rationalistic methods even when empiricism as a conclusion has been reached. Do not pragmatists operate the same way, and leave their views resting on rationalistic assumptions and procedure?

A chapter on the notion of truth defines it as agreement. The agreement must be progressive, agreeable, harmonious. This reduces to a harmony which criticism will show rests on rationalistic determination. The true and useful are identified, and room is made to declare these to be also the beautiful. Press this and there will appear an ideal and perfected universe loved by rationalists but dreaded by all who prize experience.

A leading must be worth while. Criticism will probably show this to mean worth while to man as man, as morally and even religiously conditioned.

Existence in kinds is admitted. Then nominalism holds one name to represent reality. Leading takes us to where some one's idea copied experience. If not allowed to give a rigid dualism, this will turn out to be transcendental. Admitted consistency will reduce to objectivity and necessity. Coercion admitted to be on thought everywhere will prove to be rational or transcendental.

The suspicion may well be entertained that all the historical methods are valuable for data, but that some sort of a rational one may ever prove to be the one actually used for final estimation.

A Test for Adolescents. ELEANOR D. KELLER, Baltimore.

A series of maxim tests for insight, reason and judgment is suggested to take the place of some of the puzzle tests of Binet-Simon. These seem unfit for subjects over twelve. The maxim test is readily evaluated and can be given to the subject in the laboratory or to a class or group of varying ages. It was given in Baltimore to about 2,000 girls and boys in high schools, to a few defectives of thirteen and over, and to a few post-graduate students.

The returns from 1,404 high school girls give median for Class A, 4.1; Class B, 5.4; Class C, 7.4; and Class D, 7.7. A perfect score would be indicated by 14. This shows that high school

freshmen lack greatly in ability to reason, judge, or interpret maxims. It is not until we reach third and fourth high school years that the curve of distribution approaches the normal.

The returns from about 2,000 boys and girls over thirteen, adolescents, show a growth in ability to reason with maturity, the curve rising with age of subjects. This test is offered to test insight; reason, judgment, the more complex mental powers, in place of some usually found unsatisfactory in Binet-Simon tests for adolescents.

Experiments with the "Free Association" Method. LUCILE DOOLEY. (Reported by R. M. Ogden.)

The object of this investigation is to study the consciousness of reaction, with special reference to the emotional, infantile and other "complexes" which may appear. A preliminary series of 50 word-reactions is the basis of this report. The words were exposed in a card-changer, and the reaction made by hand with a Morse key. Seven observers, five of them inexperienced, participated. The results have no final importance, but present a fairly adequate survey of the individual types of the reagents.

The types of reaction-consciousness were found to correlate closely with the reaction times. The fastest reactions are those of an automatic type of mind. Verbal imagery is conspicuous. Thought-processes are frequent. The reaction-word is usually a *coördinate* of the stimulus-word. The attitude is impersonal and non-emotional.

Longer reaction-time is correlated with a variation in type towards more concrete experience. Visual images predominate as motives for reaction. These usually refer to objects in *subordinate* relationship with the stimulus-word. Personal reference and emotional complexes are frequent, while the reaction-word is but an automatic adjunct of the experience, and is often omitted.

Concerning the Psychology of the Origin of Creation Stories. W. T. SHEPHERD, Waynesburg College.

The paper is a report of a brief psychological study of the origin of typical creation myths. The writer attempts by an analysis of such stories to ascertain the mental forces which impel primitive peoples to the genesis of that class of myths, and the principal factors which are revealed in such myth making.

Several well known Greek creation myths, such as the Homeric, Hesiodic, Orphic are considered; the Babylonian, old Norse, as well as present day stories of the creation of the world, as believed by the New Zealand natives, etc.

In all the above mentioned myths, psychological analysis seems to reveal the same impelling mental forces and similar mental factors. The writer concludes that curiosity and wonder have been the principal impelling forces to such genesis, while primitive imagination, and primitive credulity have been the principal factors, and primitive reason a subordinate factor in the mental process involved.

EDITORIAL ANNOUNCEMENT

In view of the great increase of material offered for publication, the Editors of the REVIEW PUBLICATIONS announce their intention of starting a new magazine to be called the *Journal of Experimental Psychology*, provided sufficient subscriptions and a small guarantee fund can be obtained. It is proposed to place the new JOURNAL under the editorial charge of Professor Watson; it will contain the same number of pages annually as the REVIEW and will probably appear bi-monthly, at a subscription rate of $3. The PSYCHOLOGICAL REVIEW will follow its traditional policy, covering the field of general, genetic, and applied psychology, and including theoretical contributions, criticisms, discussions, etc. Professor Warren will assume editorial charge of the REVIEW when the new JOURNAL is started. Notices will shortly be sent to subscribers asking for support of the new enterprise.

HOWARD C. WARREN,
JOHN B. WATSON,
JAMES R. ANGELL,
ARTHUR H. PIERCE.

BOOKS RECEIVED DURING JANUARY

MODIN, B. *What is Man?* Rock Island, Ill.: Augustana Book Concern, 1913. Pp. 335.

SEASHORE, C. E. *Psychology in Daily Life.* New York, London: Appleton, 1913. Pp. xviii + 226. $1.50 net.

GIESE, F. *Das freie literarische Schaffen bei Kindern und Jugendlichen.* Leipzig: Barth, 1914. Pp. xiv + 242. 14 Mk.

FALKENFELD, H. *Wort und Seele. Eine Untersuchung über die Gesetze in der Dichtung.* Leipzig: Meiner, 1914. M. 3.

CROCE, B. *The Philosophy of Giambattista Vico* (Trans. by R. G. Collinwood.) New York: Macmillan, 1913. Pp. xii + 315. $2.60.

CARUS, P. *Nietzsche and Other Exponents of Individualism.* Chicago: Open Court Pub. Co., 1914. Pp. 150. $1.25.

WALTER, J. E. *Nature and Cognition of Space and Time.* West Newton, Pa.: Johnston and Penney, 1914. Pp. 186.

NOTES AND NEWS

ON January 16, Dr. C. E. Ferree, of Bryn Mawr College, read a paper before the Philadelphia section of the Illuminating Engineering Society entitled: A Preliminary Study of the Deficiencies of the Method of Flicker in the Photometry of Lights of Different Color.

EDMUND B. HUEY, PH.D., died in Connell, Washington, on December 30, 1913. Dr. Huey had been in the west for a year trying to regain his health. He had previously been associated with Dr. Adolf Meyer, at the Johns Hopkins Hospital. He was the author of a book on "The Psychology of Reading" and another on "Mentally Defective Children," and was one of the foremost leaders in the more recent study of mentally defective children. He spent a year studying defective children at the State Home for the Feeble-minded at Lincoln, Ill., and had previous to this spent two years with Janet in Paris. He was preparing a book on clinical psychology, but about six months before his death the notes and what manuscript he had prepared, the accumulation of perhaps ten years, were completely destroyed by fire.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

VISION—GENERAL PHENOMENA

BY EDWIN B. HOLT

Harvard University

The little-heard-of color-theory of Zenker has been redescribed, with critical comments, by Minkowski (21). Zenker's view is that the light which reaches the retina is reflected by systems of thin plates which make up the ends of the rods and cones, the oncoming and the reflected rays produce by interference standing waves whose crests lie at different distances from the reflecting surfaces according to the wave-length of the rays in question. The nervous substance in different layers of the retina will then be stimulated photo-chemically by different wave-lengths, and thus tissues of different "specific energies" lying in the different layers of the retina will always be affected by certain specific wave-lengths of light. For the rest the theory rests on Müller's theory of specific energies. In some careful work on the cephalopod eye Fröhlich (12) finds evidence that the visual "specific energy" is a matter of the periodicity of the nerve-impulse. With the Einthoven galvanometer Fröhlich found that the action-currents of this eye, which is virtually a rod-eye, exhibit periodic fluctuations varying from 20 to 90 times per sec. under various conditions. The frequency and intensity of the rhythm increase with the intensity of the illumination (stimulus); they also vary with the wave-length of the stimulating light. There is also an after-rhythm whose frequency and intensity depend on the wave-length of the preceding stimulus: this is the basis of after-images, which are thus not a fatigue phenomenon (cf. Homuth, 16). But light-adaptation is a fatigue phenomenon, and the light-adapted eye reacts with less intense and

less frequent nerve-impulses. Blue-violet light has the highest stimulating, and fatiguing, power: and accordingly in the light-adapted eye the blue-violet light has lost most efficiency and the maximum brightness point of the spectrum has moved toward the red end (Purkinje phenomenon). The frequencies of the nerve-impulse were found to be for red, 20–40 per sec.: for blue, 40–60: for white, 60–90. "These excitations produce in the central nervous-system antagonistic processes, excitation or inhibition. This excitation, as well as the inhibition, can be strong or weak, and they are to be looked on as the physiological basis of color-sensation." Interesting in this connection is the paper of Sivén (**26**) who presents a series of facts to show that the "rods are the organs which are concerned in the perception of color of short wave-lengths." The von Kries duplex theory "can no longer be upheld." At any rate the facts cited by Sivén deserve attention. Lasareff (**18**) gives an "ionic theory" of rod-vision based on "Loeb's law." In rod-vision at the threshold the stimulating value of a stimulus of any color is equal to the amount of energy absorbed by the visual purple. In another paper (**17**) Lasareff reports that if two visual stimuli having a given intensity-difference are presented in rhythmical alternation, the period of alternation can be so selected that the given intensity-difference shall be a just-perceptible difference. This period is found to be a linear function of $\Delta j/j$, where j equals the intensity of the stimulus. Or, $\Delta j = kj/n$ where Δj is the just observable difference, j the intensity of the light, k a constant, and n the number of intensity alternations per second. Lasareff further gives (**19**) a mathematical formula for the relation between light intensity, area stimulated, etc., and the resultant sensation ("stimulation value"). Exception will perhaps be taken, on empirical grounds, to some of the assumptions on which he bases the formula.

For normal eyes Borchardt (**3**) finds that the threshold value of illumination is fairly constant when the area stimulated subtends a visual angle of 7° or over. As the visual angle varies from 1° to 7° the threshold stimulus rapidly decreases in both central and peripheral fields. The periphery (60° from fovea) is about twice as sensitive as the central field. This paper is in harmony with that of Blachowski (**2**) only on the supposition that "*Binnenkontrast*" is not an appreciable factor at threshold intensities. *Binnenkontrast* (Abney's "extinction of light") is the depressing effect exercised by one retinal element on the sensations from neighboring and simultaneously stimulated elements. Blachowski studies this

phenomenon by comparing the threshold values of very small areas when superimposed on small and large stimulated areas, respectively. As the background area increases, the threshold illumination of the small, superimposed patch decreases. There may be some question as to the interpretation of this result, since it remains true that the total stimulation of the *just-perceptible* superimposed area is *less* when the illuminated background is large than when it is small. The paper contains interesting collateral discussions, especially in regard to Hering's "color constancy of visual objects." The author finds a *Binnenkontrast* for both white-black and color. Hermann studies an analogous phenomenon (15). Two colored fields are viewed simultaneously on a light (*H*) and a dark (*D*) gray background, respectively. Owing to "black induction" from the light ground (*H*) the colored field thereon (*Hc*) looks darker than the other colored field (*Dc*). White light is now added to *Hc* until *Hc* = *Dc*. But now *Hc* looks less saturated than *Dc:* accordingly color is now added to *Hc* until again *Hc* = *Dc* (*now* both in intensity and saturation). Hermann finds now that the ratio of the *total* amount of color in *Hc* to that in *Dc* (Révész) increases as a linear function of the brightness of the *H* background. Superficially at least these results seem hardly reconcilable with those of Blachowski. Comparison of the two papers (2 and 15) seems to present an interesting problem. Cobb and Geissler (4) study the effect of dark and light surrounding fields on (1) difference discrimination and (2) visual acuity, in the central field of vision. The dark field used was practically a physical absence of light. "For [test] objects of relatively low brightness, the presence of a surrounding field of relatively high brightness has the effect of lowering the capacity of vision" for both (1) and (2). "In the case where the surrounding field was slightly brighter than the test-object visual discrimination was found to be actually better" for both (1) and (2) "than for a physically identical object seen in dark surroundings." Similarly Cobb (5) finds that "the bright surroundings are seen in all cases to cause more or less extreme loss in visual discrimination when the test-object is observed at a brightness much less than that of the surroundings." "Bright surroundings which are not brighter than the test-object itself result in slightly better vision [acuity] than the dark surroundings." The judgments on (1) *fluctuate* least when the test-object is of equal brightness with the surroundings: and there is some evidence that here also the difference-threshold itself tends to be lowest. Baird, in (1), corrects some misstatements and

unwarranted assumptions that have been published by Ferree and Rand in their discussions of colored after-images from subliminally colored stimuli, and in connection with some topics similar to those investigated by Cobb and Geissler.

Geissler (13) inquires "whether the number and sizes of colored stimulus-increments corresponding to just noticeable saturation differences would lend themselves to a measure of saturation." For the color red he finds that the stimulus-differences corresponding to just-noticeable saturation-differences are approximately equal through a considerable range, and especially for the lower saturations used. The author deems his results to be tentative, but it appears not unlikely that the difference limens for saturations will be found to be absolutely (not relatively) equal. Pauli (23) gives interesting data on the specific judgment of brightness (heterochrome). White and yellow or yellow and green are easy to compare as to brightness; white and green are harder; red and yellow, and blue and yellow are the hardest. In the more difficult comparisons the colors are felt to present other than chromatic differences—differences which are hard even to name. Homuth's study of after-images (16) is too detailed to be adequately summarized. The "flight of colors" is described and interestingly commented on. *Randkontrast* is distinguished from *Flächen-* or diffuse contrast: the latter is not so distinctly a complementary phenomenon. The after-image, whether positive or negative, is not a fatigue phenomenon and is a process independent of any reacting field of light (both these in agreement with Fröhlich 12). The "flight of colors" is not a fatigue phenomenon, but a case of rivalry between idioretinal light and the after-image optogramme, which latter includes the stimulations set up in the several fundamental color-processes. Homuth propounds yellow, blue, and purple as the three primary color-processes, and discusses this theory at some length (pp. 228–236). Edridge-Green (8) likewise argues, from various after-image phenomena, that yellow is a simple and physiologically fundamental sensation. The same author contends (9) that there is "a continual flow of photochemical liquid from the periphery to the center of the retina." This accounts for the lack of definition of after-images, for their liability to wander, coalesce, etc., etc. Schulz (24) studies the effect of santonin poisoning on the ability to discriminate as "darker" or "lighter" two violet (or yellow, or red, etc.) stimuli. Very interesting curves are obtained but, in the reviewer's opinion, the employment of "darker-lighter" judgments

in order to study yellow- and violet-vision was ill-judged. "Santonin (yellow) vision" is accompanied by decreased ("light-dark") sensitiveness to violet. Before this stage comes on, and very shortly after the santonin is ingested, there is a brief phase of decreased sensitiveness to yellow and of increased sensitiveness to violet. In (**25**) Schulz studies in a similar way the effect of digitalis on the seeing of green. Arndt's "biological law" is confirmed.

Parker and Patten (**22**) find that continuous illumination of the eye is physiologically more effective than interrupted illumination. When two lights, an intermittent and a continuous, were equated for normal vision, the former was shown by the radiomicrometer to be physically 5.9 per cent. more intense than the latter. Differing rates of intermission, between 540 and 2,950 per minute, did not significantly change this figure. Mallock (**20**) finds that the illusion of seeing as if at rest the spokes of the wheels of a moving automobile is due to some jar to the head or nervous system (as in walking). Under experimental conditions so slight a jar as that occasioned by winking the eye sufficed to produce this intermittence of vision. The theory offered by Mallock to explain the phenomenon is undoubtedly inadequate. Groos (**14**) refers to a very similar cause some subjective illuminations of the visual field which are often observed during earthquakes. Ferree (**10**) attributes the fluctuating appearance and disappearance of liminal visual stimuli of point area to "adaptation," *i. e.*, "the progressive loss of sensitivity to colored and colorless light caused by prolonged exposure of the eye to these lights." The eye becomes "adapted" to the small stimulus until it no longer sees it, and then a small involuntary eye-movement comes in to bring the stimulus on a fresh part of the retina, and the stimulus is again seen, while the "adapted" part of the retina has time to recover; and so on. Agreeably to his usual method the author undertakes to establish the utter imbecility and incompetence of those investigators who, prior to himself, have ventured to study the same problem.

Trendelenburg (**27**) was able to obtain binocular mixture of spectral colors, without configuration of the field, by reducing the size of the stimuli to a visual angle of 30 minutes; rivalry was thus very largely done away with. Trendelenburg finds that in binocular mixtures less of the shorter-waved component is required than is required in monocular mixtures to produce the same hue. It is less certain, however, that this is true when complementary color-pairs are being mixed. Dawson (**6**) finds that small intensity dif-

ferences are more accurately, rapidly, and confidently discriminated by two eyes than by one. He believes this to be due neither to the lack of practice in uniocular discrimination, nor to a summation of brightnesses in binocular vision; but to the circumstance that the binocular image fluctuates less than the uniocular, and so gives a steadier basis for judgment. Each eye's image is subject to fluctuation, but the two images do not fluctuate synchronously, and therefore the binocular image is steadier than either uniocular. Filehne (11) aims to explain why on a cloudy day a snow-covered landscape looks whiter and brighter than the clouded sky, which although really brighter looks gray and darker. The author shows that on looking at the sky the eye becomes relatively light-adapted; on looking at the snow, relatively dark-adapted. Now the light on the snow is more uniformly distributed (as to shadows, etc.) than it is in the sky (!): therefore when the eye looks at the sky not only is light cut off by the diminished pupils and made ineffective by the light-adapted retina, but also the cloud masses look very dark by contrast with the unclouded spaces. Dufour and Verain (7) describe an experimental arrangement similar to that for Ragona Scinà's experiment.

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VISION—PERIPHERAL AND FOVEAL

BY C. E. FERREE

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Very little work has been done in this field during the past year. Werner (6) studies the influence of the blind spot on the spatial values of the visual field. Eleven figures are in turn so placed in the field of vision that the blind spot falls closely within their margins. In each case the observer reports distortion of form and decrease in size. Werner concludes against the doctrine of "associative filling-in." Hoppe (2) describes an unusual visual phenomenon which he believes to be due to some action of strong light

on cells of the retina not usually regarded as sensitive to light. The conditions for obtaining the phenomenon are long adaptation to strong diffuse daylight, 2 minutes in the dark-room, and a return to the daylight illumination. The appearance is of a star-shaped pattern concentric to the fixation-point. At a projection distance of 1 meter the pattern covers an area 15 cm. in diameter. Perlmann (3) reports a case of sympathetic amblyopia which has been under his observation since 1910. The report is made in part because doubt has recently been expressed that the phenomenon exists. Beauvieux and Delorme (1) investigate the disturbances in light and color sensitivity for 71 cases of chronic glaucoma to find out whether these as well as the narrowing of the visual field may not have a diagnostic value. They conclude that the disturbances obey no characteristic law and have, therefore, no diagnostic value. Vogt (5) describes a successful method of demonstrating the yellow coloration of the macula by ophthalmoscopic examination. A successful demonstration seems to depend on getting light of the right composition. All red rays must be eliminated, for they only emphasize the natural redness of the fundus and give an unfavorable background for the discrimination. The light must be freed also from all violet, ultra-violet, and indigo rays, for these cause an obscuring fluorescent action of the lens. The best light is a mixture of pure blue and yellow. Vogt uses with success in a projection lantern light filters which transmit the spectrum from 620$\mu\mu$–420$\mu\mu$ with the maximum of transmission in the yellow and cyan blue. When this light is thrown into the eye by means of an ophthalmoscope the macula shows a strong yellow coloration. This light is of excellent quality, moreover, for the general ophthalmoscopic examination of the retina. Rand (4) reports a quantitative study of the factors that influence the sensitivity of the retina to color and works out methods of standardizing these factors. She was led to undertake this study because of the inability, generally recognized, of obtaining reproducible results in the work of determining the sensitivity of the retina to color, more especially of the peripheral retina. The factors influencing the sensitivity to color may be divided into two classes: (1) those pertaining to the stimulus or source of light; and (2) those extraneous to the stimulus. To the latter class belong the effect of preëxposure, the brightness of the surrounding field, and the intensity and constancy of the illumination of the field of vision. In previous work the effect of the last two of these factors has been recognized, but no systematic

quantitative study of their influence has been made and no adequate means of standardizing their effect has been devised. The pre-exposure and surrounding field, for example, should be of a gray of the brightness of the color for the conditions under which the observation is made; and the general illumination of the field of vision should not only be maintained constant, but there should be such a specification of this illumination on every point that influences the results of the investigation that the conditions of work may be fully understood and duplicated. Under the factors pertaining to the stimulus, we find size of stimulus or visual angle, and the composition, amount, and white-value of the colored light employed. Of these factors size of stimulus has been adequately treated and in some cases also the composition of the light employed. No adequate specification, however, has been made of the amount or intensity of light used;[1] and no account has been taken of the relative amounts

[1] Since the specification of amount of light is purely a physical procedure, Rand advocates the adoption of the method used by the physicists for this purpose, namely a specification in terms of energy or C.G.S. units. The inadequacy and difficulty of a photometric specification of colored light is discussed at length. Relative amounts or energies of colorless lights, for example, estimated in terms of some known standard may be specified by photometric methods; but relative amounts of colored light can not be so specified in terms of known colorless standards because equal amounts of colored and colorless lights do not arouse equal luminosities in sensation. The specification can be made only in terms of power to arouse the colorless component in sensation.

A similar attitude is taken towards the terms that are used in the specification of the stimulus. Since the stimulus is purely a physical quantity, the author favors the adoption of the terminology of the physicist for this purpose. She points out that any other course tends to produce needless confusion, especially in the overlapping fields of physical and psychological optics. In the writings of Landolt and Abney (a physicist), Baird, for example, interprets *intensity* as applied to colored light to mean white-value, and ascribes the variations they get in the limits of sensitivity to variations in the white-value of the stimulus, when what is actually varied in their experiments was the total amount of colored light coming to the eye. In this way he gets authority from the writings of these men for equating the stimuli in white-value for making a determination of the comparative limits of sensitivity. In her own work Rand used intensity in accord with the physicist's definition of the term, namely, the amount or energy per unit of area and unit of time at the point considered.

In fact, Abney and his collaborator Watson have made a specific statement of what Abney means by the term intensity in all his work. Watson (Proceedings of the Royal Society, 1913, 88A, 404–405) after stating that luminosity and intensity are used interchangeably, says: "The physical brightness of a light, i. e., the stimulus, will be spoken of as the intensity, the term brightness being reserved for the sensation produced when the light enters the eye. . . . The above definition of what is meant by the luminosity of a color in the spectrum of a given source is equivalent to that employed by Sir William Abney in all his work." Abney (see W. de W. Abney

employed in making comparative determinations of sensitivity to different colors.[1] Some attempt, though, has been made at a subjective regulation. Bull, Hess, Hegg, and Baird, for example, equated their stimuli in terms of the cancelling proportions of the antagonistic colors for a determination of the comparative limits of sensitivity to these colors. This procedure is characterized by Dr. Rand as an anomaly in methods of standardizing, arising probably from doctrinal rather than experimental considerations.[2]

and W. Watson, *ibid*, 1913, 89A, 233) sanctions this definition in the following words: "An explanation of what is meant by the luminosity of a colored light is given on p. 404 of Vol. 88 (A, 1913) of the Proceedings."

[1] The author assumes no responsibility for creating the problem of determining the comparative sensitivity of the retina to lights of different color, but she contends that if such a comparison is to be made, account should be taken in making the comparison of the amounts of light used in each case. The quantitative distribution of light in the spectrum, for example, varies widely both for a given light source and from light source to light source; yet no account has been taken of these variations in making determinations of comparative sensitivity. The relative sensitivity of the eye to the different colors has been estimated by comparing threshold and J.N.D. values expressed in terms of proportions of the total amounts of light used when no knowledge was had of these amounts, and the limits of sensitivity have been determined and compared for systematic purposes without any attempt at an equalization or even a consistent regulation of the physical quantities employed.

[2] Concerning the advisability of equalizing lights in terms of the color component they arouse in sensation for the purpose of determining the comparative sensitivities to different colors, Rand says in substance: (1) Stimuli should not be so equalized if one is to test the comparative sensitivity of the retina to the different colors. Such equalization begs the question at the outset. If the limits of sensitivity, for example, were to be determined with stimuli so equated for the central retina, the results obtained would not at all express the comparative limits for the colors in question. If these limits should be found to coincide, the conclusion could not be drawn either that the sensitivity of the retina to these colors extended only to this point or that there is equal sensitivity at this point to the colors used. At most no more could be said than that approximately the same ratio of sensitivity to the two colors obtain in this region that was present at the point in the central retina for which they were equated; but this ratio may not be a 1 : 1 ratio. In fact the investigator who gets his limits to coincide with stimuli so equated finds himself in the position of having made his conditions such that the limits could not help but coincide regardless of whether they ought to do so or not. He is not working with real limits, but with limits arbitrarily established, and the coincidence he finds is not a real coincidence, at least so far as he is able to determine by his method of working, but an artifact. (2) The stimuli especially should not be equated in terms of the cancelling-power of antagonistic colors. This method is anomalous. One scarcely knows what it does accomplish. On the one hand, stimuli so equated are in no way equated in physical intensity; and on the other hand, it would be the merest assumption to say that they have equal power to arouse sensation. To bear out the latter point Rand gives results comparative of the power of different colors to arouse sensation and to cancel their antagonistic color.

These same writers also equalized their stimuli in white-value for determining the comparative limits of sensitivity. Rand points out that they have not shown experimentally that the difference in the white-values of the colors employed affects the comparative limits of sensitivity, nor have they been able to get such evidence from the work of other investigators. Keeping the amount of colored light constant, she has made a determination of the amount of change that may be made in the white-values of the colors red, green, blue, and yellow of a given composition and amount, and has found that a much greater change may be made for each of these colors than exists between them at full saturation without affecting the limits of sensitivity. Fully aware of the quantitative effect of the achromatic upon the chromatic excitation from the results of previous investigations she has made along these lines, the author seeks to determine experimentally why such differences in the amount of the achromatic component of the excitation should have no effect upon the limits of sensitivity. She finds that sensitivity to color falls off very abruptly within the last 5° before the limits are reached. For example, to narrow the zone of sensitivity to color by 1°, it is found that for the stimuli used the amounts of colored light must be reduced from 24 per cent. to 37 per cent., varying with the color and to some extent with the meridian of the retina investigated; while the threshold 1° farther in is from 25 per cent. to 44 per cent. less even than it is at this point. It can thus be readily understood why a given amount of change in the white-value of a color may be of importance in making a threshold determination in the center of the retina and of no importance whatever in making a determination of the limits of sensitivity. Dr. Rand thus not only shows that there is no need of equalizing colors in white-value for making a determination of the comparative limits of sensitivity, but she points out two ways in which the equalization tends to defeat the purpose of the investigation. (1) The quality of certain colors is greatly changed when their brightness is altered, *i. e.*, a sensation is aroused, which has a color quality proper to a different range of wave-length. Moreover, the colors for which this qualitative change is greatest, namely, the blues and yellows, are those in which the greatest brightness change must be made to produce the equalization. And (2) the intensity of colors equated in brightness is necessarily much reduced; therefore, by means of them no comprehensive estimate of color sensitivity can be obtained.

The last eighty pages of the article are devoted to the report of a painstaking quantitative study and analysis of the effect on the retina's response to color of the brightness of the surrounding field, the preëxposure, the combined effect of preëxposure and surrounding field, and the general illumination of the field of vision. Methods of standardizing each of these factors[1] are described and a comparison is made of the experimenter's ability to reproduce results when these methods are employed and when no more precautions are taken than were used in previous work. In a long series of observations the author finds that for the former case she is able to duplicate the limits of sensitivity within 1°, and the limens of sensitivity at representative points in the peripheral retina within 2°–3°; while for the latter case the limits of sensitivity varied with 4°–6° and the limens of sensitivity from 60°–82°.

The author concludes her paper by pointing out that errors in the control of the factors that influence the response of the sense-organ and not errors in the judgment of the sensation aroused are apparently the cause of the large M.V. that has so long annoyed investigators of the color sensitivity of the peripheral retina. That is, before beginning her attempt to get a better control of the factors that influence color sensitivity, she had used all the psycho-physical precautions known to her to eliminate errors in judgment, still her inability to reproduce her results rendered, in her judgment, any accurate investigation of the sensitivity of the peripheral retina hopeless. On the other hand, with the control she has been able to get of the factors that influence the sensitivity of the retina to color and with only a comparatively rough observance of psycho-physical precautions, a very close reproduction of results has been rendered possible. With regard to work in the optics of color at least then, she is forced to conclude that the major source of error is not in the factors that influence the judgment but in those that influence the response of the sense-organ. Moreover, she would suggest that if in other sensory fields more attention were paid to the factors that influence the response of the sense-organ and relatively less to the factors that influence the judgment, a higher degree of precision may be attained in our methods of working.

[1] The standardization of the illumination of a room, for example, requires not only means of making small changes, but also a sensitive method of measuring or detecting these changes. The author describes a method of detecting changes in illumination which show a much greater sensitivity for daylight work than is possessed, for example, by equality of brightness photometers of the Sharp-Millar portable type. The method shows also high sensitivity for the photometry of lights of different color.

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VISION—COLOR DEFECTS

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Köllner (8) makes an important contribution to the literature of color defects. After a preliminary sketch of the facts of normal color-vision, Köllner gives a good general view of our present knowledge of the congenital defects of color-vision, following the customary German classification. Methods of diagnosis are suggested and a brief review given of the explanations of the facts of color blindness attempted by exponents of various color theories. The main body of the book is devoted to a detailed description of the *acquired* color defects. This field has been Köllner's specialty for a number of years, and his able treatment ought to make his book a standard volume for eye specialists. Köllner divides his discussion into 4 parts: (1) the general pathology of color-vision, comprising a thorough study of acquired blue-yellow, red-green and total color-blindness, colored seeing (perceiving colorless objects as though tinged with red, yellow, green or blue) and psychical color-blindness (color amnesia and color alexia); (2) the chief groups of disorders which cause or are accompanied by abnormal color-perception,—defects in the dioptric apparatus, diseases of the retina, the choroid, and the optic tract from retina to cortex, functional

and vasomotor neuroses, toxic conditions and abnormal states due to the abuse or exhaustion of the eye itself; (3) the best methods of testing color-vision in the fovea and the periphery; and (4) the implications to be drawn from the consideration of the facts of acquired color-blindness for a critique of color theories. Köllner's book is well integrated by the frequent use of cross references, furnished with excellent bibliographies of pertinent literature (though limited too exclusively to German publications), and well indexed.

In striking contrast to Köllner's work is Abney's book (1), in which the author has "brought together in book form the substance of a somewhat large number of communications which during the last 25 years he has made to the Royal Society, on the subjects of colour photometry and colour vision." Abney announces in his preface that one of the reasons for publishing his book was "his wish to show that the Trichromatic Theory of Colour Vision does not yet require a funeral oration over its remains," and a considerable part of the book reads like a lawyer's defense rather than an unbiased statement of facts. Pages 267–412 are devoted to an account of the author's own work on color defectives. Starting with the assumption that partial color-blindness is due to the loss of one of the three fundamental color sensations, the author seeks to show that the kind and degree of defect can be determined by measuring the luminosity of spectral colors in terms of white light, with which they can be equated in brightness by the use of the flicker method. Abney describes his color-patch apparatus, gives many luminosity curves and explains his method of calculating the various degrees of color deficiency. Abney seems unaffected by modern German and American work on color-vision and blandly assumes, for example, that a subject may lose his sensitiveness to red in various degrees without showing any deficiency in his sensitiveness to other colors, while white would appear to such a person as tinged with green, according to the form of the Helmholtz theory given in the first edition of the *Optik*. His color patch apparatus might be put to good use in a better cause. It is unfortunate that the author's personal influence was so great that the British Board of Trade Committee on Sight Tests in 1912 adopted Abney's method as the color test to be used on appeal, for the seaman will be quite as unwilling as the psychological critic to believe that a man's competency to "pick up colored lights" at sea can be determined by his "luminosity ratio,"—"the ratio of the brightness of a red (wave-

length 609 $\mu\mu$) to that of a green (wave-length 541 $\mu\mu$), divided by the value of this ratio for a person possessing normal vision."

Edridge-Green (3) reports that among men he has found 6 per cent. to be definitely color-blind and 25 per cent. defective in color-vision when compared with the other 75 per cent.; emphasizes (4) the necessity for using color names in testing for color-blindness; claims (5) that dichromates show such marked individual differences that it is better to arrange them in a series with transition forms, than to try to divide them into two distinct classes; strengthens his former claim that dichromates can often form the Rayleigh equation (yellow equals red plus green) as accurately as persons with normal color vision, by giving a case (6); and reiterates (5) his assertions that simultaneous contrast for red and green is increased in dichromatic vision, and that some subjects show loss of sensitiveness to red because of a shortening of the spectrum, without exhibiting any other color defect. Galloway (7) reports a case of this last type, investigated with wools and with Edridge-Green's lantern.

Armaignac (2) suggests an arrangement of colored wools inside a box, which permits the display of small amounts of color for the discovery of central color scotoma, and the ready increase of the area of stimulation at will.

Stilling (9) presents a new edition of his Pseudo-Isochromatische Tafeln, in which he has altered somewhat the arrangement of the plates to make it impossible for anyone to learn the test for the purpose of feigning color-blindness. And to these plates he has added four plates of colored letters printed on black, to be used as a general test of color perception, similar to the plates published by him in 1876. A general discussion of color defects, with directions for the use of the plates, is given in the introduction.

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HEARING

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Recent investigations dealing with the analysis of tones and vowels indicate the need of a more or less radical revision of some of the fundamental views of hearing. The most striking results reported during 1913 are probably those of Jaensch (4). This author has devised a unique synthetic method for the study of vowel sounds. He describes his apparatus as a *selenium siren.* The selenium cell is known to be very sensitive to light stimuli. The light to which the cell is exposed is furnished by a projection apparatus. To provide the conditions of a simple sine-wave of measurable vibration rate, a rotating disk with hatched edge is introduced between the source of light and the cell. Combinations of disks and modifications in the hatching provide all manner of complex vibratory stimuli. The cell is connected with a telephone-receiver whose membrane is set in vibration to produce the corresponding sound.

The net result of the investigation is that any disturbance in the regularity of a sine-wave gives a noise, but if the disturbance be sufficiently uniform to maintain an average value without too great a mean variation, a vowel sound is heard. These disturbances may be introduced in different ways. The addition of sine-waves of varying frequencies, which, however, preserve a constant average, changes the tone into a vowel sound. The same effect may be secured with a constant wave-length, by an alteration of phase in short intervals. Even superimposed curves in the ratio of 3 : 4 or 4 : 3 were found to give vowel character to the lower tone, which is at the same time intensified. As Rudolph Koenig first indicated, and recent investigators have clearly demonstrated, the principal vowels are distributed at intervals which approximate

octave distances. The peculiar pitch of a vowel is determined, then, by the average which all the single vibrations must approach. The vowel quality is clearest at a certain mean variation; beyond that it becomes obscured in a more or less undifferentiated noise.

The author concludes that the noise sense is distinct from the tone sense, and that vowels are the specific qualities of noise. He also contends that the sense of noise is genetically prior to the sense of tone, and that Köhler's results, which seemed to show that vowels are qualities of the tone sense, were erroneous. A pure tone, however, which has the vibration-frequency of a certain vowel, will resemble that vowel because of the fact that the tone sense, being more recent in the history of the race, also arouses at the same time more or less of the older and more fundamental noise character of sound. In the case of very low and very high tones, the musical quality and pitch are lost. There remain for these regions noises having the qualities of certain consonants, *m* for the low region and *s* for the high. The author upholds Hermann's "formant" theory together with the conclusion that the vowel sound and the tone upon which it is sung are in large measure independent phenomena. By his synthetic method he finds it possible to vary the vowel with constant pitch, and also to vary the pitch with a constant vowel.

Köhler (6) in a brief communication deals first with some observations on high tones which lead him to believe that the limit of hearing as set for 20,000 vibrations is too low. The *s*-sound is produced at about 8,400 vibrations. *f* appears an octave higher. He regards the latter as a pure tone since it can be eliminated by suitable interference apparatus. With yet higher frequencies, the *f* recedes and a *ch*-sound appears. Interference eliminates this up to 30,000 vibrations. If the octave law holds, we should expect this sound to occur with tones of 34,000 vibrations, at least, and probably vary on upwards so that the limit of hearing would fall between 34,000 and 68,000 vibrations. Confirmation for this view is found in the fact that pathological cases of deafness for high tones also indicate deafness for the consonants *s*, *f* and *ch*.

Although these results are in line with Köhler's well-known theory,[1] they do not seem to be necessarily at variance with Jaensch's contentions, since it is improbable that the interference tubes employed were adjusted with sufficient delicacy to eliminate the adjacent frequencies, which, on the Jaensch theory, are the true producers of the formants in question. It is therefore possible

[1] Cf. this journal, 1911, 8, 96f.

that sounds heard above 20,000 vibration-frequency are no longer tones but noises.

Köhler's second note deals with the theory of clangs. His observations here bring him also into touch with Jaensch, though again unconsciously. He now finds that it is not alone the single partial corresponding to the vibration-frequency of the vowel which contributes to its appearance in a clang, but all the partials of a certain regional valence. Thus he finds that when *a* is sung on a fundamental of 340 vibrations, and all the partials save 1,050—the approximate pitch of *a*—are eliminated, the vowel tends towards *m*, but if 1,360 is permitted to remain, a very good *a* is possible. He concludes that the partials of a clang are relatively weak in a sung vowel. They do not remain side by side as individual components of the clang, but enter into a resultant totality. That which we are able to analyze out of the total clang is not the partial in its full individuality, but rather something left over from the combined totality, and of relative unimportance. In extenuation of these conclusions, a tentative theory is offered of the physiological processes involved. In this the author suggests that the resonators of the basilar membrane are not single fibers, but regional segments corresponding to the different vowel qualities. The intermediate tones between the vowel tones are thus produced by the combined activity of different resonators. A substantiation of these suggestions is sought in the work upon animals, where it has been shown that continued stimulation by certain tones destroys the organs of the cochlea, low tones attacking the tip and high tones the base of the membrane. The amount of destruction, however, has proven too great to be in full accord with the Helmholtz hypothesis. But if the resonators are not numerous, but few in number, this discrepancy is accounted for.

Baley (1) reports some interesting results which may be correlated with Köhler's theoretical suggestions. This investigator finds that several tones, differing by small but equal vibration-frequency, when simultaneously sounded, have a tendency to flow together into a single resultant tone, whose pitch is that of the arithmetic mean of the several tones. This tendency is so strong that, in the middle region of the scale, even ten tones embracing an interval of a half-tone may be thus united into one mean tone. The phenomenon occurs after a shock which lasts for a short time, and is dependent to some extent upon the position of the head. Yet even in unfavorable positions, the number of discriminable

tones is less than the actual number sounded. With the addition of tones on either side of a small interval, the impurity of the interval is not increased, although an unpleasant effect, due to the noisy and confused character of the complex sound, is experienced.

Révész (13), whose experiments with v. Liebermann were reported last year,[1] has since published a brochure in which the general bearings of his distinction of tonal quality and pitch upon music are given. Certain of his conclusions are in accord with Jaensch's views, since he finds the vowel series to be independent of both pitch and quality. v. Liebermann, who is deaf for quality in certain regions of the scale, still recognized without difficulty the vowels of this region, while another observer, who was quite deaf for tones above c^3, could still detect the vowels which occur at these pitches. He, therefore, also refutes Köhler's original view that vowel quality is the single characteristic of tones, and concludes that the tonal series is made up of three subsidiary series, namely, pitch, musical- and vowel-quality. Regarding "absolute pitch," he finds two distinct phenomena: absolute pitch in the true sense, and absolute quality. The first is acquired, the second is apparently innate, yet the first is found without the second, the second never without the first.

In his study of the musical interval, he finds both pitch and quality to be involved. Distance alone does not determine the interval, because the same interval in different regions of the scale gives an impression of different distances. In addition to pitch-distance there must also be a quality-distance, which he terms a "segment." Equal segments are not always equal intervals, because the segment remains the same when its qualities extend beyond the range of an octave. In successive tones the appearance of the interval is the foundation of melody. With simultaneous tones—harmony—pitch rather than quality is the more important factor, as the phenomen of "orthosymphony" has shown.

The painstaking experiments of v. Maltzew (9) deal with the reliability of judging successive intervals in the high and low regions of the scale. The common musical intervals were employed, and for the higher register they fell between c^3 and c^6. All were within the octave range, and were judged both as ascending and descending steps. Errors in judgment were found to increase progressively with increased pitch. Consonant intervals were judged with more reliability than dissonant intervals, except in

[1] Cf. this journal, 1913, 10, 107f.

the case of seconds, the larger intervals being less reliable and the errors more widely distributed than the smaller. Two kinds of error were prominent: (1) the confusion of neighboring intervals, which is most frequent when the interval is small; (2) the confusion of intervals having a similar degree of consonance.

A consideration of the parts played by fusion and distance in the judgments led to the conclusion that neither can be offered in explanation of the results. If it were chiefly a matter of either or both, there should be no marked difference in judging ascending and descending intervals, yet the latter are much less reliable than the former. The author infers, therefore, a qualitative individuality of musical steps, a content of interval which is not referable either to fusion or distance. This "Schritt- oder Übergangserlebnis" is in many ways identical with Révész's concept of the "segment." Marked tendencies were noted to substitute smaller for larger intervals, and familiar or frequent for unfamiliar or infrequent intervals. There was also discovered in the higher region a normal "false-hearing," which occasions confusion among common intervals such as the octave and major sixth. The reason is that the higher tone is heard at a lower pitch than it actually possesses. A perseverative tendency is also operative at times, which occasions the recurrence not only of certain tones, but also of certain intervals. In the lower region of the scale the errors were found to be of a similar nature, although the presence of overtones often added to the difficulty of making reliable judgments.

Kemp's investigation (5) dealt mainly with direct observations on simultaneous clangs, produced by the tonometer, in comparing groups of two and three with reference to their degree of fusion. The experience of fusion is defined as a characteristic, unanalyzable content. As secondary features are noted the unity of the experience and the incomplete analysis of the clangs involved. The main result of these experiments is the distinction of four principal characteristics which contribute to the experience of consonance, each of which possesses its own peculiar features. These are: fusion, sensory agreeableness (*sinnliche Wohlklang*), sensory conformity (*sinnliche Zusammenpassen*) and harmonic conformity (*harmonische Zusammenpassen*). It was possible for the observers to differentiate these and to establish differences in the order of musical intervals when their judgments were based upon these different points of view. The following table indicates these differences of order, the highest degrees being given first:—

Fusion	Sensory Agreeableness	Sensory Conformity	Harmonic Conformity
Fifth, Fourth	Major Third and Major Sixth	Fifth, Major Third and Major Sixth	Fifth and Major Third
Major Third	Fifth		Major Sixth and Minor Third
Sixths and Minor Third	Fourth, Minor Sixth and Minor Third	Fourth, Minor Third and Minor Sixth	Fourth and Minor Sixth

The complexity of the experience of consonance is further indicated by the following table, in which the Roman numerals, I., II., III., measure corresponding degrees:

	Fusion	Sens. Agr.	Sens. Conf.	Harm. Conf.
Fifth	I.	II.	I.	I.
Fourth	I.	III.	III.	III.
Major Third	II.	I.	I.	I.
Minor Third	III.	III.	III.	II.
Major Sixth	III.	I.	I.	I.
Minor Sixth	III.	III.	III.	III.

Experiments were then performed to compare the fusion value of two-tone and three-tone chords, and especially to test Külpe's law, that with equal degrees of fusion among the intervals of a chord, a higher total fusion is obtained when the more highly fused interval is lowest in the chord. Stumpf has contended that the fusion of an interval is not affected by the addition of a third tone. The difference between these authorities is adjusted, and both laws are found to be valid. Stumpf's law appears to be applicable to an "ideal" fusion, and its operation is approximated when the observer abstracts from the added tone. The effect of the third tone is, however, in accordance with Külpe's law when the abstraction is incomplete. With the attention directed to sensory agreeableness rather than to pure fusion, a change in the effect was always found when the third tone was added, irrespective of complete or incomplete abstraction, but the change was not the same as that which occurs when pure fusion is the standard of judgment. Since an added tone does not necessarily alter the fusion of an interval, but does, under the same conditions, invariably change its character of agreeableness, the conclusion is reached that feeling is not referable to the sensory components, as such. Stumpf's opinion that the agreeableness of chords is to be reckoned among the sensory feelings, is therefore questioned.

Waiblinger (18), in a brief article, elaborates a previous pronouncement that the constructive elements of modern European

music are the *fifth* and *major third*. In the major triad, *c-e-g*, the "tonic effect" is noted in the tendency of both *e* and *g* towards *c*. In the minor triad, *c-e♭-g*, *g* again tends towards *c*, but also towards *e♭*. This is held to account for the incomplete satisfaction, or "minor effect" in music. Both the scale and its various triads are then analyzed with respect to these "convergent" and "divergent" tendencies. It is found that in the major scale there occur four convergent and three divergent chords, while in the minor scale two are convergent and five divergent. Taken together, and eliminating identical triads, there appear to be four convergent and eight divergent three-tone chords. An attempt is then made to show that musical effects, both melodic and harmonic, are resolvable into these tendencies occasioned by the tonic effect. The analyses are somewhat difficult to follow, since they are expressed throughout in terms of the letters of the scale, rather than by a numerical notation to indicate the relationships involved.

Krüger (7) in a brief abstract summarizes his well-known theory of consonance, and criticizes some of the objections to it which have been raised by Lipps and Stumpf. "The fundamental phenomenon of all dissonance consists in the existence of a *mistuned unisone* at the bottom of the total acoustic complex." The chief objections to the theory are declared to rest upon the neglect of associative factors, which play a large part in the concrete perception of tonal combinations. The immediate perception of consonance and dissonance is not independent of absolute pitch. Psychologically speaking, consonance and dissonance seem to have originated within the limits of the human voice.

K. L. Schaefer (14) has reported five cases in which combination-tones were perceived after loss of the drum or middle ear apparatus. Difference-tones of every order and pitch, even the very low tones, can apparently be heard in the absence of the ear drum. In the author's opinion the seat of difference-tones is the oval window. Peterson (11), however, referring to Clemens Schaefer's conclusion (1910) that combination-tones may arise in the fluid of the inner ear, calls attention to the fact that he had reached this same conclusion and had published results in its support in 1907. He also notes that his experimental results have demonstrated that subjective combination-tones do not appear after the fundamentals, but simultaneously with them.

Meyer (10) considers Bocci's recent demand that more attention be given to the morphological peculiarities of the organ of Corti

in devising theories of hearing, and objects to the imputation that his theory is open to this criticism. In reply, he maintains that his theory, together with those of Bonnier and ter Kuile are the only ones truly founded upon morphological facts. The three may be regarded as essentially one theory, since all are based upon the ideas of Johannes Müller. After reviewing the contributions of Bonnier and ter Kuile, the author describes his own method of procedure, and defends the use of the mathematical analysis, which he has found to suit the facts of the case better than does the Fourier analysis. The next problem was to apply this method to the mechanical processes of the organs involved. It was found to be applicable to an inelastic, bendable rod, to one end of which a transverse wave-motion is conducted. In conclusion, he propounds nineteen questions and answers concerning the morphological peculiarities of the cochlear organs. Among the points taken up are several dealing with the arch of Corti. This arch, it is maintained, affords a skeletal support which adds strength to the membranous tissues. Furthermore, the widened membrane at the apex of the cochlea provides a greater stimulable area for increased intensities than would be otherwise possible. In accordance with the resonance theory, however, we should expect an opposite distribution of fibers. The advantage of a long canal is to furnish a greater capacity of analysis. Animals having a short canal probably distinguish only high and low tones. A canal without windows would still afford a seat of hearing; the addition of windows simply adds to the sensitivity of the organ.

Peterson (12) in a second article reviews the present situation with regard to conflicting theories of hearing, and concludes that the facts seem to demand a resonance theory of the type indicated by Helmholtz. Three specific objections to the Helmholtz theory are then considered. First, as to the intensity relations of combination-tones, it has been found that difference-tones are sometimes more intensive than their fundamentals. This, he believes, may be readily explained when the difference-tones in question occur at a pitch which is more frequently heard than that of the fundamental. Furthermore, two or more difference-tones often coincide to strengthen each other. The difference-tones which fall between the fundamentals are weak, because the lower fundamental, which is known to acquire increased intensity, obscures them. Second, as to the obliteration of tones by lower loud tones, this he finds to be very slight when the tones are conducted directly through the

skull. He therefore concludes that the interference ordinarily observed is largely physical, and external to the cochlea. Third, the perception of the direction of sound by means of phase-differences is referred to "some cortical region" which may take note "of a slight disparity in phase, so to speak, of the neural impulses from the two ears."

Goebel (3) reports experiments upon the prepared ear of a hen under microscopic examination. His results indicate that the acoustic activity of the fowl's cochlea is similar to that of the maculæ in mammals, and seems to present a link between the human maculæ and cochlea. The direct cause of stimulation in all such organs is to be sought in the transformation and displacement of a membrane (*Deckhaut*). Thus, the underlying hair-cells are stimulated. The inner papillæ of the basal membrane (*Grundhaut*), in which the hair cells are embedded, serve for high tones, and the outer ones for low tones. In addition, the cochlear region is in general more sensitive to medium and high tones, and the macular region to low tones.

Beyer (2) reports observations on patients with defects of the middle ear, and finds that even the lowest tones may be heard in the absence of the drum and ossicles, including the stirrup-plate. The intactness of the labyrinthine membranes is apparently the only absolute condition for the proper functioning of the cochlea. The middle-ear apparatus is regarded as a mechanism for subtle regulation of the labyrinthine water column. Schulze (15) supports the view that the ossicles vibrate with the fluid of the cochlear canal as a fixed or incompressible body, because the linear dimensions of the bones are so small, when compared with the wave-lengths of the more usually heard tones, and, furthermore, because the vibration-frequencies of the bones are so much greater than those of the highest tones. Kutvirt (8) investigated 198 new-born babes, mostly within ten minutes to twenty-four hours after birth. He estimates that three-fourths of the new-born react to sound within twenty-four hours. Acuity or weakness of hearing he finds to be in relation to the length and difficulty of birth.

Waetzmann's book (17) is said to give a careful review of the resonance theories of hearing, with special reference to the views of Helmholtz. It is chiefly the physical problems which are dealt with.

Urban's (16) audiometer, which may be mentioned in conclusion, has already been described by Seashore in this journal.[1]

[1] Cf. this journal, 1914, 11, p. 20.

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[1] For my references to the articles of Beyer, Kutvirt, Schaefer, Schulze, and Waetzmann, I am indebted to the review notices of H. Beyer and W. Köhler in the *Zsch. f. Psychol.*, 1913, 66, 290–293, and of H. Keller in the *Arch. f. d. ges. Psychol.*, 1913, 28, 129–130.

SPECIAL REVIEWS

Grundzüge der Psychophysiologie. Eine Darstellung der normalen generellen und individuellen Psychologie. ALFRED LEHMANN. Leipzig: Reisland, 1912. Pp. x + 742.

Our information regarding psychology is large but unsystematic. Mental events depend on complex groups of conditions and neglecting any one of them may entirely vitiate the result. Even those phenomena which are tolerably well understood cannot now be systematized, because this may be done on the basis of a theory only and there is no workable theory at hand. The current theories are of metaphysical significance only and do not furnish real psychological explanations. Lehmann thinks that the energetic view is the only one successful in this respect. Mental phenomena, according to this theory, are due to a peculiar form of energy which originates by the chemical transformations within the central organ of the nervous system, and which is subjected to all the laws of energy transformations. Psychological laws are, therefore, special cases of the general principles of energy transformations. As formulated today these laws are unduly simplified and are not more than the working basis of a future, more complete, theory. These views of the Danish scientist have been known since about 1901 and the present book is the outcome of their application to the entire field of psychology. There is no question that the energetic view is one of the most original and most interesting doctrines of today.

The scope of the book is limited to psychology of the normal adult. The data of child psychology are used only where they give a better understanding of the adult mind. The book is divided into four parts. In the first part mental phenomena in general and their relations to their physical and physiological accompaniments are studied. It begins with a statement of the mind-body problem and of the fundamental principles of energetics. Then follows a chapter on the reactions of the living organism and on the laws of energy transformations that apply to them. The fourth and last chapter of the first part deals with the nerves and the central organ. The anatomical part is very clear and it seems that the amount of anatomical information to be given has been very judiciously selected.

The chapter closes with a discussion of the energy transformations in mental and nervous work, as determined by calorimetric experiments, and of the author's theory of inhibition and reinforcement.

The second part has the title Psychophysics and deals with simple mental phenomena and their relations to external stimuli. Psychical elements are defined as mental phenomena which are not susceptible of further analysis. Of such elements Lehmann distinguishes two: sensations and feelings. The sensations are discussed under the headings: optical sensations, acoustic sensations, taste and smell sensations, dermal sensations and organic sensations. The latter is a term for a group of sensations which comprise kinæsthetic sensations and sensations due to vegetative functions of the organism. It is well known that the author has advanced many new views as to the psychology of sensations, and that is what this part really amounts to, so that one may be sure to find it interesting and stimulating reading.

The third part deals with the mutual influence of mental contents and is properly called psychodynamics. Lehmann distinguishes between psychodynamic processes and psychodynamic activities, the latter being characterized by an accompanying feeling of effort or activity. The psychodynamic processes take place either in the sense organ or in the central organ and consist either in reinforcement or inhibition. As an example of the first kind brightness and color contrast, and the ghost of a moving light are discussed at some length. After a discussion of central inhibition and reinforcement, association and reproduction are described as results of repeated reinforcement. Psychical activities are classified as attention, discrimination, relating processes, and combination. We may be allowed to mention the following detail of the presentation, because it may be useful for similar purposes. Lehmann, belonging to the visual type, describes his introspections while solving a certain mechanical problem. To the text is added a series of pictures of more or less diagrammatical character which give an excellent idea of the steps by which the solution was reached. It is a matter of course that this scheme cannot be used for people who belong to the verbal type, and that its usefulness is limited in work with subjects who belong to the mixed type, but the assistance of some such scheme will be very welcome in all the cases where complicated introspections have to be digested.

The discussion of psychic complexes is the topic of the fourth part. By this term Lehmann refers to certain complex contents

which have the same essential features in all normal individuals. They do not correspond to external stimuli but develop in consciousness on the basis of experience. Time and space, the ego, emotions and volitions belong to this group.

F. M. URBAN

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Encyclopædia of the Philosophical Sciences. Volume I. Logic. ARNOLD RUGE, WILHELM WINDELBAND, JOSIAH ROYCE, LOUIS COUTURAT, BENEDETTO CROCE, FEDERIGO ENRIQUES, and NICOLAJ LOSSKIJ. Translated by B. ETHEL MEYER. English editor, HENRY JONES. London: Macmillan and Company, 1913. Pp. x+270.

One of the distinctive merits of this initial volume lies in its reflection of the modern spirit of interest in and respect for widely divergent and even contradictory modes of thought. It would probably be difficult to find two more radically antithetic positions than those taken by Couturat in "The Principles of Logic" and by Croce in "The Task of Logic." The former writes with an eye single to the exposition of recent developments of symbolic logic, or what he prefers to designate as algorithmic logic, or logistics, a practical application of which science would be the elaboration of a language truly international and rational. The latter begins his paper with an attack on the futility and remoteness of the essentially scholastic activities of the logisticians, and then turns to a comprehensive statement of logic as neither a complex of rules nor a branch of psychology but as philosophy, or philosophical logic, conceived in the Hegelian spirit.

Again, in the paper on "The Problems of Logic" by Enriques, which may be characterized as an expression of critical positivism, the task of reason, that to which logic applies, is to draw together into a synthesis reality and spiritual elements, already given and awaiting one another; whereas in the paper on "The Transformation of the Concept of Consciousness in Modern Epistemology and Its Bearing on Logic" by Losskij synthesis is conceived of as having taken place in the object; the reasoning activity can be only analytic. Thus for the latter writer logic, having investigated the grounds on which the relation between the subject and object of a judgment is based, is concerned only with the objective, or synthetical, side. "Analysis, which . . . is the subjective work of the individual knowing, and only serves as a bridge to the objective side of judg-

ment, is of importance for Psychology, but not for Theory of Knowledge."

Windelband ascribes more importance to the psychological phases of logic than any one of the other contributors. He treats of theoretical, genetic, and social aspects of psychology as furnishing indispensable preparation for any logical inquiry and theory; it is necessary to study the genetic process which produces the feeling of the truth value. He states his agreement with the pragmatist that psychogenetically truth has no primary value for mankind, but "like all the results of civilization it attains value by means of many media, and, in accordance with a general law, begins as means and becomes an end in itself." In this preliminary tracing of the development of the truth value the sphere of the individual conscious life is overstepped, and "the socio-psychological presuppositions of Logic" become involved. Windelband brings out with great clearness and suggestiveness, but all too briefly, the important point that "perceiving and knowing as empirical functions are entirely social in their nature." He suggests also that the logical concepts of validity and of universality root in the judgments of a social community. Again, the "social character of cognition . . . shows itself above all in the fact that it finds its expression in *speech*, as the most characteristic vehicle of common life."

Yet all of this, in Windelband's treatment, is merely preliminary. Pragmatism, "mit allen seinen Deklamationen," is allowed to occupy but a "niche in the entrance porch of Logic." Even theoretical psychology can furnish no psychological principles of logic. By theoretical psychology Windelband clearly means that type of psychogenetic inquiry which aims to analyze the always complex content of conscious experience into its originally simple elements. It is this type of psychology which obviously does afford Windelband the warrant to say: "The decision of all these genetical problems, however, while for the Idealogist a matter of life and death, and for Theoretical Psychology of the greatest significance, is for Logic itself quite irrelevant; for Logic is concerned not with the origin but with the validity or truth of ideas." For it is a type of psychology that was preoccupied with "impressions" and ignored the expressive or motor functions. It was a psychology without hands. That is not the case, however, with recent developments in functional and social psychology, so appreciatively referred to by Windelband. It is difficult, if not impossible, to reconcile his recognition of their logical significance with the position he assumes when

he proceeds to develop a positive logical theory. They then are deemed to afford materials only; whereas logical theory "must start from the most general character of the theoretic consciousness. We find this in Kant's *principle of synthesis*."

One of the most significant points in Royce's profoundly suggestive paper on "The Principles of Logic," a paper which is concerned mainly with an elaborate treatment of the "Theory of Order," may be referred to in this connection. It is the point that our modes of action are subject to the same general laws as those to which propositions and classes are subject, and may be viewed "as a system within which the principles of logical order must be regarded as applicable." The so-called algebra of logic which may be applied to them becomes a calculus of modes of action, infinitely rich in ideal possibilities. The position here taken with reference to the existence of certain modes of activity and certain laws of the rational will, which are unescapably apriori conditions even of attempting to presuppose that they do not exist, is characterized as "absolute pragmatism" (as if the saving grace and most dearly cherished attribute of pragmatism were not its essential relativity!).

What are these "modes of activity" but the expressive and motor aspects of conscious organic life, ignored by the traditional psychogenetic type of analysis, and then seized upon and abstracted from immediate experience by the logician or philosopher, to reappear now in the guise of a synthetic principle, now as the concept of validity, and now as an ideal system of Absolute Pragmatism?

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Thought and Things: A Study of the Development and Meaning of Thought, or Genetic Logic. Volume III, Interest and Art, being Real Logic; I, Genetic Epistemology. James Mark Baldwin. London: George Allen & Company. New York: The Macmillan Company, 1911. Pp. xvi+284.

It would be difficult to disentangle the purely psychological considerations developed in this volume. One of the virtues of the work doubtless lies precisely in the interpenetration of psychical, logical, ethical, and æsthetic "thoughts and things." Of the psychology involved it may be said in general that it is genetic not only as to its subject matter, but also as to its method; it may be recognized as the method of interpretation first developed in the

volumes on *Mental Development* and now come to its maturity. In the features of the adult form we may observe a likeness to the earlier traits of its childhood and youth,—a sort of "semblant revival."

This volume is devoted in the main to a detailed study of the logic of the ethical and the æsthetic experiences; and it culminates in the statement of a philosophical programme to be known as "Pancalism," the full treatment of which is postponed to the forthcoming and final volume. On the psychological side it is apparent that the concept of the bi-polar self of the *Social and Ethical Interpretations*—the self of habit and of accommodation, of self-assertion and of imitation—continues to play a leading rôle. The logic of this concept is in control, apparently, throughout the greater part of the discussion. Like every working concept it is, of course, an abstraction; and is not open to criticism on the ground that it does not contain a full representation of the reality to which it refers. It may be considered as involved instrumentally in at least four phases of the present discussion:

1. It answers adequately to the paganly non-moral "give and take" of unequal social selves, where self-assertion and imitation function alternately.

2. It answers adequately, also, to that æsthetic experience (but conceivably non-artistic expression) in which both self-exhibition and imitation function together under the influence of some "make-believe," some "semblance," some "livslögnen," which sets free and harmonizes the bi-polar self as a whole.

3. It does not answer adequately to the true moral experience, as distinguished alike from conformity to social habit and from following individual inclination. The bi-polar self is a self of arrested development, as is clearly seen when it is brought face to face with a moral situation. It is a self incapable of generating a moral ideal. A miracle is invoked: Let the "ought" arise out of the "must!"

4. It seems to be responsible, in part at least, for the statement of an irreconcilable dualism of logic and ethics. The contrast between logical necessity and moral necessity, according to Professor Baldwin's account, could not be more marked than it is. Logic is conceived of as concerned with the necessity of establishing the whole in the world of ideas, and of separating it positively from any further control by fact. "So far as it becomes formal and logical, a body of theoretical intuition ceases to be material and experi-

mental, a body of growing and inductive knowledge. The mediating body of ideas is taken to be a detached and self-sufficient system of absolute truths." In the case of the moral ideal, on the other hand, no rules of consistency are presented. "Instead of a body of relational contents, there is an attitude of will, a motive of personal choice, a movement of determination of the self upon a practical problem which allows alternative solutions" (p. 136). "In the one, *the end is lost in the means;* in the other; *the means is lost in the end. Each thus attains its normal (!) ideal*" (p. 133).

On such a tragic ending as this we may well be thankful to have the author ring down the painted curtain of "Pancalism."

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DISCUSSION

NOTE ON A CASE OF CHROMÆSTHESIA

The following data are submitted in order to add to the evidence already offered by Galton, Calkins, Pierce, Claparède, Dresslar and others in regard to the permanence of the association in cases of synæsthesia and to show the effect on the colors of the combination of tones, with special reference to complementary colors.

The subject was a young talented woman musician and composer, who was twenty-three at the time of the first investigation, which was made in January, 1905. A second investigation was conducted seven and a half years after the first. The subject could name the color, in fact could see the color at the mention of the musical note. At times however she also struck the note on the piano. The colors were seen as light similar to the colored illumination of the stage. This differs from the case reported by C. S. Myers[1] in which the subject thought rather than saw the colors. The color was the same as to hue for a given tone in all parts of the scale. It changed, however, as to luminosity, being bright in the higher and dark in the lower register. In this respect there is also a difference from Myers's subject, who saw different colors with a change in pitch. The phenomenon has been present as far back as the subject can remember. She began to play the piano shortly before the age of three and distinctly remembers seeing the colors then.

Some of the associations are as follows:

	1905	1912
c	red	red
d♭	purple	lavendar
d	violet	violet
e♭	soft blue	thick blue
e	golden yellow	sunlight
f	pink	pink, apple blossoms
f♯	green blue	blue green
g♭	greener blue	greener blue
g	clear blue	clear sky blue
a	cold yellow	clear yellow, hard, not warm
b♭	orange	verges on orange
b	very brilliant coppery	very brilliant coppery

[1] "A Case of Synæsthesis," *Brit. Jour. of Psych.*, 4, 1911, pp. 228–238.

It will be seen that there is almost perfect agreement between the two investigations. The subject assured me that she had never given any thought to the investigation in the interim.

In December, 1913, investigations were made in regard to the combination of tones. When those tones were chosen which corresponded rather closely to the complementary colors the results were as follows: c (red) and f# (green blue) gave a very indefinite light verging on gray. Red came up at times. G (clear blue) and a (cold yellow) called forth a hazy mist like the other only this time yellow and blue came up at times. The subject upon being questioned expressed total ignorance of the properties of complementary colors. That the fusion is not complete is not surprising when one recalls the fact that in musical fusion the separate notes can be heard as well as the resulting chord.

In chords such as for example c è g the color of the fundamental predominates. In fact in all triads it is the color of the fundamental note which prevails. In dissonances the colors are paler, as if there was a veil over them. In the altered chords no one color predominates. There is no fusion, the different colors flashing up more or less together. The dominant seventh and ninth are not so hazy. They take on the color of the fundamental note, but the other colors keep coming up.

In conclusion it may be stated that the subject did not have any other form of synæsthesia, which fact seems to disprove Myers's statement that "it is probable for the full development of synæsthesia a strong tendency to a certain kind of association is requisite." Myers's subject formed associations between colors and words, the days of the week, etc. A comparison of the two cases seems to indicate that the chromæsthesia here recorded is entirely of physiological origin, while Myers's case started perhaps from some physiological predisposition and developed through chance associations. A third type of associations frequently reported and one to which the term synæsthesia should not be applied is where the associations are entirely the result of the experience of the individual, in most instances through the mediation of feeling tone.

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BOOKS RECEIVED

HUNT, E. L. *Diagnostic Symptoms in Nervous Diseases.* Phila. & London: Saunders, 1914. Pp. 229. $1.50 net.

DERCUM, F. X. *A Clinical Manual of Mental Diseases.* Phila. & London: Saunders, 1914. Pp. 425. $3 net.

COFFIN, J. H. *The Socialized Conscience.* Baltimore: Warwick & York, 1913. Pp. viii + 247.

BLONDEL, C. *La Conscience morbide, Essai de psycho-pathologie générale.* Paris: Alcan, 1914. Pp. 336.

KLEINPETER, H. *Vorträge zur Einführung in die Psychologie.* Leipzig: Barth, 1914. Pp. vi + 435. M. 6.60; M. 7.50 geb.

FISKE, E. W. *An Elementary Study of the Brain.* New York: Macmillan, 1913. Pp. vii + 133.

NOTES AND NEWS

ARTHUR HENRY PIERCE, professor of psychology at Smith College and editor of the PSYCHOLOGICAL BULLETIN died on February 20 after a short illness. His colleagues on the editorial board of the REVIEW PUBLICATIONS are deeply sensible of the loss sustained by these magazines and American psychology generally. Dr. Pierce was an efficient and tactful collaborator, and a man of unusually charming personality.

ABOUT 30 pictures of psychologists have been procured by Dr. E. A. Kirkpatrick of Fitchburg, Mass., in accordance with the plans suggested in the BULLETIN some months ago.

PROFESSOR THOMAS H. HAINES, of Ohio State University, who is on leave of absence, is conducting the courses in psychology at Smith College during the present semester.

THE New York Branch of the American Psychological Association held its mid-year meeting at Princeton on February 23.

DR. LIVINGSTON FARRAND, who was secretary of the American Psychological Association, 1896–1904, entered upon his duties as President of the University of Colorado February 1.

THE following items are taken from the press:

DEAN JAMES R. ANGELL, head of the department of psychology at the University of Chicago, will be the next Convocation Orator at the university.

PROFESSOR JOSEPH JASTROW, of the University of Wisconsin, gave the opening Convocation address at the University of Missouri on February 4, on "Theory and Practice."

DR. EDWARD K. STRONG, JR. has been appointed professor of psychology and educational psychology at the George Peabody College for Teachers.

MR. H. G. CHILDS, professor of educational psychology in the Brooklyn Training School for Teachers, has accepted an appointment to the chair of educational psychology in the University of Indiana.

DR. ROBERT H. GAULT of Northwestern University has been promoted from assistant professor to associate professor of psychology.

DR. GEORGE R. M. WELLS, of Oberlin College, has been advanced to an associate professorship of psychology.

"PRACTICAL Applications of Psychology" was the subject of an address by Professor J. R. Angell, of the University of Chicago, delivered on January 6 in the Fine Arts Theater, Chicago, under the auspices of the University Lecture Association.

NOTE.—Until further notice it is requested that all MS. intended for the PSYCHOLOGICAL BULLETIN, announcements and notes, proof, editorial correspondence, and books offered for review, be sent to Professor Howard C. Warren, Princeton, New Jersey.

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THE

PSYCHOLOGICAL BULLETIN

THE MIND TWIST AND BRAIN SPOT HYPOTHESES IN PSYCHOPATHOLOGY AND NEUROPATHOLOGY

BY E. E. SOUTHARD, M.D.

Harvard Medical School

When my friend and colleague, Professor Angier, desired that I should write a review of my general attitude toward the problems of psychopathology in their relation to the more general problems of cerebral function and of consciousness, I was minded to refuse. The point was that I considered that my ideas were little more than a mass of unproved hypotheses. However, I had just been meditating on the results of the first ten years of the Bullard Professorship of Neuropathology in the Harvard Medical School, and found myself able to draw up without great difficulty a sketch of my various unproved hypotheses, some of which I here present.

Perhaps I should preface this account of a point of view by some remarks which I hope will not be over personal. Psychologists, and especially psychiatrists, while dealing with personality day by day, are too often loath to display their own on paper. When at the Triennial Medical Congress at Washington, in 1910, I was moved in discussion to denominate two great groups of friendly opponents in the field of psychiatric theory respectively as the "mind twist men" and the "brain spot men," I was reproached by some of my best friends with making light of a grave matter. The phrases are, to be sure, of little moment; but I consider that the distinction between those who uphold the hypothesis of psychic factors as opposed to those supporting the hypothesis of encephalic factors must be drawn if we are to make any sort of progress in genuine psychopathology. The ardent parallelists (among whom, I must confess, I should not like to be numbered) would, I suppose,

say that mind twists and brain spots are all one, since everything depends upon the aspect from which one works. The methodical purist might indeed assert that he who dealt in mind twists should not commingle therewith any data concerning brain spots; and the anatomist would be sure to resent a commingling of the psychic with his own localizations. For my part, without any stringent proof, I feel that somehow the hypotheses which for better or worse I was fain to describe as the mind twist and brain spot hypotheses are in some sense and in the long run identical hypotheses. I have indeed endeavored to give expression to the concept of their essential identity in a paper entitled, "Psychopathology and Neuropathology: the Problems of Teaching and Research Contrasted,"[1] and I pointed out how pernicious in research may be the dogmatic insistence on the doctrine of psychophysical parallelism in medical and premedical courses in psychology, pernicious because it inhibits the free interchange of structural and functional concepts and the passage to and fro of workers in the several sciences. I went on to show that psychology and physiology have more in common than either has with such structural sciences as anatomy and histology, and that the main common element of both mental and cerebral processes is the time element as against the space element of the structural sciences. On this ground I further conceived that the mind twist and brain spot hypotheses for the explanation of certain forms of mental disease are entirely consistent with each other, since from a different angle each is dealing with the same facts.

My point of view here is not quite naïve or quite so innocent of metaphysical speculation as the anatomist often pretends to be. The attitude in question is one strongly influenced by my work for some years past in Professor Josiah Royce's Logical Seminary, in which the fundamental concepts of science have been taken up. I should not wish, however, to convey the impression that Professor Royce is in entire agreement with my point of view.

Any logician must, however, be readily convinced that the current classroom distinctions between organic and functional disease, especially between organic and functional nervous diseases, are flimsy distinctions. They often amount to saying that a disease shall remain functional only so long as the microscope or other technical tool shall fail to prove their organic nature. Such distinctions may be practical; I have even heard them termed prag-

[1] *American Journal of Psychology*, 1912, 23.

matic, although I doubt whether the true pragmatist could see much use in the distinctions as drawn. The concepts of structure and function have also been considered among Professor Royce's varied seminary topics, and several definitions have been proposed. The most interesting of these runs to the effect that the functional among diseases is the disease which is reversible, either practically or theoretically, in such wise that the original condition can be approximately regained. It is obvious that this definition, if sound, will not jibe altogether with the one above mentioned, namely: the vague concept of the functional as that which has not yet been proved to be structural.

In securing a working definition of the functional in disease, it will always prove necessary to adopt some definition of disease itself. Two obvious lines of distinction have occurred to Royce's seminarians, which may be briefly characterized as leading to the concept of the abnormal and the concept of the morbid. The abnormal is very possibly an entirely quantitative distinction, including as its leading varieties the supernormal and the subnormal. The greatly supernormal or greatly subnormal may be termed anomalous; but anomalies are not necessarily, although they prove often to be attended by, diseases. The morbid (this term is for some reason indelicate and has been somewhat illogically replaced with the term *pathological* in modern writing) may consist in, or be produced by, the abnormal; but a deeper account of the morbid is probably to consider it as a name for conditions which somehow defeat the evolutionary use or object of the cell or mechanism in question. Thus, a condition which entails the premature death of the cell or a loss of its important appendages or organoids would be a morbid condition. Thus the concept of pathology would have at its core the teleological concept of the morbid, but would have as a rule also to consider those quantitative variations from the normal which we gather under the term *abnormal.* It is a profound, but here not especially pertinent, question how far the concept of the morbid is itself also a quantitative affair. But the main point I here make concerning the concept of the morbid is that it is a biological concept and not a broadly physical one.

I should not venture here to offer these truisms if I were not convinced that the psychologist in the academic sense seems to believe, and at any rate often leads his students to believe, that psychopathology is in some sense a science of psychical anomalies; that is, of psychic processes that are figureable in curves at the

upper or lower end of the normal curves. When the academic student begins to get a grip upon the essential problems as they are presented by a patient, or by those remains of human beings which often yield the greatest returns for a given amount of investigation, he discovers that a science of supernormal and subnormal measures leaves him entirely at loose ends and does not get him a millimeter onwards with his problem. Here, it does not do to speak with authority; yet the returns to the committee of the American Psychological Association, on which I served, as those returns were prepared by Professor Franz, indicated that those concerned with the problem of interrelations betwixt psychology and medicine were split into camps along the above lines, namely: A camp of those claiming the virtues of studying the quantitatively anomalous, and a camp of those who wish to study the biologically non-adaptive or the evolutionarily unfit.

So much by way of preaching. As a practical method of getting the students, and particularly the graduate students, to appreciate the science of the psychiatrist's problem as the pathologist sees it, I have in the last few years come to express the idea in somewhat the following terms: I first beg the student to consider the nervous system as theoretically reducible to a linear system of neurones, separated in the Sherringtonian manner by synaptic planes. I then point out that, if given muscles are convulsed as in an epileptic attack, we cannot safely state that the spinomuscular neurones which supply the convulsed muscles are in any respect abnormal, except that we must admit that their existence and participation are necessary for the production of the convulsions in question. Similarly with the corticospinal neurones, whose impulses are conceived to run into the spinomuscular neurones at the appropriate synaptic planes (under various conditions of inhibition and reinforcement which may be neglected). In epilepsy, we do not often discover that the corticospinal neurones are any more visibly diseased than are the spinomuscular neurones. In point of fact, the analysis of epilepsy, as of a great variety of neuropathological conditions, involves considering one by one, at greater and greater removes from the seat of the physical phenomenon of convulsions, the successive neurones which are indispensable in the production of the symptom but are not responsible therefor. In epilepsy, in point of fact, in the majority of cases in which science has at all made out the immediate cause of the convulsions, it has been discovered that the seat of the lesion is not in the motor neurones but

on the afferent side of the apparatus. These considerations for epilepsy I brought together in a paper entitled, "On the Mechanism of Gliosis in Acquired Epilepsy."[1] I there pointed out the relation of my own "microphysical" theory, and its endeavor to describe certain pericellular conditions which might well bring epilepsy about, to the "level" theories of Hughlings Jackson, as well as the relations of my theory to the Sherringtonian concept of synapses. In that paper I gave a highly demonstrative case of epilepsy of nine weeks' duration, terminating in four days of practically continuous convulsions due to a virtually non-destructive lesion of a sensory area. There was a focal encephalitis of the right cornu ammonis which, whatever its cause, exhibited an interstitial accumulation of neuroglia cells, leaving the nerve cells virtually intact. My hypothesis was that fresh surfaces of separation had been interposed between sets of nerve elements. I supposed that these elements, having their currents in the forward direction, and being placed under fresh conditions of intimate pressure, would initiate continuous or lasting stimuli, which would set the remainder of the apparatus moving in an abnormal fashion.

The point which I wish to make for the present purpose is that in the case of epilepsy just mentioned, and in a vast majority of cases of neuropathy of every sort, we may well suppose that the neurones which lie outside the focus of disease, and the muscles, glands, or other organs which they supply, may be entirely normal and executive of their normal functions. I tried to sum this concept up in the following phrase: Neurones may be intrinsically normal whereas extrinsically abnormal; entirely normal structures may accordingly purvey and be necessary in the production of disease.

This simple concept of the intrinsically normal yet extrinsically abnormal or morbid is of great use in psychopathology. I find it dominating my own methods of thinking. When public attention was directed, in the period just preceding the Washington Congress above mentioned, to the problem of dementia præcox, it seemed to me that very probably the brains of dementia præcox patients would be found to be normal; at least it was true that some of the most eminent psychiatrists had been unable to discover, in the majority of cases of mental disease (in which field dementia præcox must largely bulk), anything abnormal, let alone morbid. Although it had become a household word that insanity was brain disease,

[1] *American Journal of Insanity*, 1908, 64.

yet there was little or no evidence or hope that the brain disease would be soon discovered. Under this assurance, I wrote a section of my paper on dementia præcox entitled, "A Study of the Dementia Præcox Group in the Light of Certain Cases showing Anomalies or Scleroses in Particular Brain Regions."[1] I there pointed out that the disease diabetes mellitus, being distinguished among other diseases by the production of great amounts of urine with an abnormal amount of sugar, might well be conceived by the tyro as a kidney disease. Yet upon investigation, it turns out that the lesions of the kidney in diabetes mellitus are negligible and inessential, and that the disease itself must be related to remote or unknown organs. This analogue points the way to a broadening of the concept of the intrinsically-normal-but-extrinsically-abnormal to include other elements than neurones, and indeed to include the chain of organs which we latterly suppose are concerned in the production of internal secretions. Just as the intrinsically normal kidney is extrinsically abnormal in diabetes mellitus in the sense that it purveys a large amount of sugar in the urine, so *might* the brain in dementia præcox be intrinsically normal yet extrinsically abnormal, in the sense of producing delusions, catatonic excitement or stupor, or other characteristic symptoms whose genuine origin might conceivably lie entirely outside the nervous system.

This was my conception of the probabilities with respect to dementia præcox when I entered upon the study of a series of brains in that disease in preparation for the Congress of 1910. It still remains my conception of conditions in the sister disease, manic-depressive insanity; but in dementia præcox I was greatly surprised to find that the vast majority of cases were distinguished as to their brains by the possession of distinct though mild lesions in the nature of anomalies, atrophies, or scleroses, which in so labile an organ as the brain must perforce have their effects upon brain functions.

This long preamble is probably justifiable in preparation for showing why a psychopathologist should find himself a localizer despite logical predilections against brain localization for psychic processes. I may briefly state the view to which my as yet unproved hypotheses seem to be leading, as follows: It seems to me that just as a tremendous leap forward was taken when the Flourens view of the interchangeability of brain parts was sup-

[1] *American Journal of Insanity*, 1910, 67.

planted by a roughly localizing view, and when the bilaterality of brain function began to be unravelled, along with the data showing the seizing of some functions by one hemisphere as against the other, so we may be now in the process of a great advance as we come to a full recognition of the value of distinguishing the parts of the cortex which lie forward of the fissure of Rolando and above the fissure of Sylvius from the parts which lie behind and below those fissures. For it seems to me that the indications are strong that the silent portions of the pre-Rolandic areas of the cortex, forming the anterior association center of Flechsig, are predominantly motor in function; whereas the correlative backward-lying association center is predominantly sensory. Just as it is convenient at some times to divide the earth into an eastern and a western hemisphere, and sometimes into a northern and a southern hemisphere, so it may be well for many purposes to distinguish the left hemisphere of the brain from the right, but for other purposes it may turn out that the pre-Rolandic and supra-Sylvian portions of both hemispheres, with their concomitant commissural fibers in the corpus callosum, should be fairly sharply distinguished from the post-Rolandic and infra-Sylvian regions of the cortex. It is true that the forward "hemisphere" is of far less bulk than the rearward and nether "hemisphere"; but this difference in size is only another illustration of the difference which holds throughout the nervous system between the afferent and efferent fiber systems which compare quantitatively always much in favor of the afferent.

It does not appear that the theoretical distinctions which are possible between these two portions of the cortex have been developed as elaborately as they should be by either the anatomists or the physiologists or the pathologists. I have personally been led to wonder whether there is any basis for considering the pre-Rolandic tissues as having anything whatever to do with consciousness, that is, with *consciousness in its cognitive sense.* This was the burden of my communication at the New Haven meeting of the American Psychological Association in the closing days of 1913.

I arrived at this idea in a concrete fashion. I found in the course of my anatomical analysis of dementia præcox brains, that cases with frontal lesions were chiefly cases distinguished by the possession of delusions; that is, belonged to the so-called paranoid group of dementia præcox (to employ Kraepelin's 1899 classification). I found that the catatonic cases were correlated, not so much with pre-Rolandic atrophies, as with atrophies of the post-

central, parietal, or in some cases cerebellar, tissues. This seemed at first glance a surprising correlation, since delusions are apparently of a psychic texture, whereas the muscular spasms, inhibitions, stereotypies, and impulsivities of catatonia, suggest the efferent rather than the afferent system. Upon reflection, however, it appeared that a similar apparent difficulty lodged in the sensory basis of many epilepsies, as alluded to above. After all, it was not the content of the delusions which was so important to the patient; it was the process or formation of these delusions. It was not so much the false beliefs with which either society or the patient himself was concerned; it was rather with the maintenance of the falsely believing process, the morbid will to believe. Every one's working day is a kaleidoscope of false beliefs. But luckily they correct themselves or get supplanted in such wise that a normal attitude ensues. The psychopathology of insane delusions was consequently to be interpreted rather as a psychology of false believing, and was better conceived as a matter of behaviorism than of introspective psychology. Thus, whether my anatomical correlations were sound or not, I was able to arrive at an interesting concept of delusions as a form of conduct rather than as a form of static mental contents.

On the basis of this concept, I was led to analyze delusions of the various groups, classified (as we had by chance chosen to classify in the Danvers symptom catalogue) according to Wernicke into autopsychic, allopsychic, and somatopsychic. I quickly found that somatic delusions are far more representative of actual visceral conditions than is usually held. It is accordingly possible to conceive of many somatic delusions as virtually illusory in nature. Conclusions in this direction were published in a paper "On Somatic Sources of Somatic Delusions."[1]

This led to a study of allopsychic delusions, namely: those false beliefs dealing with the environment and especially with the social environment, which was published with A. W. Stearns in a paper entitled, "How Far is the Environment Responsible for Delusions."[2] The majority of these cases were found to be more truly instances of autopsychic or personal delusions, than environmental. This study was followed by one on the correlation between delusions and cortex lesions in the pronouncedly organic disease general paresis.[3] Incidentally, we here again found that the in-

[1] *Journal of Abnormal Psychology*, 1912–1913.
[2] *Journal of Abnormal Psychology*, 1913.
[3] With A. S. Tepper, *Journal of Abnormal Psychology*, 1913.

stances of somatic delusions sometimes complicating the picture of general paresis were usually attended by an adequate peripheral basis. Thus, a patient who described himself as blind but as having a filter over his eyes in such wise that he could see, turned out to be the victim of cell losses in the visuo-psychic type of cortex, with maximal pigmentation of the neuroglia cells. The patient should have expressed his delusion by saying that he could see but had a cortical veil preventing his perceiving properly.

More important, however, was the discovery that autopsychic delusions and that characteristic ruin of personality which we classically assign to general paresis must be correlated with frontal lobe lesions. In the non-autopsychic group, we found the lesions distributed elsewhere than in the frontal region; that is to say, we found these non-autopsychic cases failing to show the classical frontal brunt of the distinctive process. Here, then, was concrete evidence that the personality, conscious as it seems, was more closely related with the pre-Rolandic than with the post-Rolandic tissues; with the efferent mechanism more than with the afferent mechanism. It seems to me that here again we are securing evidence which supports to some extent the objectivistic or behavioristic trend in modern psychology. It seems possible that psychopathology, even in the exquisitely psychic fields of the delusions, will not gain so much by an endeavor to ferret out the innermost psychic secrets of the patient as by a careful quantitative study of his reactions in the line of conduct. If some method could be devised for obtaining the survival values of these actual processes of conduct rather than their academic quantitative values, we should be so much further on the road to a behavioristic psychopathology.

A similar line of thought follows suit in respect to catatonia. This exquisitely muscular phenomenon, like the similar phenomenon of epilepsy, turns out, as it seems to me, to be more a sensory than a motor affair. Just as delusions had less sensorial significance than they had significance on the side of action, so the catatonic and cataleptic phenomena turn out to have less significance from the side of action than from the side of the sensorial, or at all events the afferent, apparatus. Again discounting the question whether the anatomical correlations in dementia præcox upon which I founded this idea are sound or not sound, it is clear that some heuristic value must fain attach to this concept. It is, in any event, important to consider how far catalepsy is actually due to a sort of morbid kinæsthesia. Suppose a postcentral disease which should

provide to the surfaces of separation between neurones their initial stimulus, purveying as it were quasiperipheral stimuli of a given kinetic quality, then perchance the remainder of the general mechanism although quite normal (*intrinsically*) would have to react in the cataleptic way. What might seem to be a will disturbance, or a disturbance initiated in or near the precentral gyrus as a form of abnormal or morbid conduct, might perchance be executed by a thoroughly normal precentral and frontal mechanism on the basis of abnormal or morbid conditions in the post-central region. Upon this basis might be built up, in short, a kinæsthetic or quasikinæsthetic theory of catatonic and cataleptic phenomena.

An illustration from less disputed fields may serve to bring out the point. It is well known that experimental physiology has shown that there are two centers for conjugate deviation; namely, a center in the angular gyrus, which lies posterior to the Rolandic fissure, and a center in the middle frontal gyrus which lies anterior. Should we regard the results of stimulating these two areas as entirely similar? Are we to suppose that projection fibers run directly from both these cortical areas to the appropriate oculomotor neurones? Are we not rather to suppose that they stand to one another in some logical sense resembling that in which the area of Wernicke for sensory speech stands to the area of Broca for motor speech? Can we perhaps generalize that many or the majority of the complex functions for which the cerebral cortex is built are thus doubly supplied fore and aft by mechanisms which on the one hand are more closely related to conduct or behavior elaboration, and on the other hand to kinæsthetic or cognitive elaboration?

This leads me to quote with as much disapproval as I becomingly can from Wundt's expression of his anti-localizing views in the first volume on speech in his *Völkerpsychologie*. Wundt decries the conception that every cortical brain cell harbors some idea. The unregenerate physiologist, according to Wundt, holds the conscious conception that deposits of different ideas or thoughts are distributed over the cortex in districts; one for sound impressions, one for visual images, etc. These compartments of the cortex, according to Wundt, were conceived by illogical physiologists as in part occupied by ideas, and in part engaged ahead for future occupants. Destruction of a center for ideas would of course destroy ideas deposited; but fortunately these destroyed ideas could be replaced by new ones occupying cells now vacant. Such a restoration of function would not differ essentially from the process

of normal brain development so long as still disengaged cells remained available. Prior to the work of Broca, in 1861, according to Wundt, every one had thought vocal sounds to be of physical origin but words of psychic origin. A word, to be sure, required the physical aid of sound production, but nevertheless every word was really the outcome of a concept and was exactly as much a psychic affair as desire or will; but Broca showed that motor (or better, according to Wundt, ataxic) aphasia depended on lesions of a certain part of the brain (inferior frontal convolution). Wernicke followed in 1874 by showing that sensory (or better, according to Wundt, amnestic) aphasia depended upon lesions of a certain other part of the brain (superior temporal convolution). Then followed Kussmaul's scheme in 1877, which as modified by Lichtheim in 1885, seemed to show that at least thirteen different kinds of aphasia might be produced by lesions appropriately placed in different parts of the brain. Then followed the work of Meynert and the work of Munk.

I suppose there can be no objection to this schematic account of the history of the doctrine of aphasia as developed by Wundt, but I should now wonder whether it is advisable to consider that any idea, or at all events any cognitive process, can or ought to be related to such an area as that of Broca. The area of Broca, like the area near by for conjugate deviation, or the so-called graphic center or similar congeries of interrelated elements, may be supposed to be, or to take part in, a synergic mechanism for one or other purpose. The frontal part of the brain is doubtless full of these synergic mechanisms. The negation of personality entailed by frontal lobe disorder indeed indicates that the synergic mechanisms, or kinetic patterns or schemata, normally contained in the anterior association center are even capable of novelty production, of the faculty of innovation, upon which our title to supremacy as human beings depends. Accordingly, I should wonder whether the analysis of the effects wrought in such areas as that of Broca was not more a matter of behavioristic psychology than of introspective. Some might inquire whether it were not well to consider such an area as entirely physiological in its action. To this form of expression, I should have no objection if it be understood that in some way or other we must explain the correlation of personality with these forward lying cell systems. It is probable that these cell systems of the anterior association area are every whit as much entitled to psychological consideration as the cell systems of the

posterior association center. Yet the operations of the latter are very possibly on theoretical grounds far more open to introspective study than are the operations of the forward lying cell systems.

Naturally, the products of the action of the precentral gyrus or of the area of Broca do get representation on the cognitive side, that is mainly in the kinæsthetic manner and doubtless more back of the fissure of Rolando than forward thereof. On this account, introspection has been an important, or even essential, method in the analysis of behavioristic problems, since the kinæsthetic or other similar record of what is being done will often serve as the best guide for the actual course of events when the behavioristic method itself may not yet be able to cope with technical difficulties. On the other hand, after all, what the psychopathologist as well as the psychologist wants to register is the acts and deeds,—that is, the conduct,—of the individual, and on this account the operations of the anterior association center of Flechsig are of prime value.

In partial support of these ideas, I have recently studied the literature and certain casualty ward records with post-mortem studies available to me, with the object of learning how far what we term clinically consciousness and unconsciousness are consistent with extensive lesions of different parts of the cortex. Already the Crowbar Case and other similar cases stood to prove that the frontal cortex might be seriously injured without permanent impairment of consciousness in the slightest degree. An affection of character might well ensue, indeed is described as having ensued in the crowbar case; but it does not appear that consciousness, or at all events selfconsciousness, was lastingly injured in that classical case.

The considerations of this latter study led me to consider the meaning of the term consciousness. It seems to me that the term should be restricted to what it etymologically seems to signify, namely, cognition and compounds of cognition. It seems to me that the components of will and possibly those of emotion are entirely, or almost entirely, gotten into what we call consciousness by the cognitive route of kinæsthesia, and that there is great question how much elementary introspective stuff there is to the will and the emotions which cannot better be accounted for on the basis of kinæsthesia. If this account of consciousness as in a sense cognitive is a good simplification of nomenclature, I would suggest that a similar simplification in the field of the so-called unconscious is sadly needed. Some textbooks on psychology

seem to identify consciousness with mind. The unconscious is, according to these authors, surely much more than the non-conscious, and indeed has been hypostasized into a novel and mystical entity having all the old warmth and intimacy of the so-called conscious and many strange intimacies besides. If one tries various current definitions of the unconscious by replacing the term *unconscious* by such a term as *non-conscious* or *non-mental*, one discovers how much balderdash has been inflicted upon us by many exponents of mystery.

So much will suffice for a doubtless far too personal and over dogmatic account of my reaction to the present situation in psychopathology and psychology. I do not vouch for the ultimacy of any of the ideas expressed, and must place upon my friend, Professor Angier, all responsibility for the premature delivery of possibly non-viable children of fancy.

Summary.—I am sure that some of the dozen or more separate conceptions to which I have asked attention in the above review will hardly carry conviction in the present sketchy form.

1. The *mind-twist versus brain-spot hypotheses* have nowhere been discussed *in extenso* (although see articles on "The Problems of Teaching and Research Contrasted and a Study of the Dementia Præcox Group," etc., mentioned in text), and I am not sure that the distinction will strike the reader as more than a fresh sample of psychophysical parallelism. Without special title to a viewpoint, I wish however to say that personally neither parallelism nor interactionism seems to me safe ground and that some kind of identity hypothesis for all the operations concerned would be better consonant with my views. One thing will be clear from the above sketch, viz., that it may well be possible that mental operations of the introspective kind are not correlatable (in any sense) with a good part of the operations of the cerebral cortex.

2. The definition of *consciousness as equivalent to cognition and compounds of cognition* leaves the non-cognitive portions of the mind (will and emotions) only capable of introspection by the kinæsthetic and allied sensorial routes. But, whether the above definition is correct or not, it is at least clear that many authors in the past have confused the issue by identifying mind with consciousness, at a stage when neither concept was capable of exact statement.

3. The pathological evidences which have absorbed my personal attention have led me to a *reëmphasis of the Flechsig concept of*

anterior and posterior association centers, to a natural correlation of consciousness and the entire sensory portion of the mind with activities of the posterior association center, and to a similar correlation of non-conscious, *i. e.*, objectivistic or behavioristic portions of the mind (notably the voluntary faculties) with activities of the anterior association center: the *prepallium* (pre-Rolandic cortex) would thus be more closely related with behavior (kinetic and pragmatic schemata) and the *postpallium* (post-Rolandic and infra-Sylvian cortex) most closely related with consciousness.

4. But, if the *prepallium* is more an organ of behavior than the receiving *postpallial* mechanism, it is expressly to be stated that the capacity for novelty-production, or innovating power, is not to be abstracted from the prepallial neurones. Such innovating power, exquisitely mental as it seems, is not necessarily conscious in the sense of essentially cognizable. It is perhaps only the *history* of our innovations and inhibitions which we register in the postpallial mechanisms. Arguments in this direction are to be drawn from the decisive ruin of the personality which attends *prepallial* destructive processes in general paresis of the insane.

5. A sketch is offered to show that the non-conscious, *i. e.*, non-cognitive, side of delusion-formation is perhaps more important than the conscious (or contentwise) side. At least the morbid correlates of delusion-formation seem to be prepallial rather than postpallial disorder as a rule.

6. The reverse seems to hold for such apparently motor or behavior phenomena as epileptic and cataleptic phenomena: these are possibly based more often on postpallial (sensorial?, kinæsthetic?) disorder than on intrinsic disorder of behavior mechanisms.

GENERAL REVIEWS AND SUMMARIES

THE FUNCTIONS OF THE CEREBRUM[1]

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The study, or science, of cerebral function is, like many other sciences, in a complex stage of its development. The relation of the brain to other parts of the body or to mental processes is no longer considered to be a mysterious matter, nor are the simple explanations of its functions believed to be entirely satisfactory. The collection of facts has proceeded to such a point that it is now generally recognized that even the relations of the cerebral cells to the production of movement are not to be explained in a simple manner. Many observations of motor, sensory and association disturbances accompanying cerebral lesions have been recorded which can not be explained by the older hypotheses, and which, in fact, negative them. Some have been insisting for a number of years that the cerebral relations are not simple, but because of certain practical needs and applications, the discrepancies have been largely disregarded. It must be understood that cerebral relations are not becoming complex in the sense that more areas with definite functions are being discovered, but in the sense that many functional variations are being recorded, that there are many so-called anomalous disturbances associated with cerebral lesions. For this reason the simple explanations or theories are no longer acceptable, and many which have hitherto been considered almost like statements of fact are undergoing radical modifications.

The general belief that aphasias in right-handed people are produced exclusively by lesions in the left hemisphere and in left-handed people by corresponding lesions in the right hemisphere is not borne out by a number of cases, and it is valuable to have the additional negative case which has been described by Long (**6**). On autopsy, Long discovered in this left-handed individual that

[1] For last previous review see PSYCHOL. BULL., 1913, **10**, 125–138.

the aphasia was associated with lesions of the second and third frontal convolutions, of the island of Reil, of the internal capsule, and of the surrounding regions in the left hemisphere. The reason for an association of such contralateral lesions (*i. e.*, not corresponding to the hemisphere of greater voluntary control) with the speech disturbances is not plain, but it is apparent that in this case, and probably in others, there may be an anomaly in the motor and sensory association functions of the cerebrum, or, which seems to the reviewer more probable, that we have in this case only an example of the normal variation in function in different individuals.

The symptom variations which are found in individuals with lesions in the occipital lobes are also very great. Certain cases have been described in which very extensive lesions have not been accompanied by a complete loss of vision, while in other cases comparatively small lesions resulted in almost complete loss. At other times it is found that even in apparently complete bilateral lesions some visual ability remains. In extensive calcarine lesions, and especially in those cases in which there are visual defects for special retinal segments, it is not unusual to find that patients still retain certain visual ideas and have visual experiences which are of the nature of hallucinations. In the case which has been described by Josefson (5), this was found. In this patient, in addition to the general mental changes associated with the pressure, etc., due to the cerebral lesion, which was produced by a glioma or a sarcoma in the left occipital lobe, there were found homonymous hemianopsia with optical aphasia and alexia, but the patient had marked visual hallucinations in the right visual field corresponding to the hemianopic area, and the hallucinatory figures were at times larger than normal. Such cases have more than the particular interest for the purpose of localization of cerebral function, for they indicate that even though there be large amounts of destruction of cells and fibres, the mental functions, supposedly connected with the activity of these cells and fibres, may still persist. They also indicate how little we know at present of the relations of cerebral cell activity and such mental things as ideas.

Minkowski (9), after extirpating the occipital regions of the cat's brain, and in certain cases the eyes, has determined the paths of degeneration, and especially the relation of the degenerations in the external corpus geniculatum due to lesions of the striate area (calcarine cortex). His results indicate that the external geniculate body is the only subcortical structure in which, following

an extirpation of the striate area, a degeneration of the ganglion cells is determinable, for neither in the pulvinar nor in the anterior quadrigeminal body was he able to determine accurately that there were pathological changes in the ganglion cells following such injuries. These latter structures, pulvinar and quadrigeminal body, do, however, show degenerations following the destruction of cortical areas near the striate area. Minkowski has also been able to demonstrate a finer anatomical relationship between the calcarine cortex and the geniculate body, for he has observed that the anterior portion of the striate area is connected largely with the anterior portion of the external geniculate body and the posterior portion of the visual cortex with the posterior part of that ganglion. A somewhat similar relationship is found to exist between the eyes and the corpora geniculata, and Minkowski has been able to show that there is a fair degree of correspondence, or anatomical relationship, of the retinal areas to parts of the geniculate bodies.

Boyd and Hopwood (3) have reported the autopsy findings and the clinical phenomena in an interesting case, which, by exclusion, gives valuable information regarding the more definite localization of the cerebral center for hearing. In their patient they discovered in the left temporal lobe of the cerebrum a large cyst which destroyed the superior and middle temporal gyri, with the exception of the anterior portions. In this patient no impairment of hearing was discovered by the clinical examinations, and the evidence appears to be conclusive that the portions of the temporal lobes which were destroyed are not primarily, or necessarily, concerned with the perception of sounds. It will be remembered that Campbell, on histological ground, has laid particular stress upon the anterior gyrus of Heschl as a special sensory center and as being closely associated with the function of hearing; in the patient described by Boyd and Hopwood this gyrus escaped involvement, and the authors conclude that the results tend to support Campbell's conclusion that only the anterior parts of the superior temporals are hearing centers.

It is well known that in certain animals, as the cat and dog, paralyses due to cortical destructions are not permanent, the destruction of the motor area resulting in only a temporary paralysis which is followed by a subsequent practically complete recovery of control of voluntary movement in the involved segment. It has also been believed that after the destruction of part of the motor area in man and in the higher apes the paralysis resulting from the

lesion is permanent. In a chimpanzee, however, Brown and Sherrington (4) destroyed the left cerebral arm area, and although this area was completely destroyed, voluntary movements at the right elbow could be performed, and in a comparatively few months such a great amount of return of voluntary movements of the whole arm, took place that eventually there was no obvious difference in the control of the movements of this arm as compared with the left arm, which was normally innervated. The authors conclude that this return of function can not be due to a regeneration of the area which had been destroyed, nor to the assumption of this function by the corresponding portion of the right hemisphere, nor to the vicarious function of the left postcentral cortex. Following extensive precentral cortical lesions in man, there may be immediate extensive paralyses, even hemiplegias, which are expected to, and do, show a certain amount of improvement in the weeks succeeding the initial cerebral insult. Whether the partial restoration of functional control is due, as has been assumed by many, to a subsidence of the pressure, or to some conditions as yet unknown can not be definitely solved. The results of the experiments of Brown and Sherrington are, however, suggestive that even though there be a destruction of the cells, there may follow a functional amelioration. The possible ways in which this may be brought about are numerous, and we need only mention, by way of suggestion in this connection, the well-known efferent functions of the caudate and lenticular nuclei and of the cerebellum. In this connection also, it may not be amiss to call attention to the fact that the reverse condition has sometimes been met with, *viz.*, the appearance of organic-like paralyses without corresponding lesions of the cerebrum or of the other parts of the nervous system. Scientifically, it is neither satisfying nor exact to call these latter conditions hysterical or functional, for they tend to show that the cerebral relations are not as simple as they have been conceived to be, and the use of a special name is, in this case, only an indication of lack of knowledge.

Romagna-Manoia (12) has, in his book, collected very completely the phenomena associated with hemiplegia in its different stages, and has given us a careful account of minute experimental results on this matter, which are most interesting for the purpose of diagnosis, but which, in addition, are of value for the understanding of the relations of the cerebrum to other portions of the nervous system. The facts are too numerous to be detailed in the present

brief review, but it may be mentioned that the reflexes, the resulting contractures, and like phenomena accompanying the various paralyses have been carefully described and amply dealt with.

An interesting study of the stages of development of the cortex of an eighteen weeks' human embryo has been reported by Bolton and Moyes (2), who give us an account of the cell structure which, in its way, is a companion research to those of Flechsig on the myelinization of the brain. The embryo brain which is described contained only beginnings of the Rolandic, calcarine and parieto-occipital (temporary) fissures, the cingulum and the opening of the island of Reil. The Betz cell area was well marked and easily localized, although the authors say that the discovery of the Betz cells in a fetus of this age was a surprise to them. This area, probably on account of the lack of infolding of the central fissure, has a much wider extent than that in the brains of newborn children and adults, and in general a similar statement may be made regarding the calcarine type of cortex. Much of the cortex showed comparatively slight development, although the precentral and postcentral areas are remarkably well evolved in comparison with the remainder. They note, and in this there is support for Bolton's previous contentions, that the anterior frontal or prefrontal cortex is throughout its depth extremely embryonic in structure. No systematic attempt has been made, as did Flechsig, to correlate the findings with functional development, but it is apparent that the greater development of the precentral and postcentral areas, at this stage of its life, is to be correlated with the well-known activities of the embryo. It is believed, the authors conclude, that this development "bears a definite relation . . . to the already stable condition of the lower reflex mechanisms."

By histological methods Malone (7, 8) has attempted to differentiate the types of cells which are concerned with different types of function, and for this purpose he has examined a number of parts of the cerebrum and has applied his methods especially to the examination of definite cell groups. In the vagal nucleus, he shows, there are three types of cells which may be taken as correspondents of the three kinds of muscle (striated, the heart, and smooth), which are innervated by the cells in this nucleus. He reports that "there is no gradual transition in structure between the cells of the afferent and motor chains, and there is no indication of the beginning of motor structure in afferent cells. Those cells in the efferent chain whose function consists exclusively or primarily in conducting

impulses through the chain to cross striated muscle, or between motor centers, are characterized by a common structure, which differs according to the position of the cell in the motor series." He furthermore remarks that "an important field is open to students of the central nervous system in studying the cell structure of different cell groups, and in correlating a definite structure with a definite cell activity wherever this is possible"; and he concludes that "a definite type of cell structure corresponds to a definite cell function." If we consider this "conclusion" as a "point of view," we should be more nearly correct, for it has not been demonstrated that cells of different sizes and of slightly different appearances may not have similar function. If it could be shown that all kinds of histologically different cells in the cerebrum differ in function, and that each different combination of cells (cytoarchitecture) also represented a different function, the problem of the cerebral physiologist would become, if not less arduous, at least better defined. The connections of cortical cells with extracerebral parts and the interconnection of cortical cells must be investigated before we shall have definite knowledge of the function of special groups or groupings in the cerebrum, but for many it is more satisfying to speculate how things may be, rather than to investigate how they are. It is because of this failing that we possess many assumptions and hypotheses regarding the functions of individual cells. We should be more scientifically served if there were published fewer speculations and more serious attempts at anatomo-functional correlations, such as that of Malone.

During the past ten years the corpus callosum has been the object of numerous pathological and clinical studies. This has been due principally to the fact that lesions in this region have resulted in various types of apraxia and because it appears that by means of this structure the two hemispheres are closely connected. Our knowledge, however, of the course of the fibers which make up this structure has been rather inadequate, but van Valkenburg (13) has now compared the results of animal experiments and pathological human material, and although he has not been able to fix a definite relation for the callosal fibers for all portions of the brain, it is apparent that these fibers do pass from one hemisphere to the other and apparently bind corresponding or allied areas. In this work he shows that in certain parts the callosal fibers probably arise from the fifth and the sixth layers of cortical cells and that in proceeding to the opposite side they terminate in

the third and, possibly, the fourth cortical cell layer. He has pointed out another interesting fact, viz., that there is a connection between the precentral area of one side and the opposite postcentral area. The other extensive connections, between the corresponding occipital lobes, and between the corresponding frontal lobes, are better known, on account of the association of lesions in these tracts with the phenomena known as apraxia. The importance of a knowledge of these tracts is now being more appreciated, and we may hope to obtain in the not distant future more information of the corresponding areal connections of these tracts of the callosum and the processes or functions which are subserved.

Of a somewhat similar anatomical nature, and with similar physiological value, is the study of Besta (1), who has carefully worked over the paths of degenerations following various lesions in the brains of dogs and cats. By comparing the results of the degenerations of fibers by the Marchi method and those of cell atrophy, he has determined the paths of fibers and, consequently, of the impulses which normally pass between the cerebrum and cerebellum. One of the most interesting facts in his results is that, contrary to the contentions of von Monakow and others, he did not find, and because of this he denies that there are any cerebropetal fibers in the pedunculi cerebri.

In a general article, Pawlow (11) has reported his views of higher nervous function which have resulted from his experiments on psychic secretions. The psychic secretions which he has been mainly instrumental in demonstrating in animals he has termed "conditional reflexes," since, unlike the organic or the well-established reflexes which are carried out by the spinal cord and the medulla oblongata, they may be affected by and they depend upon a multitude of conditions. It is well known that when food is presented to an animal so that the animal sees the food, secretion by the digestive glands begins before the food is taken into the mouth. Pawlow has also shown that if, at the time food is presented, a stimulus which is extraneous to this food be also given to the animal, the combination of stimuli results in a secretion. After this combination, food plus an extra stimulus, has been used with an animal a number of times, it becomes sufficient for the production of the digestive secretions to present to the animal solely the extraneous stimulation which has been previously associated with the food. The non-food stimulus then gives rise to, or is accompanied by, the reflex activity. It has also been possible to show that even

though the character of the extraneous stimulus be changed, this non-food still results in secretion production. For example, if at the times that food be presented an electrical stimulus be given to the skin of the foot, the secretion of saliva becomes associated reflexly with this electrical stimulus. After the reflex has been well established, it is no longer necessary to present food to bring about the reflex, nor is it even necessary to stimulate the foot by electrical means; painful stimuli, such as cutting and burning, are also accompanied by the same sort of reflex activity, viz., secretion. Because of these and many other facts Pawlow points out, or concludes, that part of the function of the central nervous system, and especially that of the cerebrum, is that of dispersion, not only that of correlation or integration, of impulses, and that the cerebrum acts to a great extent, as the reviewer pointed out more than ten years ago, for the production of new types of activity and new reflexes, and, perhaps, anatomically for the purpose of making new connections.

The localization of functions in the cerebral cortex, or in the brain of man, von Monakow (10) writes, constitutes a complex problem, which is the goal of localization in the central nervous system in general. He points out, as others have previously done, that localization may be considered in three different ways: first, the localization in an anatomical sense, viz., groups of fibers and cytoarchitectonic; secondly, the localization according to symptoms and symptom groups, or the correlation of irritative or defect phenomena with localized injuries to the brain; and thirdly, the definite localization of mental functions. These three ways of looking at cerebral functions are frequently, perhaps usually, not differentiated. It is, however, important and necessary that they shall be kept clearly in mind if we are to draw a distinction between what may be called the "association of cerebral lesions with motor, sensory and association defects," and the "localization of mental processes." Every cerebral injury results in two stages or forms of symptoms, the initial and the residual. Both of these must be carefully noted and analyzed if we are to understand the complexity and the integration of cerebral activities. Among the most important of the general effects is that of diaschisis, which results in a cessation of impulses over the whole cortex and which is essentially a "reduction or cessation of the capacity for excitation." Widely separated areas are always involved even when only a very small portion of the cortex is affected. Some destructions may give rise

to perfectly obvious defects or exaggerations, others may give rise to effects which are to be determined only in an indirect manner by a process of exclusion, while others again appear to be of a "latent nature and only become manifest when there is added to the primary operation a second operation upon, or a pathological process in, another region of the cortex." At present we are only able to say that the motor and sense areas are roughly determinable; their functions are not circumscribed, or, as von Monakow says, "*inselförmig*," but they are parts of a mechanism, and concerning their finer organization and their temporal and spatial relations to psychic phenomena we know almost nothing. Our present knowledge regarding cerebral-mental relations is not much greater than that of the neurologists of a hundred years ago. The facts at hand, as was pointed out several years ago, may warrant the conclusion that there is a "close connection between the brain and mental processes," but at the same time they also permit only the general conclusion that "the mental processes are not due to the independent activities of individual parts of the brain, but to the activities of the brain as a whole."

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REFLEX MECHANISMS AND THE PHYSIOLOGY OF NERVE[1]

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The present state of knowledge on the physiology of nerve is nowhere better presented than in the admirable Croonian Lecture (1912) of Lucas (21). The most important recent discoveries are here given in readable form, and it is shown that the Nernst theory of nerve-action, with some necessary extensions, is probably the beginning of a definitive theory. In the past year the two topics most actively discussed have been the production of reflex rhythms and the 'all or none' principle.

Sherrington, Brown, Forbes, Henkel, Vészi, and others have done a large amount of work on reflex rhythms which are produced by the nervous system independently of any rhythms which may be contained in the stimuli. The most common type of reflex found in a mammalian spinal preparation is that in which a single stimulation of an afferent nerve-trunk on one side causes the contraction of an ipsilateral flexor muscle, inhibition of the antagonistic ipsilateral extensor muscle, contraction of the symmetrical contralateral extensor muscle, and inhibition of the corresponding contralateral flexor (Sherrington, 30, p. 265): *i. e.*, the stimulus causes ipsilateral flexion (noci-ceptive reflex) and contralateral extension. In this arrangement lies the secret of motions of progression—step, walk, etc. Antagonistic muscles are regularly innervated reciprocally, symmetrical muscles are frequently but not invariably innervated reciprocally, while synergic muscles receive generally an identical reflex innervation. If, now, when a unilateral stimulation

[1] For last previous reviews in Bulletin, see "Reflex Action": R. S. Woodworth, 1911, 8, 126–129; and "The Physiology of Nerve": E. B. Holt, 1913, 10, 146–151.

to afferent nerve has set up ipsilateral flexion and contralateral extension in two symmetrical limbs, the symmetrical afferent nerve of the opposite side be stimulated, the new stimulus commonly breaks through the effect of the old, the flexed limb is extended and the extended limb is now flexed—a step has been taken. The results attained by similar compounding of stimuli have been discussed at length by Sherrington (30, 31, 32), Brown (6, 7, 8, 10, 11, 12), and Forbes (13, 14). The striking point now is that if two opposing reflex stimuli, as above described, are given continuously and simultaneously (faradic stimulation) each reflex will alternately inhibit the other, and a rhythmical movement of progression results. How now, does this alternating inhibition arise? Baglioni (3) has suggested that as a limb flexes, afferent impulses (proprio-ceptive) are set up in the contracting muscles, and that these impulses inhibit the movement of flexion, thus allowing the contralateral stimulus that makes for extension to come into play. This, however, seems not to be the case, since these reflex rhythmical progressions are readily obtained in de-afferented preparations (Brown, 7, 10).

It has long been Sherrington's view that inhibition depends on a state of tissue "that at some restricted *locus* breaks or bars the transmitting power of the conductor." It has its seat "probably about the starting-point of the 'final common path'" (30), *i. e.*, the motor roots of the cord. In harmony with this Brown writes as follows regarding the origin of reflex rhythmic progressions (7, p. 286). "The cell-bodies and their processes of the efferent neurones of the antagonistic muscles form centers which mutually inhibit each other. A stimulus which falls upon one will therefore through it inhibit the other. But if this inhibition reduce the activity of the second center, that will inhibit the first less, and so the process will proceed until there is a limit set to this 'progressive augmentation of excitation.' . . . The limit may be set by a process of inhibitory fatigue. If this [progressive augmentation of excitation] proceeds the balance will turn in the opposite direction, and there will be a progressive augmentation of excitation in the other center until it too reaches its limit, when the process will set in in the other direction again. In such a scheme there is, however, no explanation of the occurrence of inhibition before excitation in time. It is not difficult to overcome the difficulty by postulating a pair of interposed centers between the afferent neurone and the efferent centers, and by supposing that these too mutually inhibit, and that, in addition, they inhibit the [p. 287] crossed primary centers. It

will be observed that in this scheme no explanation of the nature of the inhibitory process is given." (Precisely such a pair of "interposed centers" as Brown postulates is shown, on quite independent grounds, to exist, by Verworn, **36**, and Satake, **29**. The reviewer does not see how it solves the difficulty.) The essential feature of this view lies in the "inhibitory fatigue," which Sherrington and Forbes (**14**) locate at synapses.

A somewhat different view of reflex rhythms is given by Forbes (**13**, p. 297), who compares the breaking through of either of two opposed influences to "the stream of air emerging from a tube under water. A source of energy tends to produce an increasing force (*A*) opposing a relatively constant force (*B*) which tends to keep the energy pent [p. 298] up or potential; when (*A*) becomes greater than (*B*) the accumulated energy is released and becomes kinetic. The force (*B*) need not be constant, but if it increases during the increase of (*A*), its rate of increase must fall off below the rate of increase of (*A*) before the release can occur. The crucial point is this: that when once the release of energy begins it proceeds until more energy is released than is represented by the excess of (*A*) over (*B*). The condition which determines this may be figured as a sort of momentum of discharge, although it may not involve inertia in any strict sense of the word. . . . To develop rhythm of discharge there must be an approximation to the 'all or none law' of the heart beat. . . . There seems to be in the discharge of reflex impulses, and perhaps in all vital activities, some phenomenon akin to the 'all or none law' with its refractory period, which makes for intermittence of response." This shows a change of emphasis from the fatigue emphasized by Brown, to a "momentum of discharge" and "some phenomenon akin to the 'all or none law' with its refractory period." But it may be questioned whether these last two are at all identical functions. The possibility of explaining reflex rhythms by means of the principle of refractory period will be discussed later in connection with inhibition itself. A few further points in the papers so far mentioned remain to be noticed.

In his "Integrative Action of the Nervous System"[1] Sherrington described the "drainage theory" of McDougall, and one could infer that he deemed it a theory worth considering, although he by no means definitely espoused it. In the papers of the present year Sherrington makes no mention of this theory, although it is close to his topic: and Brown (**7**) declares directly that the "drainage

[1] For a review of this book see this BULLETIN, **8**, 119–125.

theory" is untenable. And indeed the papers of Sherrington, Brown, and Forbes yield considerable evidence that such is the case.

For many years it has been deemed an assured fact by most German physiologists that in ordinary life activities antagonistic muscles contract simultaneously, that indeed any nice precision of movement (whether voluntary or involuntary) could be secured only in this way. And it is of course certain that antagonists can be voluntarily contracted at the same time, and that in spinal preparations antagonistic muscles are often simultaneously innervated (*e. g.*, a degree of antagonistic innervation is characteristic of the "scratch reflex"). Yet it has not been made clear heretofore, so far as the reviewer knows, how Sherrington related these facts to his principle of "reciprocal innervation." (And here it is amusing to note that Descartes was aware of "reciprocal innervation," and that he clearly entertained the "drainage theory: "cf. "Les Passions de l'âme," article 11.) Sherrington has now touched on this matter (30, p. 269 ff.; 6, 31), stating explicitly that simultaneous reflex contraction of both members of a pair of antagonists is very common in every-day life and is to be observed experimentally. The stimulation of a single afferent nerve-trunk regularly gives reciprocal innervation of two antagonistic muscles; but if symmetrical right and left afferents are simultaneously stimulated each member of the pair of antagonists receives an excitatory *and* an inhibitory influence, and if the stimuli are properly adjusted as to intensity both of the antagonistic muscles may be contracted simultaneously. In other words "double reciprocal innervation" may produce "some degree of contraction by both the antagonists at the same time"; and thus the compounding of stimuli often masks the more fundamental function of reciprocal innervation. Furthermore, "the accuracy of a muscular contraction, delicately adjusted to the extent and force of the movement which is required, is usually a result of the graded combination of both inhibitory and excitatory influences coalescing upon the motor centers involved" (30). This is quite the German view. On the other hand Sherrington intimates that grace of movement and, say, abandon are probably found where each of the opposed muscle-groups is in turn completely at rest.

Now these facts somewhat modify the view of reciprocal innervation which a reader may easily have derived from the "Integrative Action." Firstly, antagonistic muscles are susceptible of simultaneous contraction; secondly, one muscle can actually receive

excitatory and inhibitory influences simultaneously, and this condition results not in a mere algebraic summation of the influences, but in a peculiar and characteristic muscle "tremor" (Sherrington, 32; Forbes, 13); and thirdly, both phenomena are functions of the spinal centers, and probably, in fact, of the motor half-centers. This shows that the inhibition which underlies reciprocal innervation is not the absolute block which some of Sherrington's earlier papers may have led readers to imagine. In fact a slight and rapid muscle tremor is regularly produced by the simultaneous play of excitation and inhibition on one muscle, just as "progression" and other rhythmic movements are regularly produced by the simultaneous play of excitation (and inhibition) on antagonistic muscle pairs. The problem now remains whether the inhibitions and other phenomena of "reciprocal innervation" and of "double reciprocal innervation" can be explained in terms of fatigue and recuperation (Brown), or of "momentum of discharge" or "refractory phase" (Forbes).

However these phenomena are to be explained, there seems to be little doubt (Baglioni, 3, to the contrary notwithstanding) that their mechanisms lie within the spinal levels and not far from the motor roots. Sherrington (30), Brown (7, 10), Forbes (14), Satake (29), Beritoff (4), Vészi (38), and Henkel (17) all emphasize this point. The last two investigators, on the basis of work with the strychnine-poisoned cord, speak of an "autonomous" rhythm of the nerve-ganglion.

Baglioni (3) gives a general discussion of theories of inhibition, with special reference to the theories of Hering, v. Cyon, McDougall, Verworn, and Fröhlich. The general tendency of the year's work seems to be toward the theory that nervous inhibition is due to the *interference* of nerve-impulses—a view that is not distinctly novel, but one which has received support and enhanced definiteness from recent work (with Einthoven's galvanometer) on the periodicity of the nerve-impulse, and on "refractory phase." The string-galvanometer has revealed oscillations in the nervous impulse of frequencies too high to be recorded by the older and less sensitive instruments. Furthermore, each oscillation appears to have its own refractory phase. And these two facts seem to imply that important interference phenomena are bound to appear wherever nervous impulses meet in converging toward their "final common path," *i. e.*, a motor nerve-root. Direct evidence of such interference of impulses, and evidence that is free from complication

with the obscure phenomena of synapse or muscle, is afforded by the Wedensky effect. This is the phenomenon that "at a certain stage in the fatigue or narcosis of a muscle nerve preparation, a series of strong or rapidly recurring stimuli may produce a small initial contraction only (Anfangszuckung), whereas a series of weak or slowly recurring stimuli produce a continued tetanus." In an ingenious and admirable paper (2) Adrian studies this phenomenon without making use of the muscle or the myo-neural junction: the effect exists in the plain nerve-fiber. And he corroborates Lucas's explanation (22) that the Wedensky inhibition is due to the fact that the second or any subsequent stimulus finds the nerve incompletely recovered from the just-previous excitation, *i. e.*, in refractory phase, so that the second or subsequent propagated disturbance is by just so much reduced. The strength and frequency of the stimuli can be so adjusted that all propagated disturbances after the first will be too weak to cross the myo-neural junction. Here then we have inhibition by *interference* within plain conducting fiber. The possible complications where nerve-impulses of different (and perhaps inconstant) periodicities converge on common paths cannot be foreseen: but it is clear that inhibition by interference is an hypothesis that may reasonably be entertained in connection with the rhythms produced by double reciprocal innervation. It is probably this which Forbes has in mind when he states (13) that it is apparently "some phenomenon akin to the 'all or none law' with its refractory period, which makes for intermittence of response."

But if reciprocal innervation and, as we shall later see, the "all or none law" are frequently masked by the necessity of stimulating whole nerve-trunks instead of single nerve-fibrils and of observing the results on entire skeletal-muscles instead of on a single motor fibril and its attached muscle elements, the principle of inhibition by interference is still more deeply hidden in the network of the spinal cord. For this reason although the interference of nerve impulses is coming to be frequently and confidently spoken of, as by Verworn (36), Satake (29), and Vészi (38), very little that is definite has so far been brought out. Baglioni (3) opposes the theory of inhibition by interference. Some technique is urgently needed by which the activity of a single nerve-fibril can be observed and then followed.

Any very conclusive work on the periodicities of the nerve-impulse is also thwarted by the necessity of observing the resultant

oscillations from a mass of nerve-fibrils simultaneously excited. Verworn states (36) that the frequency of oscillation depends on the freshness and vigor of the nerve. Mines (26) observes in muscle electrical responses at the rate of 50 per sec. (the rate of the faradic stimulus) while the mechanical response (contraction) shows no fluctuations. Henkel (17) states that the action-currents in nerve and muscle are rhythmical, and that strychnine cramp is due to an "autonomous" rhythmic discharge of the ganglion centers. The most important discovery is that of Fröhlich (16) who finds that the action-current, in the cephalopod eye under stimulation by light, is oscillatory, and that the frequency varies with the intensity and *wave-length* of the stimulating light. The frequencies range from 20 to 90 per sec. He states that these excitations, varying in period with the wave-lengths of the stimulating lights, "are to be looked on as the physiological basis of color-sensation." This is a definite hint as to the nature of "specific nerve energies," and it further complicates the problem of interference. It should be mentioned, finally, that if the inhibition of nerve-impulse is due to interference, this inhibition would be chiefly manifested where nerve-impulses meet, *i. e.*, at the synapses: and this would accord with Sherrington's view that the synapses are the seat of inhibition. There might be some question, too, as to how far the "fatigue" of synapses is an interference phenomenon (Forbes, like Sherrington, places fatigue at the synapses: 14).

No work of the year shows more resourcefulness and elegance of method than the several papers on the "all or none law." The law is generally confirmed. Adrian, in two remarkable papers (1, 2), shows that a propagated disturbance in nerve on emerging from a region of decrement (*e. g.*, a narcotized or asphyxiated tract) recovers its full intensity, and this within at most 5 mm. from the point of emergence. "It is extremely probable that the magnitude of the disturbance which has travelled a few mm. in normal tissue will be independent both of the strength of the stimulus which has set it up and of any changes which it may have undergone in its course down the nerve before it entered the normal part." "The recovery of a disturbance . . . is not at all affected by the extent of the reduction it has suffered, provided that this is not great enough to extinguish it completely." The "all or none" principle is often veiled in work with nerve-trunk, where the number of elements stimulated is variable. Threshold stimuli applied to a nerve-trunk excite only a portion of its fibrils (Lodholz, 19).

In passing through a region of decrement the nerve-impulse suffers a continuous diminution, and if the region is long enough it will be extinguished (Adrian, 1, 2; Lucas, 21, 22), and the distance required to extinguish it "is the same whether the impulse originates from a very weak or a very strong stimulus" (Lodholz, 19). The impulse decreases most rapidly when it first enters the region of decrement: its decrease is an exponential function of the length of impaired nerve that it has traversed. This decrease is, however, per linear unit traversed a logarithmic function of the time during which the region of decrement has been exposed, say, to asphyxiation, *i. e.*, of the depth of narcosis (Lodholz, 20). The speed of propagation is at the same time reduced; and both phases of the action-current suffer the same retardation. Beyond the region of decrement the impulse resumes its original rate of propagation (Fröhlich, 15). If Tait's theory that the absolute refractory state corresponds to the rising phase of the electrical response, the last statement quoted from Fröhlich would *seem* to be at variance with the observation of Lucas (22), that "at a stage of its action at which alcohol has made a nerve conduct with a large decrement, the time of recovery (refractory period) is not prolonged."

The fact of summation of nerve stimuli bears interestingly on the all or none principle. The most interesting theory of summation is that of Lucas (21) who gives evidence for a preliminary process of local change, or "local excitatory process" which precedes the propagated disturbance. Summation takes place wholly in the local excitatory process, for in summation phenomena the earlier (subliminal) stimuli do not seem to set up any propagated disturbance whatsoever. The "electrical response" of nerve is essentially connected with the propagated disturbance alone. On the other hand Lucas (22) gives an interesting reinterpretation of Grünhagen's gas-chamber experiment, showing that irritability and conductivity do not vary independently. "It appears probable that the need for an increase of current-strength [exciting stimulus] and the decrement in conduction arise from a common cause, an increased difficulty in setting up the propagated disturbance." Mines discusses the phenomenon of Treppe and of the summation of contractions in tetanus (26), arguing that they are not at variance with the all or none principle in either nerve or muscle. In other cases, as in pulsus alternans (27), an apparent summation is produced by the varying number of fibers which are at different times set in action. This is especially the case as a stimulus is gradually increased from threshold strength (Lodholz, 19).

The all or none law is thus upheld by Verworn, Lucas, Adrian, Lodholz, Vészi, Mines, and others. Brown offers some experimental evidence against it (9), but he admits that the evidence is not wholly conclusive. Adrian is of opinion that the only way to produce a sub-maximal propagated disturbance is by timing the stimulus to fall on the partially refractory stage of a previous disturbance (2): Vészi seems to be of the same opinion (38). It is to be noted that Verworn (36) attributes that *Bahnung* which is the basis of habit-formation, *i. e.*, the establishment through repeated use of reflex patterns, to "hypertrophy" of the paths so used. This is also the physiological basis of memory.

As to the more precise nature of nerve-action, the modified Nernst theory seems to be gaining ground (Lucas, 21). Lillie (18) traces interesting parallelisms between the lowered toxic actions of various salt solutions, their lowered power to increase the permeability of plasma-membranes of irritable tissue, and their lowered stimulatory power in the presence of anæsthetics. Thus in anæsthesia "an anti-cytolytic or antitoxic action" goes "with the anti-stimulating action of the anæsthetic." Traube (34) adduces important considerations relating the narcotic effects of substances which are soluble in water with the surface-tension of the resulting solution. "By accumulating at the boundary between cell-walls and (the contained) cell-fluid, narcotic substances reduce the electric contact-potential, and so operate directly to inhibit the propagation of motor and sensory stimuli by the nerve-centers." Traube believes that narcotics penetrate the nerve-cell: Menten (25) reports that potassium salts "in anæsthesia produced by lipoid-solvent anæsthetics" penetrate medullated nerve-fiber. Mansfeld and Bosányi (23) report that in magnesium-narcosis the magnesium does not penetrate the nerve-cell: it affects the cell-membrane. Porter (28), studying reflex phenomena under asphyxial conditions, states that "the threshold of the nerve-muscle preparation remains unaltered during even severe asphyxia"(!). Mares (24) states that the process of death in nerve-tissue presents a phase in which Pflüger's law of stimulation is reversed, *i. e.*, the excitation is at the anode when the current is closed; at the cathode when the current is broken. Verzár (37) finds that the passage of an action-current over a nerve diminishes both of the extra-polar polarization-currents: this probably comes from a change in permeability of the semi-permeable cell-membrane. Stübel (33) finds microscopically visible changes in the myeline sheath of nerve due to protracted or even

brief stimulation. An interesting theory of the functions of the eye, in general agreement with the Nernst theory of nerve-action has been proposed by Troland (35). Lastly, Boeke (5) seems to have demonstrated conclusively that in some cases at least the central end of a motor nerve (hypoglossus) if joined to the peripheral stump of a sensory nerve (lingualis), will regenerate along the path of the latter. Some of the motor fibers, arrived at the surfaces of the tongue, actually penetrated taste-buds, and other epithelial cells. Other fibers seemed to try to form new motor end-plates.

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REPORTS

Eleventh Annual Conference of Experimental Psychologists.

The Annual Conference of Experimental Psychologists was held at the psychological laboratories in Schermerhorn Hall, Columbia University, on Thursday and Friday, April 9 and 10. About forty psychologists were present, representing the laboratories of California, Cincinnati, Clark, Columbia, Cornell, George Washington, Georgia, Harvard, Minnesota, Pennsylvania, Princeton, Vineland, Wesleyan, Wisconsin, Yale, Bureau of Education of Chicago, Brooklyn Training School, and the Abbe Laboratory of Cleveland.

In reporting the work in progress in the various laboratories the Psychological Index classification of topics was followed, and all work bearing on a given topic reported under that heading. This was supplemented by more general reports from laboratories which were not represented at the earlier sessions. This method brought out interesting indications as to the topical distribution of current research work in the laboratories represented. Perhaps the most striking fact is the general neglect of sensation, psychophysics, and anatomy and physiology of the nervous system. The larger number of reports bore on such topics as learning, memory, tests, mental defect, work, attention, judgment, association, and affective experiences.

The social features included a dinner and smoker given by the department of psychology of Columbia, at the Faculty Club. Two forenoon and two afternoon sessions were held and opportunity was given for visiting psychologists to inspect the laboratory and to take part in several researches there in progress.

H. L. Hollingworth

NOTES AND NEWS

THE EDITORS of the PSYCHOLOGICAL REVIEW PUBLICATIONS take pleasure in announcing the election of Dr. Shepherd I. Franz to the editorship of the PSYCHOLOGICAL BULLETIN. Professor Franz will take charge beginning with the May issue.

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.

WE REGRET to announce the death on February 16 of Dr. Theodate L. Smith of Clark University, the author of many contributions to child psychology. Also the death on April 9 of Professor Alexander F. Chamberlain, of Clark University, author of "The Child and Childhood in Folk-Thought" and of many contributions to anthropology.

A CONFERENCE on individual psychology was held under the auspices of the department of psychology at Columbia University April 6–8. Papers were read by a large number of former students of the department.

DURING the current semester, Professor W. V. Bingham is on leave of absence from Dartmouth College for travel and for study at Cambridge University. He will return to Hanover in season to take charge of the Dartmouth summer session, of which he is director.

THE psychological laboratory at Wellesley College was completely destroyed by the burning of College Hall on March 17. Nearly all the apparatus was lost, besides several valuable records. The MS. of a thesis on the Application of the Method of Right and Wrong Cases to Intensive Smell Discrimination by Miss Alice Forbes was consumed; also a much more extensive piece of work upon a problem in Free Association, and a series of intelligence-test records made upon 100 members of the college, 40 normal children and a number of defective children at Waverley. Professor Mary W. Calkins was sleeping in the building when the fire broke out, and had a narrow escape.

THROUGH the kindness of relatives the psychological library of the late Professor Arthur H. Pierce has been presented to Smith College.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

CUTANEOUS, KINÆSTHETIC, AND MISCELLANEOUS SENSES

BY JOHN TRUMBULL METCALF

Cutaneous Sensation.—The experiments of Head upon the cutaneous sensibility of areas supplied by regenerating nerves have been repeated by Trotter and Davies (21). These authors follow Head's method, severing three sensory nerves in different parts of the body. The first result of the operation is complete loss of sensibility in the central part of the area supplied by the nerve, this region being surrounded by a hypoæsthetic zone. The authors do not, as did Head, find that the different forms of sensibility return in two groups, but rather that all forms return together. All returning sensibility shows the two phenomena of Intensification and Peripheral Reference, and most of the peculiarities of the sensibility of an area supplied by a regenerating nerve may be grouped under these two heads. Intensification is defined as "a qualitative change in the sensations elicited from a recovering area which makes them abnormally vivid." Peripheral reference is "the peculiarity of recovering areas whereby sensations, instead of, or in addition to being felt at the place stimulated, are felt in the distal part of the affected area." The authors cannot agree with Head in assuming that there are two systems of nerve fibers, one for "epicritic" and the other for "protopathic" sensibility and that in regeneration one system regains its functions before the other. They think that Head was led to the belief that sensitivity to heavy touch regenerated before that to light touch because the latter appeared at first in a form so hypoæsthetic that it was not observed.

Fabritius and von Bermann (9) succeed in producing artificially a state in which the skin of a member loses its sensibility, by tying it up tightly with a rubber band for from 60 to 80 minutes. One or more fingers, and sometimes the whole hand were treated in this way. With the finger in this condition the authors determined two things, the effect upon the spatial threshold and the difference threshold for lifted weights. They find that for about 35 or 45 minutes after the tying-up there is just a slight rise in the two-point threshold. During the next 5 to 7 minutes, however, it increases so rapidly that at the end of this time it is too large to be determined on the finger. Sensitivity to pressure with good localization of single stimuli still remains, though the stimulus-threshold is, of course, raised. Within the next 5 to 10 minutes the last trace of pressure-sensitivity has vanished. The authors also determine the difference-threshold for lifted weights at different stages, and they find that this form of sensibility decreases along with decrease of tactile sensitivity. The authors conclude that sensitivity to lifted weights depends upon sensations from the member itself rather than upon those from the muscles which effect its movement, since the latter are not affected by the rubber band. Thus they believe that the muscle-sensations play a very small part in the judgment of lifted weights.

A study of the accuracy of localization of touch stimuli on different parts of the body is made by Franz (10). Nine different parts of the body are chosen for investigation, a number of spots being marked out and tested on each part. The average error of localization was approximately the same for all subjects on the same parts of the body, but there are fairly large differences between the different parts of the body. In respect to the accuracy of localization the parts investigated rank in the following order: cheek, foot, chest, forearm, abdomen, thigh, upper arm, lower leg, back. There was no conclusive evidence of any tendency to localize the stimuli in definite directions, nor any correlation between the length of bodily hair on a part and the accuracy of localization there. Special tests were made to discover the relation, if any exist, between the localization-error and the two-point threshold. No constant relation appeared, though the average localization-error was always found to be smaller than the two-point threshold. Stimuli to a part were sometimes localized on an opposing part, for example near the axilla there were localizations on the chest when the arm was stimulated and vice versa.

Ponzo (17) continues his cutaneous work with a study of the accuracy of localization of thermal stimuli. With carefully constructed apparatus he obviates the difficulty of giving a thermal stimulus without at the same time arousing touch receptors. He finds that errors of localization on the finger, forearm, and upper arm, are greater for heat than for cold. Comparing these results with those previously obtained by him for other forms of cutaneous sensibility, he finds that the accuracy of localization runs in the following order: pain, touch, cold, heat. Another study of the temperature sense is made by Basler (4) who experiments to find at what rate temperature stimuli must follow each other in order to fuse into a continuous percept. The stimuli were given by a revolving apparatus which the author calls a "*thermische Reizmühle.*" He finds that cold stimuli have to follow each other more quickly than do warm in order to be fused. Both cold and warm stimuli fuse with a slower succession-speed on the palm of the hand than they do on the arm. Wohlgemuth (24) describes two new pieces of apparatus for work in thermal sensations. These are designed to supply the need of apparatus with fine points which are capable nevertheless of maintaining a constant temperature that can be exactly measured at any time.

Martin, Porter, and Nice (16), using improved methods, determine the threshold of faradic stimulation in man. Three different types of electrodes were used, one applied to the lip, and two to the fingers. Introspections of the subjects seem to show that different types of receptors are stimulated by different electrodes. The authors compare the threshold obtained with that for various activities in animals, and find that the sensitivity of the human skin to this kind of stimulation is about 1/2 that of frog's muscle, and from 1/10th to 1/20th that of naked nerve.

Basler (2) finds the smallest rate at which a point drawn across the skin is recognized as such, and also the smallest excursion of the point which can be perceived. A hard rubber point drawn across the skin by clock-work is recognized as such when it moves at the rate of 0.1 mm. per second. As for distance, he finds that the movement is observable when the point makes an excursion of .02 mm., but not when it moves only .01 mm. Benussi (5) is interested to find under what conditions two stimuli, applied successively to two neighboring points on the skin, fuse into an illusive perception of movement. Points various distances apart were investigated with stimuli given with different time intervals between

them. As long as the succession is slow the two impressions appear quite separate, and are related to two distinct stimulating objects. As the time interval is made smaller, the subject gets the impression that a single object has stimulated both points, and the subjective distance between them is made smaller. If the succession-speed is made still greater, the impression is that a single point, localized between the two, has been continuously stimulated, or that the stimulus has been moving along the skin.

Kinæsthetic Sensation.—Dearborn, in two articles (**6, 7**), describes an experiment undertaken to obtain a clearer understanding of the physiology of kinæsthesia. The experiment consisted in having the subjects reproduce a norm experienced kinæsthetically. The norms were two figures of different complexity. The subject was first blindfolded, and his hand, holding a pencil in ordinary writing grasp, was guided by the experimenter over the lines of the norm. He was then asked to draw the figure from the motor idea he had received. Other series followed in which the subject received instructions to give special attention to the movement sensations, and still others in which visual factors were admitted along with kinæsthetic ones. Deliberate attention to the conscious movement sensations tends to shorten the movements, and somewhat to lessen the angles between them. It has, therefore, an inhibitory effect. In the author's estimation, one of the most striking results is the prompt and accurate visualization of the figures—a translation of movement sensations into visual terms. This he thinks is evidence that there are subconscious kinæsthetic sensations in close connection with visual neurograms, and that this subconscious kinæsthesia represents the innate impulse to activity. Thus, there are two phases of motor control, one actuating and subconscious, the other inhibitory and conscious. He brings forward confirmatory evidence, and in his second article (**7**), goes on to develop a theory of the will based on the evidence afforded by this experiment of these two phases of kinæsthesia.

Basler (**3**) experiments to find how the tactual sense and the muscle sense compare in their ability to give us exact perceptions of small figures. He finds the muscle sense superior in this respect. His method is interesting. The figure was drawn upon a metal plate with glass ink, and the subject was made to follow it, blindfolded, with a metal stylus. Plate and stylus were so connected electrically that when the stylus ran off the non-conducting figure on to the bare plate it formed a contact and caused a telephone to

sound. The exploration of small figures in this way showed that they could be recognized if their lines and spaces were at least 1 mm. broad. The subjects were also able to recognize certain kinds of type. The author remarks that the tactual sense has its only practical value when it is used in connection with the inner touch sensations.

The object of Erismann's work (8) is to find out what underlies the sensation of movement. His method is to make a muscle work against various kinds of resistances, for this increases the intensity of the processes to be examined, and so offers a valuable basis of comparison with the contraction under normal conditions. The effect of the intensification of the sensations in this way is in every case a marked underestimation of the extent of the movement. Other variations are also introduced, the most significant being variation of the speed of the movement and distraction of the attention from the movement. It is found that neither of these effects an underestimation, and the illusion must therefore be attributed to changes in the member itself. The skin is hardly influenced by the resistances introduced. The joints, if they are affected at all, should, as shown in other experiments, give more accurate estimations instead of underestimations. The author concludes, therefore, that the illusion is to be attributed to the muscle and tendon sensations, and these he thinks should be given a more important place than hitherto in theories of kinæsthetic perception. Truschel (22) uses somewhat the same method, but with a different purpose. His object is to find out whether in our judgment of the distance moved against a resistance we depend upon the strength sensations immediately involved, or, as has often been assumed, upon secondary criteria. He concludes that such judgments are made on the basis of the immediate strength sensations involved.

A study of the part played by kinæsthesia in the perception of rhythm is made by Ruckmich (20). He finds that kinæsthesia is generally most prominently connected with the first perception of the type and form of the rhythm. The kinæsthetic processes observed during the perception of a rhythm vary greatly in texture, clearness, intensity, and meaning or reference. Individuals vary greatly in the amount of kinæsthesia they have, in its type, and in the degree of its prominence. Kinæsthesia, so important for the initial perception of a rhythm, can, after this has once been established, give way to auditory or visual processes which represent it.

Wirth and Klemm (23) continue the study of the meaning of stimulus-times for the estimation of intensity by carrying it into the realm of sense-perceptions which depend upon inner touch sensations. It is found that inner touch sensations reach their maximum intensity with much smaller times than do pressure sensations. The latter have been found to reach their maximum at 1 second, while it is here found that inner touch sensations reach theirs with times of from 1/10 to 1/4 of a second. Shorter times are interpreted as quicker, longer times as slower movements.

Miscellaneous Sensations.—Magnus and de Kleijn (15) analyze the effects of one-sided extirpation of the labyrinth with special regard to the connection of the labyrinth with the tonus of bodily muscles. Previous experiments have convinced these authors that bodily tonus is a system of very complicated reflexes, dependent partly upon the labyrinth and partly upon the neck-reflex. Four different kinds of animals are used, rabbits, guinea-pigs, cats, and dogs. The symptoms resulting from extirpation are very carefully observed and thoroughly described, and are always distinguished from the results that follow the neck-reflex. The conclusion arrived at is that labyrinth tonus exists without a doubt, but that it is developed in different degrees in different animals. Moreover, the neck-reflex has a great, and in some cases a preponderating, influence upon the symptoms which follow one-sided labyrinth extirpation. Another study of the labyrinth is made by Popp (18). He stimulates the labyrinths of doves with warm and cold stimuli by inserting a little rubber sack attached to a double cannula through which water of the desired temperature is allowed to circulate. The particular advantage of this apparatus is that it can be so arranged that only one ampulla is stimulated. He finds that warming the ampulla externa is followed by the same head-turning and the same nystagmus as when the animal is so whirled that the endolymph flows from the smooth end of the semi-circular canal to the ampulla. Cooling has the opposite effect. Warming has the same effect upon the ampulla posterior as whirling the animal so that the endolymph flows from the ampulla to the smooth end, and cooling has again the opposite effect.

Bárány and Rothfeld (1) experiment upon the vestibular apparatus in cases of intoxication and delirium tremens. The most important conclusion reached by these authors is that the disturbances which come as a result of acute alcohol poisoning, as well as in delirium tremens, have their seat in the cortex of the cerebellum.

Rothfeld (19) contributes a study of the effects of certain drugs upon the vestibular eye-reflex of rabbits. He finds that under the influence of narcotics the quick components of nystagmus disappear in the following order: (*a*) vertical, (*b*) rotary, (*c*) horizontal. He describes in detail the specific action upon the vestibular eye-reflexes of chloroform and ether and of paraldehyde.

Gertz (12) makes a quantitative determination of the amount the eyes move as a result of movement of the head. He does not believe these compensatory movements to be due solely to the action of the labyrinth, but thinks that other factors are also active in controlling them.

Three authors, Maas (14), Goldstein (13), and Freund (11), treat the phenomenon of the disturbance of the weight-sensation, and show its importance as a diagnostic symptom. It was first described by Lotmar in 1908, and he ascribed it to injury of the cerebellum. The cases reported by these authors in which the patients' sensitivity to weight-discrimination had been interfered with, all tend to support Lotmar's hypothesis. They succeeded in locating cerebellar injuries, though they could not show that the disturbances are due solely to this cause.

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AFFECTIVE PHENOMENA — DESCRIPTIVE AND THEORETICAL

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Emotional states, attitudes and functions, as distinguished from simple "affection," are the subjects of nearly all the literature here to be noticed, and there is a distinct tendency to treat them from the social-psychological point of view. Boigey (2), an army surgeon, deals with the passions mainly as moral diseases, the evolution of which is intimately bound up with our bodily activities

and our heredity. His descriptions follow traditional lines; his remarks on the treatment of the passions is generally sensible. Cartault (4) is interested, like Shaftesbury and other English moralists, to show that human nature is possessed of generous, as well as selfish, sentiments, and that these constitute its glory. He distinguishes disinterested from generous sentiments as being more negative, reserved, detached, calm, whereas the latter are more lively, ardent and active for positive ends. Brown (3) takes up in a modern form the old question as to the significance and importance of the passions in the formulation of the moral ideal. The subject is treated under four heads,—the emotional elements and their organization, the problem of values, religious experience, and the relation of religion and morals. The argument makes use of Shand's doctrine of the sentiments, "one of the most important discoveries hitherto made in the realm of emotional psychology," and culminates in asserting the power of the religious sentiment centered about the idea of God to produce without deformation a many-sided development of character. Incidentally the value of music is considered; we learn, negatively, that the emotions represented by music are not those of everyday life, nor analogous to them, but the bearing of this on the dynamic relation of music and morals is left to conjecture. Taylor (27) professes "to give a definition of Moral Sense" in notes on the emotions said to be "clinical," but what it is is hard to discover. The mind is like a line with reason at one end and the emotions, of sexual origin, at the other.

A number of writers treat specifically of the socially important sentiments of sympathy, compassion, love, hate, shame and the like. Orelli (18) gives a useful historical survey of opinions concerning pity (compassion), on the basis of which he endeavors to found a doctrine. His analysis is defective, however, for in making its essential elements to consist in the "I" pitying, the "other" pitied, and the "suffering" of the pitied with which "I" suffer, he omits the very thing in question, namely, my pity, or, misled by etymology (*mit-leiden*), identifies two things, my pity and the other's suffering, which are distinct. This mistake is expressly condemned by Scheler (21), who explains the discrepancy by distinguishing between a state of feeling and a function of feeling. One may sympathize with another's joy without being oneself in a joyful frame of mind. The confusion complained of vitiates, in his view, genetic theories which derive sympathy either from *Einfühlung*, of which, he says, there is no need, since we directly perceive the

other's state in his expression of it, or from other processes of reproduction, imitation, etc. This last is the view of Nicoli (17) in terms of assimilation. With Shaftesbury, Hutcheson and A. Smith, Scheler regards sympathy as an ultimate, original function. Phylogenetic theories confuse it with emotional contagion and are wrong in principle, for the social instinct from which they derive it can lead to quite other results, e. g., cruelty and malignity. In a similarly independent fashion the same author treats of love and hate. These, he holds, are not feelings, but emotionally qualified elementary acts. Excluding all the accidents, the essence of love is declared to be the movement in which a value-bearing object attains its supreme value. Hate is the opposite movement. Contrary views are acutely criticized, notably Freud's. An entirely different question is that of the so-called "analysis" of hate, a case of which is reported by one of Freud's disciples, Wyrubow (28). A man otherwise kindly disposed hated cats and took pleasure in torturing them. The explanation was found in an experience of childhood, the long-forgotten memory which was aroused by associations starting from an erotic dream. The cure followed. Much, of course, is made of the sexual factors. Tait (26), whose article, reported here last year, has seemed important enough to be translated into Italian, also traced to early emotionally exciting, but forgotten, experience an otherwise inexplicable aversion.

The nature of sentiments or emotional attitudes (*Gesinnungen*), friendly or hostile, generally is the subject of elaborate discussion by Pfänder (19). He distinguishes actual, virtual and habitual sentiments, but in the present article deals only with the first. Actual positive sentiments—love, friendliness, etc.—are completely characterized as centrifugal, vivifying outstreamings of feeling in which the ego in a measure unites with the object and affirms it in peculiar acts; actual negative sentiments—hate, unfriendliness, etc., are similarly characterized as centrifugal outstreamings of feeling, of corroding virulence in which the ego in a measure separates itself from the objects and denies them in peculiar acts. An interesting section treats of sentiments which are not really serious, but are not necessarily hypocritical; they appear, e. g., in make-believe and quite commonly in conventional social intercourse. These *unechte Gesinnungen* are pale and schematic imitations. Haas (12) refers such feelings to a lack of inner harmony in the direction of the will.

Flatau (11) defines shame as a mental state in which there is a painful feeling of diminished personality. Its roots are in the

bodily sphere, from which they spread over into the psychical, its reaction is to concealment—even the blush, it is suggested, may be interpreted as a mask—and it is of great social significance. The author makes some discreet observations on this last topic, opposed alike to prudery and to licentiousness. The related subject of embarrassment is treated by Hellpach (13) with characteristic German thoroughness. He considers in turn its sources, its expressions, the metamorphosis of the expression and its secondary transformation. One of the more noteworthy features of the discussion is the tracing of the process by which the expressive movements first aim to conceal the embarrassment, next to overcome it and finally to simulate it, so that, e. g., they become in the *demi-mondaine* a means of allurement.

The ambiguity in our English word "humor" is suggested by the article of Dugas (7) when compared with that of Macnaughtan (16). The French writer's *humeur* is, of course, our "humor" in which every man is according to his mood. It would be interesting to trace the connection between this and the meaning which connects it with the ludicrous through the medium of the doctrine of the temperaments back to the medical and physiological theories of Hippocrates. Dugas contrasts it with character and emphasizes its instability. He does not consider its etiology. The other kind of humor is regarded by Macnaughtan as lying somewhere between the witty and the comic, compounded of both and finer than either. Sidis (23) makes it a species of wit. Both writers agree that the primitive man's idea of comedy was originally closely connected with torture. The former finds the essence of humor in truth, which means, perhaps, what the latter means when he speaks of it in its higher stages as seeing into the infinite depths of the soul in its very failures, faults and imperfections. Sidis connects laughter with surplus energy and the play impulse; his theory of the ludicrous is the same as Bain's. Benn (1) proposes a new theory of what Aristotle meant by catharsis of the tragic emotions, namely, that it is an effect of character and plot eliminating pain and leaving pleasure as the sole end of the tragic representation. The horror which replaces the pity that is first aroused is relieved by an appropriate adjustment of responsibilities and actions which remove the representation from any real contact with the actual life of the spectators. The theory is condemned, however, as resting on a false psychology.

Cohan and Nathan (5) enumerate the tricks and devices of

actors and playwrights for exciting the desired emotions in an audience. Dugas (8) charges the James-Lange theory with flouting consciousness and identifying emotion with its physiological accompaniments; he attributes to James the view that consciousness is purely intellectual, ignoring the fact that for that writer the emotion is the perception of the bodily changes and that he based his theory entirely in the first instance on introspection. Eastman (9), on the other hand, assumes the theory and gives a concise exposition of recent work by Cannon, Crile, O'Shea and others which, according to him, supports it; the facts, however, seem clearly capable of different interpretations.

In the field of pathology Dide (6) seeks to distinguish and relate the psychosis of "impassioned idealists"—unbalanced reformers, etc.,—described by him in a recent book, in the group of otherwise recognized disorders. It is distinguished, e. g., from the *délire d'interpretation*, of which Libert (15) reports a modified case interesting to the ordinary psychologist chiefly as an illustration of the affective determination of the thought-processes. Régis and Hesnard (20), in opposition to the contention of Babinski and Dagnan-Bouveret that the accidents of hysteria are never caused by emotion apart from a suggested idea, report the case of a man of recognized hysterical character who suffered an attack of dumbness which came on suddenly as the direct result, according to the evidence, of a violent emotional shock in nightmare without any trace of previous intellectual preparation. Reasons are given for the belief that emotional hysteria is often closely connected with the dream-life, but the authors decline to dogmatize on the mechanism of the process.

Fanciulli (10) gives as the general characteristics of the affective life of little children, abundant quantity, high intensity, brief duration and the predominance of emotion over sentiment; he also sketches an outline of its development.

From the positive pleasure of the gratification of appetite seeking to remove the unpleasantness of want, Sternberg (25) draws the curious inference that the modern total abstinence movement simply shows ignorance of the physiology of enjoyment. An article of peculiar general interest to the student is that of Kutzner (14) expounding and criticizing the feeling-psychology of Wundt. The criticism is thorough, yet sympathetic and discriminating; we seem to see the whole structure raised by Wundt tottering, and we are left, in the end, with a clear and dignified impression of its impor-

tance. The conclusion of greatest significance in the view of the writer is that the doctrine of elements with which Wundt begins is traversed and overwrought by his later doctrines of creative synthesis and apperception, meaning the total organization of past experience. This is the source of manifold obscurities, and difficulties in understanding him. "With the introduction of the idea of creative synthesis the doctrine of elements has attained its ultimate consequences and is already condemned; with the introduction of the idea of apperception, in the sense defined, psychological investigation is pointed to a new path different in principle from the theory of elements." Sichler (**22**) defends against another critic Wundt's identification of feeling and will and his tri-dimensional theory of feeling, but does not touch the more serious objections which, e. g., Kutzner brings out against the latter.

The question of affective memory is again brought up by Sollier (**24**), who thinks its existence sufficiently proved by the fact, which he has no difficulty in establishing, that an affective state formerly experienced can recur to consciousness and be recognized as having been experienced before. The strength of the opposite contention lies in the denial of a memory-image of the affection, as such. This raises the whole question of the place of imagery in the memory-process. Is a specific image of the thing remembered essential in any case? Sollier does not discuss this question of images. He refers the conservation and revival of conscious phenomena to cœnæsthesia, which connects all *our* experiences with the sense of *our* personality and which envelops and includes the kinæsthesia, to which Ribot has justly of late ascribed a leading rôle in the processes of the mental life.

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ATTENTION

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There are two articles on the general nature of attention. D'Allonnes (1) interprets attention very broadly to mean the general understanding of experiences. He distinguishes four main levels. At the first, sensory attention, the conditions are physiological and unconscious, attention is induced by strong stimuli and accompanied

by reflex movements. In the second stage, perceptive attention, the interpretation of the presentation is in terms of the residue of experience and of associations. These residues act first to complete the object and in the second place serve to select what shall be seen. The two higher stages, the apperceptive and the logical differ from this only that the interpretation in the one case is in terms of preformed schemata, and in the other of logical concepts. The article is really a discussion of the entire topic of perception rather than of attention. Hicks (7) approaches the problem of attention from the genetic standpoint. He first rejects both of the theories suggested by Lotze that attention is either a sort of illumination of the object by consciousness or a result of the strength of the presentation itself. Rather one must assume that consciousness before it has become differentiated implies a capacity for discrimination as well as mere passivity. Discrimination comes through separate repetitions, through the attraction of the affectively toned presentation, through the reflexly excited movements. As time goes on repeated discrimination of a content with assimilation to similars develops clearness, which is therefore derived rather than immediate as Titchener asserts. In mature years attention is the outcome of accumulated experience, and action is to be regarded as dependent upon attention or the developed cognition rather than attention upon movement. Effort, even, is not a direct gauge of the amount of attention nor of the activity of mind. Dallenbach (3) combines in his study a measure of attention with a test of Titchener's two level theory of consciousness. As a measure of attention, appreciation of changes in the intensity and pitch of tones from a Stern Variator, counting cork balls and adding numbers were used under various distractions. The subjects were asked to grade the clearness of the impression during the period of introspection immediately following the experiment and these results were correlated with the objective results of the measurement in terms of the number of changes overlooked or of the mistakes in counting cork balls or in adding. In one set of tests the changes in tones alone were used under different degrees of distraction, in another two tasks were set to be performed simultaneously. In all of the experiments there was a close correlation between the degree of attention as estimated subjectively and the objective results as measured by the success with the task, the length of reaction time and the size of the mean variation. The distractions served in every case to lessen the degree of attention. All three of the subjects used were of the two-level type of consciousness.

Five papers are devoted to discussions of the duration of attention or the "attention wave." Flügel (5, 6) investigates the conditions that induce changes in the interpretation of figures drawn in ambiguous perspective, in two papers. In the first he is concerned to determine the factors that determine reversal. First he eliminates general factors and eye-movements by examining the fluctuations of two figures when a point midway between them is fixated. That the two figures may fluctuate independently shows no general factor can be responsible, and the fixation should eliminate eye-movements. This latter was also shown not to be present by fixating a point on a small black square placed in the middle of a figure. No tendency was observed for the eyes to move as Wundt's theory demands. It was shown that attitude plays relatively little part by using the frustrum of a prism with figures drawn on it to give the impression that it represented the inside of a room. These favored the concave impression, but the convex still came at times. The conclusion of the author is that direction of attention is the prime factor. The part of the figure that receives full attention is seen forward. In the second paper (6) Flügel deals with the influence of local fatigue upon reversal. For material he uses MacDougall's "windmill illusion." The fatigue is induced by observing it binocularly when rotating in the direction it is desired to fatigue, while tests are made by observing uniocularly. The results show that some few subjects fatigue, the majority do not. Of those that fatigue some fatigue more for one direction or phase, others more for the other. The fatigue is local not general as distraction during the fatigue did not effect the results. Ferree (4) brings new arguments against Heinrich and Chwistek's assertion that the fluctuations of point areas are due to changes in accommodation. He finds more aphakial subjects who get the fluctuations and feels sure that the changes in the images of the opthalmometer that the others mistook for signs of changes in the lens are due to eye-movements. He repeats the experiments of his earlier article that convinces him that the fluctuations are due to retinal adaptation with the recovery due to eye-movements. Billings (2) made measurements on the duration of attention to supraliminal stimuli and found the maximum much smaller than the so-called attention wave discussed above. He was led to his experiments by the fact that one frequently misses the appearance or disappearance of the stimulus or the moment of change. This indicated that there was another periodicity superimposed upon the first. Experiments with twenty-

one subjects indicated that attention can be kept upon a small object for a period of less than two seconds. The subjects used most gave a median of 1.69 secs. The distracting experience is either another object or an idea. Effort to hold attention was not effective in prolonging the period. Billings concludes that the average maximum duration of attention is very short—between one and a half and two seconds, and is in no way related to the longer usually called "attention waves." Pillsbury (8) suggests that if one considers that each recorded change consists of two waves, one the change and the other the awareness of the change, the values given by Billings should be divided by two. The resultant value corresponds approximately to the refractory period of the reflex, in Sherrington's terms, on the one hand and on the other to a number of times in different mental operations that have been referred to the attention wave or that probably have approximately the same conditions in the nervous systems, as e. g., the indifference period in time estimation, the simple association time, the best period of preparation in reaction experiments, etc.

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TIME AND RHYTHM

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Ruchmich (6) publishes a bibliography of rhythm containing over 360 titles, and asks for corrections and additions. He also reports (5) introspections of nine observers who were submitted to

rhythmic stimuli under carefully controlled conditions, using objective intensity, duration and pitch accent, and no objective accent. He concludes from the evidence that "kinæsthesis was essential for the establishment of a rhythmical perception," but that "once established," it "might be consciously carried on, in the absence of any sort of kinæsthesis by auditory or visual processes." Swindle (7) describes some experiments on the formation of rhythmic motor habits, and (as the reviewer gathers from a confused report) finds that the habit is more easily and permanently formed when different arm movements are cyclically grouped, than when repetitions of the same movement are grouped, as by counting them. Five-rhythms and seven-rhythms seem to have been easily learned. The author concludes that "rhythm is acquired by each individual, and that it is not inherited."

Boquet (2) presents impartially the results of observations by astronomers on the frequency of report of the different tenths of seconds when estimating a transit by the eye and ear method, showing individual habits in avoiding particular tenths.

Thumb (8) has made a statistical examination of certain classic and later Greek texts (Plato, Xenophon, New Testament, Demosthenes), computing from only a few hundred consecutive syllables in each case, to determine the relative frequency of long as compared with short syllables, and accented as compared with unaccented; also to determine the relative frequency of groups of 1, 2, 3, and more short syllables between successive long syllables, and in a similar fashion the frequency of the different groups of unaccented syllables between successive accented syllables. The actual rhythm problem of the grouping of short and long (and accented and unaccented) syllables in prose is not touched upon.

Verrier (9 and 10) presents arguments and measurements to show that poetical and musical rhythm is founded on an ideal equality of feet or measures, but this equality is only approximated in practice. The rhythm is practically good when it coincides with the inner or individual rhythm, which permits of considerable adaptive variation. Charon (3) attempts to apply to piano technique elementary physiological and psychological facts concerning the activity of voluntary muscle, and deplores the increasing elimination of rhythm in modern musical practice.

Decroly and Degand (4) present a biographical study of the appearance in a child's vocabulary of words expressing time relations, and infer therefrom that the notion of time develops slowly.

The study will be found interesting by anyone who takes such studies seriously.

Benussi's book (1) is the most important publication of recent years; it summarizes the older and recent experimental work, and so fills a long felt want, but suffers from an excess of constructive and postulatory material which is by no means an aid to the student.

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PSYCHOPHYSICAL MEASUREMENT METHODS

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In most experiments by the method of constant stimuli seven comparison stimuli are used. In this one follows a suggestion of G. E. Mueller, but there exists no reason for choosing this particular number of stimuli, since theoretically two are sufficient. Using fewer comparison stimuli obviously reduces the amount of labor in collecting the data, and it also has the further advantage of avoiding very large differences between standard and comparison stimuli, which always are more or less of a difficulty for the experimenter. These differences, indeed, not only serve as landmarks in the series and may possibly give some information to the subject in

regard to the objective relation of the stimuli, but they also interfere with the correct performance of the experiments, since the subject finds less difficulty in judging them and approaches the other more difficult judgments in a somewhat careless manner. Fernberger (1) studies the effect of shortening the series by recalculating the data of his experiments on lifted weights, omitting the results for the largest and the smallest comparison stimulus. The results show that this omission has practically no influence on the values of h and S and that he might just as well have used the shorter series. There are certain indications, as a matter of fact, that his results would have been better in this case. Investigations of this kind will make the method of constant stimuli a more practical method than it is now.

Gemelli's little book (2) has the purpose of introducing psychophysics into Italy, where experimental psychology is practically unknown and encounters the familiar opposition of philosophers. He justifies the experimental method in psychology by proving that its results are not in contradiction with spiritualistic philosophy. The reader conversant with the scientific movement will find nothing new in it, but the book is very pleasingly written and makes good reading.

Gemelli's study of the method of equivalents (3) very likely is the most important experimental contribution of the year. His experiments, for which he invented a new æsthesiometer, referred to the comparison of cutaneous distances in different parts of the body. He proceeds by what he calls the procedure of minimal variations in the method of equivalents—technically known as the procedure G_1. The results, each one of which is based on 10 observations, are given in great detail and promise to be very valuable. It is found that the ratio of the subjective equivalent to the objective value depends on the standard stimulus. For threshold values of the standard this ratio is high, but decreases with increasing standard stimuli and reaches a minimum for about 6 cm., from which value on it seems to increase again. Gemelli's numerical values of this ratio resemble those found by Miss Washburn. This ratio is also affected by the pressure exerted on the skin, and it differs the more from unity the lighter this pressure is. This seems to be due to the increasing difficulties which the subject finds in forming the judgment. The influence of optical images is studied by determining this ratio for sensations on the forehead and on the forearm in different positions. In one group of experiments the arm is kept

extended along the body, while in the second groups it is abducted as far as possible. In the latter case the results show a considerable underestimation and Gemelli believes that this is due to the influence of optical images. This he tries to prove by the results of a similar series of experiments on two subjects blind since birth, whose results in these two groups do not show such a difference. The third part of the book, in which an introspective analysis of the process of forming the judgment is given is of considerable interest. The formation of a judgment is regarded as a thought process, which is analyzed by the methods worked out by Külpe and his school. The book contains a large amount of very valuable information and it is to be hoped that similar monographs may be written on the other psychophysical methods. The third part particularly shows very plainly that the chief utility of the psychophysical methods consists in their usefulness for the analysis of complex processes. Gemelli asserts that the method of equivalents does not give a measure of sensitivity. This may be true of the way in which this method is usually handled, but considering its close relationship with the method of mean error one may very well believe that some measure will be found. Some of the fundamental problems of the method of equivalents are not even mentioned, which is very likely due to the fact that Gemelli is not conversant with the recent investigations on the point of subjective equality.

G. E. Müller, in discussing the value of the method of mean error, insists on its lack of precision in the definition of the conditions under which the experiments are performed. Add to this the necessity of introducing for the purpose of calculation certain assumptions, which more or less certainly are not justified. One of these assumptions refers to the frequency with which the subject prepares the different values of the comparison stimulus, and it is quite obvious that the chances of obtaining a certain stimulus as a final determination materially depend on the frequency with which it is judged. Stephanowitsch (4) tries to study this factor in experiments in which the subject was required to adjust a variable length so as to appear equal to a given standard. The variations of the comparison stimulus were controlled by a micrometer screw with which a writing attachment was connected so that the steps by which the subject approached the value of subjective equality could be determined. From these data a table of distribution is constructed showing for every subject (1) the number of times a given intensity was adjusted and judged, and (2) the number of

times this intensity was obtained as a final determination of the point of subjective equality. The procedure G_1 seems to have given satisfactory results. It is to be regretted that the report of this investigation, which was very carefully planned and well thought out, was written rather carelessly. Tables I *a* and I *b* alone contain not less than 8 errors, and a great deal of caution will be needed in using these data.

Thomson's paper (5) deals with the determination of the probable error in the method of just perceptible differences. Certain formulæ have been given by which the result of this method can be calculated from the observed relative frequencies of the different judgments. The data of these calculations are empirical determinations of certain unknown probabilities and, as such, they are affected by errors of observation. From this it follows that the result of this calculation also will be affected by an error and it is important to determine this, because its value indicates the accuracy obtainable by this method. Several years ago a formula for calculating this quantity was given, but Thomson shows that an error was made in its derivation, and he gives a new formula which I regard as correct.

In his second paper (6) Thomson takes up the study of the variations of sensitivity which occur during the short time of a sitting. This he does by dividing the time of the sitting into ten periods, and determining the sensitivity in each of them. He experimented on the spatial threshold by the method of non-consecutive groups. The threshold falls sharply at first, then slowly and steadily until about 50 judgments are given. After this it rises or changes irregularly, only to show a final drop at the end of the sitting. The idea of this investigation was forecast in Thomson's first paper on the comparison of psychophysical methods, although he indicates there a different procedure. We call attention to the following features of the paper which seem to deserve careful consideration. The first point to be mentioned is the systematic use of catch experiments. There is at present a widespread aversion against catches, chiefly due to the opposition of the Leipsic laboratory. It may be true that they are superfluous in trained observers, but if the psychophysical methods are ever to become useful for clinical and anthropometric work it will be indispensable to provide catches and distribute them most effectively. The present paper shows that they may be useful in experiments even on trained observers, for Thomson draws the correct conclusion from the mistakes on the catches: The results of the entire sitting are

thrown out, if the errors in the catches exceed a certain number. The other point of interest is the analysis of the function of the experimenter, whose influence on the outcome of the experiments must be particularly great in æsthesiometric experiments where his ability in applying the stimulus plays an important part. Thomson kept not only the subject but also the experimenter in complete ignorance of the correctness or incorrectness of the judgment given, by requiring the subject to communicate the judgments to a clerk by signs which were invisible to the experimenter.

Collecting data for the method of constant stimuli takes considerable time, during which the state of practice of the subject is likely to change. For the purpose of studying these variations, the results of my lifted weight experiments were divided in groups of fifty and the constants of the psychometric functions determined in each one of them for all my subjects (7). The results plainly show the influence of progressive practice as far as about the fifth group—exclusive of the preliminary series. From this it follows that the traditional requirement of continuing the preliminary series until the maximum of practice is reached is impracticable on account of the large number of experiments required. Similar calculations were made on Fernberger's results, which led to the same conclusions. The lower limit of the interval of uncertainty remains constant, while this interval and the value of subjective equality decrease. All these changes take place first rapidly, then more slowly and tend toward a stationary condition which is reached after about the fifth or sixth group. These data are sufficient to derive a formula for the progress of practice into which enter (1) the speed with which the subject acquires practice, (2) the maximum of practice attainable, and (3) the state of practice at the beginning of training. The difference between this and the physiological maximum attainable gives the improvement of which the subject is capable.

Psychophysics is the doctrine of conscious phenomena, their conditions, and accompaniments in so far as they are accessible to experimental investigation. One might believe that introspection is an element by which psychophysics differs from the other sciences of observation, but it is shown in my paper (8) that in final analysis all data of experience rest on statements about the presence or absence of certain conscious contents, and that there exists no thoroughgoing difference between the data of psychophysics and those of the other natural sciences. The notion of the probability

of a certain judgment is discussed at some length. Does this notion imply the denial of causal relations between the judgment—or the mental content of which it is a sign—and its conditions? This is not the case when the word chance is taken in its logical meaning, where this word refers to the presence or absence in an object of such attributes as are not included in the definition of the notion to which the object belongs. It is chance for a man to be white, although there exist causes which fully determine for every individual that he should or should not be white. It can be shown that the entire system of propositions, which is called the calculus of probabilities, can be built up on this notion of logical chance, from which it follows that the successful application of these theorems to a certain group of phenomena does not prove that they are not strictly necessitated. This leads to a discussion of those types of mental phenomena in the study of which the notions of chance and probabilities have proved most successful: the theory of errors of observation, the probability of judicial decisions, and the data of moral statistics. The last especially has aroused great interest on account of its bearing on the question of free will. The first two refer to mental contents of cognitive character in the case of which one can not object to their causal dependence on their conditions, because our ideas could hardly have biological value if they were not formed in agreement with the existing conditions. Several solutions of the problem of the regularities of moral statistics have been offered, the cleverest doubtlessly being that of the so-called Moscow school of idealism. This solution is discussed and the reasons why it can not be accepted are given.

In (10) Wirth continues his discussion with Lipps. Wirth's other paper (9) is a comment on a point of my paper (8), where it is shown that the notion of a threshold as used by the older psychophysicist is superfluous and incorrectly formed. Wirth tries to show that this notion does not contain such contradictions.

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CORRELATION

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The new second volume of Meumann's *Experimentelle Pädagogik* (10) sets forth the various problems of correlation and lights them from a quite new angle. Moreover, it marks the progress which the method of correlation has been making since the first edition of this work in 1907. So far as the writer can discover not a coefficient of correlation was quoted in the first edition and there was little or no reference to the subject. On the whole Meumann's discussion of the correlation results in the new volume are rather critical, although suggestive. Correlation, he believes, offers a means of solving the kernel of the problem of development—whether the development of certain traits hinders others, while the training of certain others may further them, and which traits are thus affected. He calls this the problem of "*Bildungskorrelationen.*" By correlation we may study, for example, whether training in concentration of attention necessarily hinders distribution of attention; whether, as Henri and Binet believed, a systematic training in visual ideas of one who is naturally auditorily minded will damage the auditory memory; whether good memory necessarily interferes with independent judgment, abstracting ability with fanciful imagination, or whether there is only the practical difficulty for an individual to develop both; whether the slower learning of the child in comparison to the adult is the result of less concentration of attention or is independent of attention; whether the longer retention by the child is only a result of the learning requiring more repetitions or an elementary capacity for a longer after-effect from a once formed memory disposition.

The examination of purely mental correlations, which Meumann believes is the ideal plan for obtaining a complete picture of general ability, he feels is extraordinarily difficult because the quantitative measures of qualitatively different performances are not, strictly speaking, comparable. The ability to distinguish tones, for example, is mentally so totally different from the learning of nonsense syllables that one must regard the measures for these two performances as entirely incomparable, viz., vibration rates of just distinguishable tones and the number of repetitions necessary for learning. The correlation teaching up to the present time he thinks rests almost entirely upon the comparison of such heterogeneous quantities. Only when relatively like partial mental abilities enter into such performances is a comparison allowable, and then the coefficient must be regarded as no more than the measure of these partial abilities. This insistance upon the analysis of the abilities correlated comes out again in the caution that a complete view of the conditions of ability cannot be secured by merely studying the correlations of intellectual factors, since feeling and will influence them in different ways. To determine whether good memory limits or furthers thought, for example, we must also consider a will factor—the spontaneity and energy with which an individual pursues his thinking.

In commenting upon the correlation between tested ability and school performance, Meumann holds that it is an error of correlation psychology today to suppose that a high correlation between the two is necessarily a criterion for the good quality of both. It may be that they both have the same one-sidedness. It is much more likely that the ranking by the teacher and the psychologist will not agree to a certain degree because they follow entirely different points of view. He finds support for his contention in Stern's discovery of a correlation of only .45 between the teacher's ranking of pupils on the basis of their school performance and, under special instructions, their estimates of the general capacity of the pupils. Moreover, he criticizes the position of Stern and Burt that the higher correlation of the combined results of several tests shows that one test compensates for another, each reaching only one side of the mind, so that only through such compensation would a total picture of intelligence be created. This presupposes, he thinks, that more such tests would not contain any inner opposition, and it especially disregards the fact that the qualitative value of the tests in relation to intelligence is entirely different. It must give a false picture of

the average intelligence of a class if high memory performances compensate for medium thought activities. The fact that a pupil with good memory often has a low type of general ability would be covered up by the simple addition of these numbers. We must control these calculations through an intimate psychological analysis of the abilities tested, otherwise the result of the compensations are only uncertain and "we urge arithmetic instead of psychological examination of ability."

A common note is struck by several investigators who have been employing the method of correlation during the past year. This is the desirability of more intensive study of the factors influencing correlation. One of the most important of these factors is undoubtedly practice and several papers indicate its effect. Unless the great complexity of the factors involved in the correlation of abilities are investigated and allowed for, Brown (1) thinks that "the speculations as to the causes of psychical correlation must be little more than futile," nevertheless he indulges in the liberal conclusion that the causes of correlation are both inner and outer, and that the inner causes are partly general and partly specific. He agrees that Hart and Spearman's paper of 1912 "indicates the probability of a general source of correlation, although the absence of probable errors deprives their conclusions of the quality of mathematical demonstration." His paper is mainly devoted to a critical consideration of Spearman's revised formula for eliminating "observational errors." Using the same criteria he employed in examining the earlier formula he tests the assumptions that these "accidental" deviations are not correlated with each other or with the abilities measured and finds these assumptions are not justified. The empirical data on which he tested the formula included the results obtained by Winch in examining 39 eleven-year old school boys with a simple motor test of marking out all the letters on a page and a complex motor test of marking out the four letters a, n, o, s. The reliability coefficients for the six successive days which the tests were given run very high, from .819 to .952. The effect of practice is shown by the increase in the correlation between the two tests in the successive trials of five minutes each, the series running .29, .44, .59, .48, .47, .50. This negatives the view that correlation is due simply to voluntary attention, lack of practice, or ability to follow directions. Improvement in one series is not very highly correlated with improvement in the other, .28. On the other hand the correlation between improvement and average ability

in each test is fairly high, .78 for the simple motor and .50 for the complex motor test. The variability of the group, as indicated by the coefficients of variability, increases with practice from the first half to the second half of the series with the simple motor test while it remains fairly constant after the second trial with the complex motor test. In a note which is a forerunner of the study of individual variability, in which we may expect investigators in the near future to become interested, he gives the correlations between the individual's average record and his variability in each test as well as between his variabilities in the two tests. These six trials, however, as he says, are not a satisfactory measure of these relations. In place of using Spearman's formula for correcting coefficients he advises obtaining accurate correlation coefficients by taking a large number of measures at fixed intervals. When the means and standard deviations at each trial indicate that the measures are sufficiently constant, then the later measurements should be averaged and the coefficients calculated from them alone. "The 'accidental' as distinct from the 'residual' deviations would thus be approximately neutralized by the law of averages, and their correlations, if actual, would be eliminated with them, while the residual deviations themselves would be reduced to a minimum."

Starch and Hollingworth have also studied the influence of more accurate measures on correlation. Starch (13) finds that the intercorrelations between the grades of pupils in arithmetic, language, geography, and history in the elementary schools, which range from .40 to .50 when the marks are taken for only one year, are all over .73 when the average marks for three years are taken for the same pupils. Reading and spelling show markedly lower correlations than these four studies. Hollingworth (7) presents an admirable study of the effects of practice on the intercorrelations of six laboratory tests from the first trial to the 205th when the limit of practice had been reached for each. The tests used were given to 13 subjects and included adding, color naming, opposites, discrimination reaction to colors, muscular coördination (three-hole test) and tapping. He gives the correlations of each test with each of the others for the first trial and for the median of the last five ending with the 5th, 25th, 80th, and 205th. The final averages of the coefficients for these positions in the series of trials are .065, .280, .320, .390, .490. Except in discrimination reaction to colors practice markedly increases the intercorrelations. The increasing correlation he thinks is to be accounted for by (*a*) decrease in the

individual variability, which affects only the first few trials; (*b*) changes in the character of the tests themselves, a progressive qualitative approximation; and, because the first two are insufficient, (*c*) "some form of the doctrine of 'general ability' . . . But the conclusion seems to call for the qualification that 'general ability' have reference to final capacity rather than to momentary performance, if the correlation is to be high. Give each individual the opportunity to attain to his limit of efficiency, his highest level of performance, and when these final limits are reached individuals who excel their fellows in one type of work will also excel in other types of work." He thinks, moreover, that we have failed to make sufficient allowance for the importance of incentive, motive, attitude and purpose in determining possible achievements. In a forthcoming paper he promises to show that "preliminary tests do not reveal the final relative abilities of the individuals as determined by their practice limits in the same tests."

In line with the suggestions of Meumann the study of Heymans and Brugmans (6) is an interesting early attempt to find the relations of certain general mental functions to each other. With groups of 12 to 15 students they measure memory, fanciful imagination, secondary function, concentration and intellect, each with from three to six tests. In each field, except intellect, the tests show some negative correlations with each other. This is especially true with the tests for memory for different kinds of material. Noteworthy are the high correlation between fantasy and intellect, .94, and the low correlation between intellect and their three tests for concentration, .07. Three out of four of the correlations between secondary function and the others are negative. The authors are especially interested in the relation of intellect to secondary function, the latter tested mainly by the prolongation of the after-effect of sensations in the various fields. Neither the extreme of secondary functioning as found in melancholia or of primary functioning as found in mania would favor high intellectual performance, so that they are not surprised at its low correlation with intellect.

A new use for the correlation method is found by Kelley (9), who employs it in the association experiment as a means for classifying the different types of word associations. This allows him to trace relationships in mental processes which might not be shown by logical classifications. It is a step toward the determination of the types of association that would be found emphasized, for example, in the scientific mind and it opens up a method of approaching

the problem of vocational guidance. Among fifteen classes of word associations Kelley finds three groups that stand out in the intercorrelations. For example, his Alpha group includes reactions by synonyms, contrast words and words of equal logical value (coordination). Correlations are given between the association reactions of the twelve students tested and their class standings in mathematics, science and foreign language. The trend of the investigation is to show that free associations are indicative of the ability of subjects. The most significant features favorably correlated with scholastic rank in the studies named are capability in the recall of particular situations and frequency of reaction with the Alpha group. The most significant features that are unfavorably correlated are frequency of visual imagery repetitions, and the Beta group (reactions with the noun-verb, verb-object and causality relations). The Beta group shows negative correlations of from .44 to .75 while the Alpha group shows positive correlations from .19 to .37. Neither the association reaction time nor its variability is strongly correlated with the grades in the college studies named, although it tends to be negative.

The service of correlation in solving a difficult problem in pure psychology is well demonstrated by Hollingworth's study of judgments of similarity and difference (8). Specimens of handwriting were arranged in reference to a standard, under directions which asked for judgments primarily of similarity or of difference. The changes in correlation showed that consistence of judgment on the basis of similarity was greater than on the basis of difference. The correlation was higher for two orders of similarity than for similarity and the reciprocal of the order of difference. The variability among a group is less for similarity. He concludes that judgments of similarity and difference are psychologically different. "Similarity seems to be more fundamental, natural, easy and self-consistent, whether a single individual or a group of observers is concerned."

Three papers contribute more or less directly to the problem of the correlation of tests and ability in school. Scott (12) believes that we should expect to find the correlation between estimates of intelligence and ranking in tests closest at that stage of life when growth is practically over and before differentiation has set in to any marked degree, such as he finds represented in the first year pupils in a normal school. After six months' acquaintance the teachers ranked the pupils reciting to them and the pupils ranked those in their section of the class. The 96 pupils were found to

be able to judge their own position relative to the average judgment of their classmates better than could any one of their fellows, the correlation with their self-judgments being .96. The teachers were less in agreement as to the rank of their pupils than were the classmates, but this was partly due to their having only a sixth as much time with the group of pupils in the class room and to the fact that the teachers were ranking the pupils as they appeared in their subject. On the whole the average of the six teachers' judgments correlates with the average of the pupils' judgments by a coefficient of .84. The average of six tests correlates highly with the estimate of the fellow pupils, .74, so that a good estimate of success in school could be made at their entrance and the pupils detected whose capacity was better than their school performance through laziness, timidity or disgust at seeking marks. Wyatt (**16**) tried out eight tests with two groups of school children and found that the analogies and the completion tests gave the highest correlations with intelligence and with the other tests. The correlation between memory for nonsense syllables and the best tests ranges from .5 to .7. The tests retain similar positions for the two groups with a correlation of .89, so that the relative value of the tests as measures of intelligence is quite reliable. The correlations of each test with every other admit of hierarchical arrangement so that Spearman's theory of the General Common Factor receives additional support. By Burt and Moore (**2**) a score or more of tests are given twice to from 65 to 130 school children and their correlations with intelligence estimates and reliability coefficients calculated. The higher and the more complex the process tested the smaller is the sex difference found to be, as shown by a correlation of .65 between the rankings of the tests in these respects.

Struve (**14**) calculates the relation between intelligence, bodily development and fatigue using 119 twelve-year old boys in four parallel classes of the seventh year in a Chemnitz school. One of the classes was composed of bright pupils, one of retarded and the other two of average children. These groups were kept separate in calculating the results. Fatigue was measured by the decrease in rapidity of adding; bodily development took not only size but health into account. Between fatigue and bodily development no correlation was found in any of the classes. Between fatigue and rapidity of addition there was no correlation. Intelligence and bodily development showed a correlation only in the class of bright pupils where it was low. Rapidity of writing numerals and of

adding showed correlations from .60 to .26 in the different groups, it being highest with the backward pupils, where writing continues to require considerable effort. The greatest fatigue was found among the bright and the retarded pupils.

Duchler (4) published the first of a series of papers setting forth in an introductory manner the methods of correlation that are most serviceable for psychology and pedagogy. This paper is devoted to developing two formulæ which are not in common use but are useful for determining correlations when the members of two distinct groups can be compared with each other in pairs as to a certain characteristic, although the members of either group are not easily comparable among themselves as to this characteristic. For example, to determine the correlation between good capacity and good performance when a judgment can be passed upon a pair of pupils, one chosen from a group of good capacity and the other from a group of poor capacity, to the effect that the pupil from the group of good capacity is better, equal or worse than the pupil from the group of poor capacity in a particular performance. Damm (3) works out illustrative examples of correlation for the information of teachers conducting experiments in psychology. Harris (5) provides a method for greatly reducing the labor in calculating intra-class and inter-class coefficients when the number of cases is large. Pintner (11) attempts to determine the correlation between fluctuating attention in the tachistoscopic reading of words and variability in reaction time as evidence that the latter is an indication of fluctuation in attention. Winch (15) uses the correlation of the results of the same group of pupils with two sets of words for standardizing the spelling lists to be used in a research on learning to spell.

It is a pleasure to call attention to the prize of $100 offered for the best paper on the availability of Pearson's Formulæ for Psychophysics, the announcement of which has appeared in the various psychological magazines together with the rules governing the contest. The papers are to be in the hands of Professor Titchener by December 31, 1914.

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SPECIAL REVIEWS

Body and Mind, a History and a Defense of Animism. WILLIAM McDOUGALL. London: Methuen, 1911. Pp. xix+384.

The first six chapters of this book are given to the rise and subsequent history of animism; the following three chapters to a sketch of the adverse doctrine as developed by the practical successes of the mechanical sciences; and the remaining seventeen chapters to a systematic presentation of the philosophical and other arguments against animism and to the author's own admirable exposition and defense of this doctrine. While the volume is frankly written as a defense and vindication of animism, its discussions and presentations are everywhere marked by the most faultless candor and impartiality of judgment. And this feature alone, apart from the further fact that the text is undeviatingly interesting, well-arranged and clear, makes this volume one of the most excellent that has ever been written on this well-nigh cardinal philosophical topic.

The author expressly disclaims having any new material to present in the historical chapters, yet he has assembled the facts so well that they yield an enhanced measure of instructiveness. Here one sees again that history is intelligible when, and only when, it is the warp and not the woof of the web of time that is studied. Forces operate continuously down the temporal series, and the consecutive history of a single line of thought reveals the force and the necessity of nature's workings as they can never be revealed in a series of cross-sections, in detailed pictures of the multifarious forces interacting at an epoch. Thus the slow attenuation of primitive anthropomorphism, with its gross conceptions of the "ghost-soul," nature-gods and demons, to the less substantial animism of the Greeks and Romans, on to the spiritualism of the early Fathers, and then on to the soul-doctrine of later and present-day theology, philosophy and psychology—makes an interesting study. And on the way one is led to speculate, indeed to prognosticate, how far such attenuation is destined to proceed.

The counter-movement against animism is presented with perfect fairness: indeed Professor McDougall has run the risk that his readers will be irretrievably convinced that mechanism holds full sway in this universe, before they reach his own systematic

vindication of animism. This shows only, however, that the author knows exactly what he is writing about, and surveys it broadly. Of especial interest is Chapter VIII., The Rise of the Mechanistic Physiology and of the Psychology Without a Soul. Here one sees how slowly the soul has been squeezed out, so to say, from any last foothold in the nervous system. From the voluminous accommodations, the bowels, stomach and brain, assigned to the soul by the earliest psychologists, it was forced into the single compartment of the brain, then into the very cramping pineal gland: then it was dismembered or indeed pulverized and distributed atom-wise to the "cell-bodies"; now it is by some forced to remove to the cortical synapses, by others swept out altogether. The excellent point is made that Kant's philosophy has not touched nor in any wise relieved us from the psychophysical problem. And as much might be said of the other idealists.

Professor McDougall's discussion of the outstanding "solutions" of the psycho-physical problem is extended, clear, scholarly, and, when one reflects what a hoary old topic it is, astonishingly original. It will seem strange to some readers that epiphenomenalism, psychophysical parallelism, phenomenalistic parallelism and psychical monism (the last two being "identity"-hypotheses) are designated as "anti-animistic" solutions of the problem: strange inasmuch as the first two at least are ordinarily called dualistic. For the author any sort of parallelism is monistic (p. 355) and is opposed to Animism; and against all varieties of the former he adduces good (and in your reviewer's opinion, conclusive) arguments. By "animism" Professor McDougall means a rigorously dualistic interactionism, with the emphasis, perhaps, on the dualism. The author finds many reasons for reasserting the dignity of the soul and its distinctness from mechanical nature; notable among these reasons are the empirical phenomena of memory, unity of consciousness, and the "meaning" of things; and, as a last, perhaps great, reason he finds (p. 194) "that Animism, or the dualistic doctrine of soul and body reciprocally influencing one another, is the only psychophysical theory logically compatible with Theism, with a belief in a personal God, a Divine Creator, Designer and Ruler of the World." The phenomena of "meaning," memory, and unity of consciousness have "no immediate physical correlate in the brain." Indeed the active and efficient Anima is found to be essential to the operation of practically all, even the simplest, of the animal functions. For (p. 266) "no adequate mechanical explanation of the

scratch-reflex has been suggested; and it may be argued with at least equal plausibility that the analogy between the processes shows that the scratch-reflex, like the instinctive expression of distress, involves some factor incapable of description in mechanical terms"; *i. e.*, an animistic factor. The arguments adduced in these connections, it should be noted, are far from being the time-worn phrases that one finds in every text-book of philosophy and psychology.

As nearly everyone is aware, the "Soul," whatever the arguments that urge one to believe in such a thing, is not, or at least has not been, a fruitful *explanatory* concept in psychology. And so the pertinent question arises in the reader's mind—"Now that you have got your Soul, what are you going to do with it?" Some suggestions of an answer to this question are given; but to the reviewer's mind these constitute the least satisfactory aspect of the volume. But of course it could be contended that the answer to this question lies beyond the scope of a "*defense*" of animism.

All in all the book is a noteworthy achievement. At every point the author writes from a direct examination of the relevant facts, transcribing his immediate vision of them and not mouthing the stale formulæ of the innumerable previous disputants on this topic. He has produced a very worthy monument to Animism.

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NOTES AND NEWS

DR. DAVID CAMP ROGERS, associate professor of psychology in the University of Kansas, has been appointed professor of psychology in Smith College, to succeed the late Professor A. H. Pierce.

DR. LUCY M. DAY, of Vassar College, has been appointed instructor in psychology in Wells College.

DR. GERTUDE RAND, demonstrator of psychology in Bryn Mawr College, has been promoted to the grade of associate.

PROFESSOR J. H. LEUBA, of Bryn Mawr, will be absent next year on sabbatical leave. His courses will be given by Professor E. Wilm, of Wells College, and by Dr. Chester E. Kellogg.

PROFESSOR J. E. W. WALLIN, of the University of Pittsburgh, has been appointed director of the Psycho-Educational Clinic in the

Public Schools of St. Louis, Mo. The Clinic will be closely affiliated with the Harris Teachers College and lecture courses will be offered in the extension division of that institution.

We have received the first number of a new bi-monthly magazine called *Revue de Pédotechnie* edited by Dr. Decroly of Brussels and published by H. Lamartin, rue den Berg 58, Brussels, Belgium. The magazine, as its name implies, is to be devoted to researches regarding the practical applications of education. The first number includes among others an article by Dr. Decroly on The Application of the Binet-Simon Tests to Homogeneous Classes.

A preliminary announcement has been sent out of the International Congress of Neurology, Psychiatry, and Psychology, to be held at Bern, September 7–12, 1914. Seven topics for report are assigned to the psychological section: mental heredity, the education of young criminals, psychology in the school, the biological bases of psychology, mental tests, the unconscious, consciousness, and attention, and the psychology of dreams. Those wishing to attend should address the Secretary, Dr. L. Schnyder, 31, rue Monbijou, Berne, Germany. In accordance with the prevailing European custom, a membership charge of 25 francs is exacted of members to defray the expenses of the congress; wives and children of members are admitted at half price.

Our readers are reminded of the Fifth International Congress of Philosophy to be held in London during the last of August under the presidency of Dr. Bernard Bosanquet. One section of the Congress will be devoted to psychology.

Through the co-operation of the estate of the late Dr. C. Annette Buckel of Oakland, a research fellowship for the study of feeble-minded children has been established at Stanford University. The department of education, under the direction of its head, Professor E. P. Cubberly, will have the appointment of the fellow, who will work in cooperation with Professor Lewis M. Terman. The first appointment will be for the academic year 1914–15. This is the first foundation for this sort of work in any California university. The income amounts to about $500 a year, and the board of trustees of the university have added an additional $500 to the fellowship. It is hoped to increase this sum so as to make possible a thorough and constructive study of the whole problem of mental deficiency.

THE following are taken from the Press:

DR. OTTO KLEMM, docent at Leipzig, has been appointed professor of psychology in Alberta University, Edmonton, Canada.

DR. MARY T. WHITLEY has been promoted to the grade of associate professor of educational psychology at Teachers College, Columbia University.

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GENERAL REVIEWS AND SUMMARIES

FEEBLE-MINDEDNESS

BY F. KUHLMANN

Minnesota School for the Feeble-Minded

The extensive use of the Binet-Simon tests of intelligence has caused a renewed interest in the study of the feeble-minded. It has opened some quite new fields of inquiry, and it has brought new points of view into the discussion of old questions. Feeble-mindedness is now quite commonly defined in terms of mental age, and its different grades classified on the same basis. Rogers (23) points out this change of basis of classification. Cornell (7) and Goddard, as quoted by Cornell, have accepted twelve years as the upper limit in mental age for feeble-mindedness. But since children may be feeble-minded with any mental age less than twelve and yet be as nearly normal as the adult feeble-minded with a mental age of twelve, the relation of the mental age to the chronological age must evidently be taken into account. Gifford and Goddard (9) classify children aged nine and a half to thirteen and a half years as "backward" when less than four years behind in mental age, and classify children aged fourteen to seventeen years as feeble-minded when four or more years behind in mental age. Morrow and Bridgman (21) classify a case as feeble-minded if the mental age is less than twelve and the difference between mental and chronological ages more than three years, apparently independently of how much the chronological age is above twelve. Otis (22) regarded girls aged ten to twenty years as mentally defective if they fell below ten years mentally, classifying them as morons if the mental age was between ten and eleven. Stern

(24), Bobertag (2), Chotzen (5) and the present writer (16) have pointed out that a certain number of years' difference between age and mental age represents a decreasing degree of mental deficiency with increase in age throughout the whole range of grades of intelligence, and have suggested using the fraction obtained by dividing the mental age by the age as a better criterion of grade of intelligence. Stern, who originated this plan and termed it the "Intelligence Quotient," and also Bobertag point out several objections to it and regard it as still falling short of entire accuracy. They suggest, however, that a case might perhaps be classified as feeble-minded if the intelligence quotient falls below .80.

This definition of feeble-mindedness in terms of mental age in relation to age, however, is not adhered to strictly, even by those who accept this method of measuring intelligence. With most students of the subject, as well as in law, feeble-mindedness has come to mean an incurable condition. This meaning of the term is retained. If the causes of the mental retardation are removable and the mental condition can be restored to normal, the case is not regarded as one of feeble-mindedness. Dullness, backwardness, mental retardation, exceptional, are some of the terms given to this latter class. Huey (15), Holmes (14), and Cornell are among those who make this distinction. On the other hand, Witmer (27) defines feeble-mindedness on the basis of social considerations alone, without reference to cause or degree of mental deficiency; the feeble-minded is the socially unfit.

Turning to the attempts at a more definite description of the general nature of feeble-mindedness, we find Huey regarding it as not alone a defect of intelligence in any grade, and in the borderline grades in adolescence as more an abnormality of the emotions, instincts and their control and direction than an abnormality of intelligence. At this upper margin it blends into the psychoneuroses. He outlines a number of functions which he thinks are arrested here, rather than intelligence in the technical sense. Among such cases there may be true feeble-mindedness with little or no mental retardation as measured by the Binet-Simon tests. Rogers (24) sounds a similar note. In distinguishing "children with mental defects" from "mentally defective children," using the latter expression as synonymous with the term feeble-minded, Witmer holds that we have in the latter only an accumulation of mental defects. Every normal child is apt to have one or several mental defects, such as sensory defect, defect in some class of

imagery, tendency to lie or steal, and so on. The undue multiplication and exaggeration of these constitutes mental deficiency or feeble-mindedness. A similar point of view is implied in Block's (1) attempt to group the Binet-Simon tests according to the special mental functions they test and thereby determine in which mental functions the feeble-minded are especially behindhand, when the responses of feeble-minded and normals are compared on any group of these tests that is supposed to test some one mental function particularly. The study by Lapie (18), who uses a number of special tests besides some from the Binet-Simon system, aims at the same thing. The view held by Hart and Spearman (13) in regard to the existence and nature of a factor termed general ability seems in direct opposition to this. They argue in favor of the existence of such a factor, or general intelligence, as opposed to the view that the mind is only a group of functions or "faculties." Their argument is based on the fact that they find a positive and high correlation for different groups of mental tests, which they explain can result only if the score in each of the individual tests is determined in part by one and the same factor, which they call general ability. They hold that the success of the Binet-Simon tests is due to the recognition of the correctness of this view. Undoubtedly opponents would not regard their interpretation of the high positive correlations as the only possible one.

The question as to the course and rate of mental development in feeble-mindedness has been raised. From three successive annual testings with the Binet-Simon tests of the 346 inmates of the Vineland, New Jersey, Training School for Feeble-minded Goddard (10) found that 67 per cent. varied less than three fifths of a year in mental age during this period of two years; 28 per cent. gained three fifths of a year or more; 5 per cent. lost three fifths of a year or more. From this he concludes that the vast majority of the feeble-minded do not improve in intellectual level, and that if there is any improvement it seems to be between the mental ages of three to nine, inclusive. Goddard, however, does not state in sufficient detail what the frequency of occurrence of the different grades of intelligence and of the different chronological ages of these inmates is for us to judge the validity of his conclusion. The tests used do not measure progress adequately for mental ages below three or above ten years, because of the absence of tests for the lower and higher mental ages. Again, if the majority of the inmates were over twelve years chronologically,

as they probably were, we would hardly expect any mental progress for this majority, according to assumptions of the tests. Several authors hold a view in opposition to Goddard's conclusion. Stern (25) assumes that the mental age of the feeble-minded increases with age, but at a slower rate than it does with normals. But he also thinks that the development of intelligence stops entirely with the feeble-minded earlier than it does with normals. Bobertag, in discussing the intelligence quotient and his results with the Binet-Simon tests, regards it as obvious that the intelligence of the feeble-minded increases with age, but at a slower rate than of normals. He suggests that the rate of mental development of the normal child is a constantly decreasing rate from birth to mental maturity, and that that of the feeble-minded follows a similar course, only it is less year for year than with normals. Chotzen's results in examining feeble-minded children with the Binet-Simon tests indicate this. Block (1), after testing 71 children of the *Hilfsschule* with the Binet-Simon tests and comparing the results with results from normals comes to the same conclusion that Stern arrived at. Boehne (3) found the children of the special classes of Rochester, N. Y., public schools increasing in mental age, as determined by the Binet-Simon tests. The present writer (17) in testing 1,300 feeble-minded of the Minnesota School for Feeble-Minded found on dividing the cases into a series of chronological age groups from younger to older that the average mental age for these successive groups increased regularly from younger to older up to the chronological age of about fifteen, after which the mental age remained constant. Elsewhere (16) I have defended the view that it would be feasible to use the intelligence quotient as found at any time for a given case as an index of the rate at which the case in question has and will be developing mentally.

The frequency of occurrence of feeble-mindedness with different classes of people has received a renewed interest through the application of the Binet-Simon tests, with the general result that previous estimates have been many times exceeded. Thus Goddard (11) finds two per cent. of the school population feeble-minded. But of 286 public school children aged six to eleven years, inclusive, Otis (22) found only three nine-year-olds, four ten-year-olds, and nine eleven-year-olds with a mental retardation of two years, and one ten-year-old with a mental retardation of three years. Dr. Otis makes no comment on what is regarded as feeble-minded. Dr. Goddard's high percentage may be due to his interpretation which

regards a seventeen-year-old child, for example, as feeble-minded if his mental age as found by the tests does not exceed thirteen years.

Morrow and Bridgman (**21**) examined 60 inmates of the State Training School for Girls at Geneva, Ill., with the Binet-Simon tests. They report only 6 as normal, 14 retarded one to three years, 11 retarded four to five years, and 29 retarded six to thirteen years. In a later study Bridgman (**4**) tested 118 consecutive cases of the same institution and reports 5 per cent. normal, 6 per cent. backward, and 89 per cent. feeble-minded. Goddard (**12**) found thirty-four superintendents of reformatories and industrial schools estimating on the average 14.5 per cent. of their 13,188 inmates as feeble-minded. Goddard and Gifford testing 100 juvenile court cases chosen at random from among cases serious enough to be sent to a detention home found 34 backward, and 66 feeble-minded, apparently none being "normal." Among the normal children of the Brussels schools Ley (**19**) found 14.4 per cent. with some moral deficiency, as compared with 96.3 per cent. with some moral deficiency among the mentally retarded children of the special classes. He includes much less grave moral offenses than those of the juvenile court cases.

This high percentage of feeble-mindedness with these different classes of children is, however, subject to the consideration of what one regards as feeble-minded on the basis of the mental ages obtained. A little further analysis of the results in some instances shows at once that the apparently very high percentage of feeble-mindedness is due to gross misinterpretation. Thus, as already noted, Morrow and Bridgman call a case feeble-minded if less than twelve years mentally and with a mental retardation of more than three years. They classify a case as normal only if his mental age is equal to or greater than his chronological age. Likewise, they regard a child over fifteen years of age as the number of years retarded that his chronological age exceeds his mental age as given by the tests, although there are no tests for the ages of thirteen and fourteen and none beyond fifteen except one group of five "adult" tests. Considering the absence of tests for these higher ages together with the rule for counting up the mental age from the individual tests passed and not passed, any child whose mental age is really ten years or more will have to measure short of his real mental age because he gets no opportunity to pass extra tests for the ages of thirteen, fourteen, sixteen and beyond. Fifty-eight of

their sixty cases were over twelve years old chronologically; twenty-six were fifteen or over. These studies on the frequency of feeble-mindedness in their erroneous conclusions have confused rather than added to our knowledge of this problem.

Several studies aiming to determine the special characteristics of some individual mental function or activity of the feeble-minded are noteworthy. Mead (20) compared the age at which feeble-minded begin to walk and talk with this age in normal children. Beginning to walk is defined as taking a step unassisted, and talking as using a word intelligently, indicating the association of an idea with its object. The average age at which 25 normal boys began to walk was 14.28 months, with an A.D. of 1.64, and a P.E. of .97. For 25 normal girls these figures were: average age, 13.48; A.D., 1.28; and P.E. 1.12. For 84 boys chosen from the "school-able" cases of the Indiana School for Feeble-Minded the average age for beginning walking was 25.7 months, with an A.D. of 9.36 and a P.E. of 8.16. For 60 feeble-minded girls similarly chosen these figures were: average age, 24.24, with an A.D. of 9.84, and a P.E. of 6.96. The results for the age at which these children began to talk were: for normal boys, average age 15.76 months, with an A.D. of 3.2, and a P.E. of 2.75. The normal girls began to talk at an average age of 14.88 months, with an A.D. of 2.76, and a P.E. 2.68. 56 feeble-minded boys began to talk at an average age of 39.36 months, with an A.D. of 16.44, and a P.E. of 13.56. For 36 feeble-minded girls these figures were: average age, 37.32 months; A.D. 17.04; and P.E. 12.00. Mead notes the educational value of the functions of walking and talking during the early months of the child's life, which by their later appearance in feeble-mindedness thus produce their influence on mental development.

Town (**26**) in studying the language development of inmates of the Illinois School for Feeble-Minded found five levels of language development with idiots, as follows: (1) understanding of gestures; (2) imitation of gestures; (3) voluntary gestures; (4) understanding of words heard; (5) sounds and attempts at articulation. For 45 cases of the imbecile grade 320 words were used, each word being suggested to a child by the use of pictures and questions. Record was also kept of all the different words used by the child during the test. The average percentage of the 320 words used by the children with mental ages of 3, 4, 5, and 6 years were 23, 41, 69, and 86, respectively. The average total number of words used were 112, 188 315, and 363, respectively, for these mental ages.

Eastman and Rosanoff (8), using the same standardized method of testing association formerly employed by Kent and Rosanoff with the insane, found certain characteristic associational tendencies with 263 "backward" children of the public schools and several training schools. These children were all retarded in school work, the majority were also delinquent, but not all were regarded as feeble-minded. The associational characteristics of the feeble-minded as thus determined were found to be (1) failure of reaction, when no response is given to the stimulus word; (2) non-specific reaction, "words which are so widely applicable as to serve as more or less appropriate reactions to almost any of the stimulus words"; (3) individual reactions, reactions not belonging to a small group of common reactions usually given by normals. The authors regard this association test as an aid in the diagnosis of feeble-mindedness.

Clark and Atwood (6) attempt to distinguish "habit-movement" from tics by defining the former as "the frequent or constant repetition of uncalled-for and exaggerated movements which are devoid of convulsive element, but from which the patient seems to derive pleasure or satisfaction," and the tic as "that type of spasmodic movement occurring in varying degrees of excursion, intensity and rhythm after the purpose of such movements has disappeared." To the authors tics seem to develop on a "neuropathic diathesis," while the habit-movements develop from a "psychopathic soil, especially on the basis of imbecility and idiocy." To the present writer the distinction made is not entirely clear. They studied 600 idiots and imbeciles for these movements, and found that all habit-movements bear some relation to sexual libido. They are all regarded as phases of the neurotic child habits, which in the normal child are inhibited through increasing mental development. It is suggested that these movements with idiots and imbeciles are merely a continuance of the neurotic infantile habits, enhanced by the lack of mental development. Some additional observations are given to support this Freudian interpretation.

Block (1) grouped the Binet-Simon tests into groups according to the mental functions he thought they tested specially, and having examined feeble-minded and normal children with the tests, attempted to discover in what mental functions the feeble-minded specially lack development as compared with other mental functions. His analysis, however, as to which mental functions are chiefly tested with the different tests is so largely merely fanciful

that the details of his results need not be quoted. He found that the feeble-minded failed more in the following tests than they did in others as compared with normal children. Repetition of five numerals; recognition of coins; arrangement of five weights in order of weight; recall of story told; copying written words; writing from dictation; naming days of the week; naming months of the year; giving date; comparing two objects from memory; game of patience; distinction between forenoon and afternoon; questions of comprehension.

A comparison of a group of pedagogically retarded with a group of pedagogically advanced children, twenty-four in all, by Lapie (18) is subject to the same criticism. His retarded cases were retarded one to two or more years, and the advanced were advanced one to almost two years. Tests on the initial threshold for noise, initial space threshold as determined by the compasses, a number of different memory tests, do not show any special difference between the two classes of children. Tests with the algometer make the retarded apparently the more sensitive to pain. In judging the relative length of two lines the advanced excelled. In giving the free associations to an abstract or concrete word there was no notable difference in the total number of words, but the retarded gave more words that were not related to the stimulus word, and their series were in other ways more disconnected. In giving as many words as possible in three minutes, in using three given words in one sentence, the advanced excelled considerably. The retarded excelled in the number of a's and r's crossed out in a given text, but the advanced worked more regularly and continuously. Suggestibility, tested with a bottle of pure water placed at some distance and the child being told it contained a strong odor, shows no important difference, except that the retarded were much less hesitant in their responses. In a test with Toulouse and Pieron's pictures with absurdities, for example a picture in which the wind blows smoke in one direction and trees in another, the advanced gave more frequent correct responses. The Binet-Simon test with nonsense statements, on the other hand, gave no significant difference. The tests of crossing out the a's and r's in a given text, giving as many words as possible in three minutes, using three given words in one sentence, detecting absurdity in pictures, and in the Binet-Simon nonsense statements, are all classed as tests of attention. He concludes that the difference between the retarded and the advanced is one of degree and not of

kind. The different mental functions are all present in the retarded, but are more poorly developed.

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EXPERIMENTAL PSYCHOPATHOLOGY

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Among the studies in psychopathology involving general experimental series, Rowland (17) contributes a brief, condensed note on her observations with normal subjects and delinquent girls. In simple reaction time as measured by Vernier chronoscope, more of these subjects gave slow times than would be expected in normal individuals. Another test was of formal memory, noting the number of repetitions necessary for learning by heart a series of nonsense syllables, with both visual and auditory presentation. Of the 35 subjects, 17 failed to memorize the auditory list in 25 trials, 11 failed in the visual test after trial, 7 without trial. 19 failed to reach the standard of normality in remembering what had been seen on cards exposed for three seconds. Burnett's test of distraction (simple maze and maze with distracting pictures) gave a performance regarded as subnormal in 14 cases. 16 failed to reach the normal standard in counting the number of times a letter occurred in a given passage. There were also three simple tests of suggestibility. Failure in six of the nine tests was deemed a subnormal record, and these records corresponded well with the official estimate of the capacities of the subjects. A comparative table at the close gives the number of cases in which the tests were "passed" by the Bedford group, 35 Mt. Holyoke students, and 35 Amherst students. The difference in favor of the college students is marked throughout, least in simple reaction time, and greatest in the auditory memory and "attention" tests.

E. K. Strong (19) adds another to the much needed researches

which attempt to follow manic-depressive conditions through changes in the depth or character of the psychosis. The tests employed were the tapping test, discrimination of weights, a cancellation test, a distraction test (using picture cards with a number attached to a corner of each, to be sorted according to the numbers), and the free association experiment. There were 11 subjects altogether, who were tested as changes in the condition indicated. Such studies lend themselves little to summary, but the author says, generalizing, that in the tapping test the opposite of fatigue is found within series as an indicator of retardation, and lack of warming up as indicating depression. In manic states there appears to be increased rate, and it warms up more. With depressed states, poor performances in the discrimination of weights are sometimes associated with loss of feeling in the body. The cancellation and distraction tests were slower in both the manic and depressed states, though probably not for the same reasons. The association experiment showed no characteristic abnormality in the depressions; manic cases showed mainly a large number of "individual reactions," and long reaction times (distractibility?). One case, of a more dementia præcox type among the subjects, reflected a lack of correspondence with the other subjects in the experimental results, as in the distraction and association tests. Besides the detailed analysis of these findings, the paper contains very useful criticisms of the tests made use of, and suggestions for their future improvement.

Boring (3) contributes what must have been a very painstaking endeavor to apply the introspective method in a scientific way to the study of mental diseases, choosing dementia præcox cases for this purpose, the material being furnished by the introspections from the eight subjects concerned in a series of maze experiments. A standard of normality for judging these introspective results is given in a study of adults trained in introspection, and of untrained boys. Among the special conclusions are the greater suggestibility of the pathological subjects than the trained normal observers, the absence of any indication of intentional misrepresentation in the reports, and the great individual variation between the patients in the factors indicating the reliability of the reports (as analyzed quantitatively in the body of the paper). "The reports are, on the whole, of about that degree of reliability that is found in reports made by untrained observers with little education and poor command of language, and appear

to differ from these reports in no characteristic way other than in the introduction of irrelevant material."

The study of Hassman and Zingerle (7) endeavors to show the value for psychodiagnostic purposes of the systematic examination of the quasi-artistic productions in such psychoses as dementia præcox, by a special case of which their material is furnished. "The patient is able to preserve single ideas, to elaborate them in drawing or painting, and to clothe them with all their proper attributes; but he does not elaborate them in a reasonable connection in the sense of a normal mental process; and is indeed incapable of bringing them into purely objective, formal, connections." The material is arranged according as the associations studied are between pictures and verbal expressions, word to picture, picture to picture, and word to word. Various dementia præcox mechanisms are brought out under these headings, and there are suggested here some promising variants of association experiments; though the most interesting portion of the paper is that in which several drawings are reproduced with the patient's own interpretation of them discussed in detail. The treatment of the data is thoroughly psychoanalytic.

Hirt's (8) extensive contribution is the first on the psychology of the writing movements that has appeared from Kraepelin's laboratory for some time. It is a compendious overhauling of the subject with experiments under a large variety of conditions, and the point of view is a broad one. The *Schriftwage* is used, adapted to continuous records. The most stress seems to be laid on the distribution of pressure within the writing movement, which the author terms the "writing accent," the observation of this factor appears to the author the most promising for future work, though it does not play this part in the study now reported. The present concern is essentially with the elaboration of such functions of the experiment as are developed by the previous investigators of Kraepelin's laboratory, the *Schreibdruck*, the *Schreibweg*, the *Schreibgeschwindigkeit* and *Schreibdauer*. The results on these different points are systematically reviewed at the end of the chapters dealing with them. It is frankly stated that genuine correlations with personality are not established in this study, but that it gives encouragement to further work in this direction.

An intensive study of writing movements in a manic depressive case is contributed by Lomer (14), dispensing with the technical refinements of the Kraepelinian methods, and more from the

standpoint of analytical graphology; allusions to different "faculties" of the personality are frequent through the article. There is no lack of quantitative measurements however. Every clinician has at least vaguely in mind some characteristics of the manic handwriting, usually exaggerated above what appears here, in the samples reproduced. He notes, not surprisingly, an increased and careless speed, a larger manuscript more characterized by pressures, a tendency to slur the ends of words, ascending lines and other symptoms, several of which are also frequently observed in general paralysis.

Lomer (15) also publishes a longer paper from the same viewpoint on the graphological symptoms of dementia and feeblemindedness. He recognizes the suspicions under which the method labors, and brings to it the enthusiasm of the propagandist, though not neglecting the work done from angles of greater experimental precision. The present material (from 12 cases) is more of the observational order, and is presented less quantitatively than in the preceding paper. This is rather unfortunate in view of the continual and praiseworthy endeavor to bring the handwriting phenomena into correlation with the personal traits of the individual. The subjective element is so great that it obstructs the acceptance of what might be perfectly valid; and even though the correlations claimed are real, there is nothing by which to estimate the degree of a handwriting character by which a corresponding personal trait is measured.

Bickel (2) contributes the only reaction time study in this series, and his problem is one of general psychology, though carried out largely with pathological material. The word "*Konstellation*" is used in the sense of Ziehen, not of the Zurich workers. Hipp chronoscope with lip and telegraph keys were employed. The subjects received stimuli for reaction with right and left hand, but were not to react unless they had first heard a prearranged signal. Premature reactions and failures of attention were eliminated. In respect to the alternation and repetition of stimulus the author says that in all his subjects (5 in number) it is the rule that in the repetition of stimulus the reaction is longer, for changed stimulus it is shorter. Latent memory picture operating in the sense of "constellation" need not therefore heighten the effect of similar presentations, but may that of dissimilar ones. (Cf. other work, on inhibition.) There are more false reactions to repeated stimuli. A stimulus if unreacted to lengthens the following reac-

tion if it is similar and shortens it if it is dissimilar; it has however the opposite effect on the mean variation. Results analogous to these appear with the method of right and wrong cases.

Reviewing the literature of pupillometry with special reference to Bumke's observations with dementia præcox, Runge (18) presents results of his observations of about 200 psychiatric, neurological and normal cases, using daylight, and a modification of the Hess-Bumke pupillometer. His dementia præcox group seem to have wider pupils at 9 candle-meters, and narrower ones in daylight, a result that is in possible accord with previous work. There was frequent departure from the round form, but this not characteristically in dementia præcox, nor were excentric pupils significantly distributed. A large percentage of catatonics showed abnormal restlessness of the eyeball. A pathological diminution of the psychic reflexes appeared in about 51 per cent. of the dementia præcox group, least frequently in the *paranoides* cases; it is not an early symptom. There follows a description of the less frequent anomalies of this nature in the other non-organic psychoses, then in general paralysis, tabes, and idiocy, where they are found rather often. The Bumke sign is important in differentiating from a manic-depressive psychosis. It appears more frequently at 9 candle-meters than by daylight, and the paper closes with a discussion of this finding and its application.

Further material on this same topic is given by Reichmann (16), starting from three cardinal pupillary anomalies in dementia præcox, the loss of psychic reflexes (Bumke), a catatonic failure of pupillary reaction (Westphal), and an induced failure of reaction after iliac pressure (E. Meyer). Pupillary disturbances are again noted most frequently in catatonic cases, and least in the *paranoides* group. Some disturbance was found in nearly 70 per cent. of all cases (215). The phenomena reported by Westphal and E. Meyer were not commonly represented. Convergence reaction was preserved in 212 of the 215 cases. As between hysteria and dementia præcox, a difference in the effect of ovarial pressure appeared in that in hysteria it was not associated with diminished light reaction. This latter was also the case in normal individuals in whom the first reaction to ovarial pressure was present. In interpretation of anomalies of light reaction, if not of the pupillary reactions in general, the author looks with favor upon a vasomotor hypothesis advanced by Westphal.

Wiersma (20) objects to the plethysmograph and to the usual

sphygmographic methods on account of the irrelevant mental states that they doubtless arouse in the subject. He describes a convenient rubber bulb sphygmograph, and also uses photographic registration in part. With this technique he presents a quantitative study of various features in respiratory and pulse rhythms. Tables are given illustrating relationships of pulse and respiration rate in different individuals and intensively for the same individual, under rest, sleep, as well as various mental and motor activities and sensory stimulations. A characteristic difference between anxious and retarded melancholias is shown, and results with idiots, imbeciles, and other pathological conditions are given for comparison with abolition or other anomaly of consciousness. The general endeavor seems to be to establish a correlation between "respiratory arhythmias" and different *niveaux* of consciousness, but the paper is condensed to obscurity.

Küppers' (11) paper reporting plethysmographic work with dementia præcox cases begins with a critical review of the previous studies, including the names of Brahn, Gent, Zoneff and Meumann, Lombard and Pillsbury, Shepard, and others, psychological rather than technical, and on the whole favorable to the method. In his experiments, respiration was recorded with a pneumograph of ordinary pattern. To eliminate voluntary movements an ear plethysmograph was attempted, unsuccessfully, because of the difficulty of keeping it air-tight. Marey tambours (*Kapseln*) appear to have been used for recording, not piston recorders. Various sensory and intellectual stimuli were employed to bring about the reactions to be observed. Control experiments with normal individuals were made, but unfortunately not carried out with the completeness of the others. As he formulates his results,

(1) In a considerable percentage of dementia præcox cases (8 out of 14), a symptom was demonstrated by the plethysmograph which may be termed *reaktive Volumstarre*, and which manifests itself characteristically in the volume curve of the arm. (2) The prerequisite of this in the central nervous system appears to be a continuous inhibition of the vasomotor centers. (3) The underlying pathological central process shows in its bodily manifestations far-reaching correspondence with a state of normal mental life, that of expectant attention (*gespannte Erwartung*).

To some criticisms of his work in this paper, Leschke (13) makes a brief reply, explanatory rather than controversial.

Another study of plethysmographic phenomena under patho-

logical conditions is contributed by Breiger (4), the material being neurasthenic in character, 9 men subjects in all, the starting point being from the observations of the curve under mental or physical activity and other alterations under exhaustion, as noted especially by Weber. The ear plethysmograph was tried, and discarded, as by Küppers, though for a different reason, the subjects finding it too disagreeable. The results deal particularly with the arm plethysmograph, in connection with pneumographic records. The author states that in certain cases he finds the reversal phenomena described by Weber, and this when at the time of the experiment the patients' feeling of well-being was diminished, for either psychic or physical reasons, as fatigue or headache. In other cases this was not found, and its absence is interpreted as a disturbance of the affective balance; "conditions of depression or tension may hinder the appearance of vasomotor reflexes."

Gregor and Gorn (5) contribute an extensive study of the psychogalvanic reflex in various mental disorders. In regard to the differential behavior of the reflex in the clinical forms investigated, they conclude that in catatonic conditions (stuporous) there is a diminished reaction in conformity with the general motor phenomena. Normal reactions, however, appeared in transitory, psychogenic stupors occurring in the course of catatonia. Terminal hebephrenics showed a loss of reaction. (It is not clear in just what sense these diagnostic terms are used.) The extent of the reflex is normal in constitutional inferiority. It appeared much lessened in mild conditions of excitement of hebephrenic or general paralytic origin. It is reduced in the depressions and increases with recovery, seeming also to distinguish manic from hebephrenic or catatonic excitements. Gregor is a tried worker in experimental psychopathology, but it would be easier to have immediate confidence in these and other findings of the study if the observations bore more evidence of rigid control. The sensibility of the instrument appears to have been much lower than the phenomena, especially those of body currents, are ordinarily investigated with. As the string galvanometer was used, more attention should have been paid to the reaction times.

Albrecht (1) complains of the lack of attention to physiological factors in the studies of the psychogalvanic reflex, which is justified in the literature that he mentions, but scarcely applies to all of it. The string galvanometer was used, with zinc sulphate electrodes, and *mirabile dictu*, he states quantitatively their resistance

and difference in potential. He rather favors taking the reflex from asymmetrical portions of the same side of the body. Higher intensities of current appear on the preferred side. He seems to have been the first to use simultaneously two galvanometers for the separate measurement of resistance and E.M.F. He does not accept the sweat-gland interpretation of the phenomena. The original conception of the psychogalvanic reflex as a "resistance" phenomenon is singularly appropriate when one contemplates the difficulty with which people learn about it. The author still deems it necessary to emphasize that it is a product of both change in resistance and body potential.

A series of association experiments with epileptics is published by Hahn (6). He lays stress on the importance with this group of not giving the stimulus words in any classified order. The results are but crudely worked out, though a special interest attaches to them in that they follow the same cases through many years. There are seven cases, but while each has a full individual report, there is no attempt to correlate the data in any way.

Kutzinski (12) presents, after a critical review of the literature, a study of how the association type is affected by experimentally induced "complexes," that is, so far as in the psychoanalytic sense a complex can be said to be induced by learning the contents of a brief story. It has an obvious relation to the work of *Tatbestandsdiagnostik*. A large variety of clinical groups are represented among the subjects. The determination of whether or not a response is here *Komplexbetont* is naturally more or less dependent on introspection, so that there was a special effort to avoid suggestion in questioning about this. As the more significant conclusions are rendered,

1. The complex reactions are but sparsely represented, and with a monotonous character.

2. The time-measurement is without special significance for ordering the reactions according to the present problem.

3. There is an interdependence between *Ausfallserscheinungen* and complex reactions, which confirm, but also elaborate the viewpoints developed by Jung and Riklin. Not only emotional complexes, but novel, recent ones, influence the number of mistakes.

4. The effect of the complex may manifest itself now in levelling, now in making objective associations internal. Which of the two factors preponderates, seems to depend not on the individual, but upon the type of disorder.

5. The predicate reactions, in the sense of Jung and Riklin, were not observed to increase under immediate influence of the complex. On the other hand, their number does increase in affective conditions.

6. In normal individuals, the association with the story and the awareness of it mostly run parallel; in these experiments the disproportionately great number of unconscious reactions is noteworthy.

A striking paper is the experimental investigation by Wiersma (21) with reference to retrograde amnesia. He formulates this phenomenon as the temporary or permanent loss of experiences immediately preceding the psychic or physical shock. Also it is observed that when the lost memories are recovered, the remotest ones return first. This fact gives the experimental *Anhaltspunkt.* Given a weak stimulus followed by a strong one, how is the former influenced by its proximity to the latter? Light stimulation was used, a falling screen exposing a small aperture and a large 150σ later. All of twelve subjects showed a greater threshold of stimulation when the strong stimulus followed, the mean inhibition for each varying from 54 per cent. to 243 per cent. As the 150σ interval was increased, the inhibitive effect diminished, being almost *nil* at three seconds. In the same way it was found that a threshold stimulus had to be exposed from 28 to 43 per cent. longer when strong stimulus followed than when it did not. Finally, different geometrical forms were exposed instead of threshold stimuli. The phenomena parallel those of a "psychogenic" retrograde amnesia. Their interpretation is given in terms of the theory of "central" and "peripheral" consciousness put forward by Heymans. A natural suggestion for further experiments would seem to be to use different sorts of primary and secondary stimuli, and if possible to avoid the difficulties of fatigue and adaptation incidental to light stimulus.

The study by Horwitz (9) is a continuation of the work carried on by Schneider, Busch, and Wolfskehl, and is most closely related to that of Mikulski. The exposure is of 9 letters, with the pendulum tachistoscope of Kramer, rather longer than usual, 130σ, the subject releasing the pendulum, and also noting the results himself. Introspective notes were made with special reference to the feeling of certainty and to particular associative cues; some of these *Merkworte* which are cited would be capable of psychoanalytic elaboration. Word exposures were similarly made with a new tachisto-

scope of Weiler's design, apparently embodying a principle applied some years ago by Dodge. Supplementary experiments were made with Ranschburg's technique. The total number of pathological subjects was 32. The results are discussed in relation to the previous work. The unfavorable effect of distraction is measured. The feeling of certainty is said to be nearly unaffected by either distraction or length of interval; distraction does, however, tend to make it less reliable. A peculiar finding is that in the distraction experiments with the hysterical subjects, the feeling of certainty seems to increase with the difficulty of the task, nor does its reliability suffer.

Isserlin (10) appends five or six pages in review of this study, discussing its relation to the more concrete, clinical issues of the problem; he appears to think that for giving a working insight into the deeper mechanisms of the disorders, the methods still leave much to be desired.

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HALLUCINATIONS AND DELUSIONS

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The literature upon these topics during the past year embraces experimental, speculative and imaginative studies, some leaning toward the philosophical, some toward the anatomical and chemical and certain ones clothed in the atmosphere of the bizarre. It is extremely interesting to note the large number of points of view from which the above problems are being attacked, the high hopes of the investigators, and the widespread applications which are being attempted, extending from the reform of medical practice to the establishment of a proper psychological basis for the problems of literature and philology.

Most important, perhaps, are the case studies. Here we find occasional infiltrations of Freudian influence. Karpas (6) analyzes a case of psychopathic personality showing few stigmata of degeneration and it was found to be in correspondence with similar cases described by Freud. The mechanism of the patient's homosexuality is as follows: She fixes her libido on her father; she then identifies herself with men; later she took herself as a sexual object. Psychosexual anæsthesia is explained as a defence mechanism against strong tendencies toward sadism and inversion. Heilbronner (5) depicts a case of a small farmer, aged 34, afflicted with

chronic or constitutional day-dreaming. This condition had continued through approximately 20 years. Beginning, as a child, to "build castles in the air," he finally spent a large amount of time in the practice, so much so that his brothers, associated with him in running the farm, believed he was shirking. He is however classed by the author as psychopathic—afflicted with "lability of personality"—on the following grounds: persistent phantasies, lack of affective tone in viewing certain repellent scenes in the phantasy, and his activity (in the phantasy) of avoiding himself. As against Bonhoeffer's similar case, the author found no loss of memory or ability to reproduce past experiences. The attitude had finally become normal for the patient. Although the evidence bears some relation to the Ganser symptom and to hysterical phenomena, it is not wholly in accord with them. It is a case of ingrained habit (*Gewöhnungsvorgänge*). Prince (12) analyzes a case of phobia for "church steeples and towers" which proved to be the visible symbol of the "ringing of bells," but without conscious association. Behind this lies a childhood tragedy, and self-reproach on religious grounds growing into a lifelong self-reproach, the psychological object of the phobia. Bunnemann (2) discusses pain of psychic origin, whether sensory or ideal—as in fear, anxiety, grief—and finds from a number of cases that it enters consciousness through association when the affective condition is heightened. The projection of the pain may be beyond the sense field and this is due to the fact that the projection field for all mental processes is ideal and only indirectly dependent upon stimuli. The argument for the teleology of pain receives a theoretical discussion, and as against Jodl, the author holds that pain is an indication that a recognized, envisaged, subjectively evaluated harm is working upon the organism. No reference is made to the work of Henry Head upon "referred pain."

Southard (14) reviewed 1,000 cases which came to autopsy at the Danvers (Mass.) State Hospital to determine whether "any delusions of a severe, essentially somatic type exist in patients having a normal sensorium." Of these 1,000, eight only were found in which the somatic delusion existed in pure form. An intensive examination of these cases is presented in this article, and the evidence for and against a somatogenic origin of the delusions is carefully weighed. The conclusions are limited to the cases examined, in which the author finds practically identical localization of the source of the delusion in a somatic lesion. Among these

1,000 cases Southard and Stearns (15) found 31 which showed evidence of allopsychic delusions and which also were free from gross brain lesions. Of these 31 however, 8 were excluded as having demonstrably morbid personality, 3 as closely approximating the imbecile type, and 4 on account of temperamental faults,—leaving a residue of 13 true allopsychic cases. Among these, the environmental factors were not sufficiently proven in 8, leaving 6 in which the environment is regarded as having been an influential factor in producing the delusion. The possible influence of personal factors is admitted, and the presence of cardiac and renal diseases is indicated. No general conclusion is drawn as to the extent to which the environment is responsible for the delusions. Southard and Tepper (16) tried to discover whether the paretic brain tends to falsify normal sensory returns from the soma. It is found that 57 per cent. of the paretic cases are possessed of delusions classed as autopsychic. 23 out of 37 cases exhibit also lesions in the frontal lobes. The results of the study are regarded as lending some color to the hypothesis that autopsychic delusions must be correlated with frontal lobe lesions.

Knauer and Maloney (7) give credit to Kraepelin for the first experimental investigations in which psychoses were induced by drugs to secure mental phenomena comparable to those of the insane. The authors made 23 tests by injection of sulphate of mescalin into the forearm. Consciousness remained unclouded, limited in a fashion similar to hypnosis, but differed from hypnosis in that while attention is narrowed "to one subject at a time, it successively passes from one subject to another." The effect of mescalin is compared to that of alcoholic intoxication; with visual hallucinations; with normal visual images and with central after-images. On the basis of introspections the authors arrange the mental phenomena, normal and induced, in serial order as regards reality. They run from weak to strong as follows:—visual ideas, mescalin hallucinations, central after-images, peripheral after-images, true objective reality (perception?). The hallucinations show no evidence of sexual coloring. Other results of the experiments are promised later—on the measurement of the power of perception, memory, weight sense, free and fixed word associations, visual acuity, power of reckoning, power to distinguish and simple motor reactions. Gonnet (4) finds that the alcoholic, after a prolonged abstinence, is subject to a residual delirium. This mental state is to be distinguished from that of the chronic alco-

holic by the absence of a progressive evolution, and by a susceptibility to persuasion and reason. Séglas and Barat (13) find that auditory verbal hallucinations evolve toward degeneration or convalescence through three stages. The term "hallucination" is reserved for those conditions in which the voice is clearly external and is assimilated by the subject to an external audition. Whenever the words seem to come "from within" the stage is "pseudo-hallucination" (following Kandinsky). And when the words are recognized immediately as coming "from without" and as being an expression of his own thought, the stage is "hyperendophasia." The progression or regression comes about through changes in the adjustment of the underlying automatisms, as shown in the stereotypy and neologisms of monologue. Masselon (8, 9) continues his studies of hallucinations in the several clinical forms of paranoid dementia, and in mania and melancholia. In paranoid dementia the tendency is to accept as true all presentations of sense or of image. As degeneration proceeds the feelings of reality and of personal identity fade. One cannot say that the subjective is substituted for the real, but both degenerate together and become, not true, but false hallucinations. Clinical experience has shown that it is difficult to demarcate mania and melancholia. But in general, mania shows kaleidoscopic hallucinations, in accord with the rapidity of thought and imagination. Patients easily distinguish the hallucinations from true perceptions and generally locate them in the head. They approach in character the imagery of reverie. There is a low degree of intensity and of objectivity. The hallucinations of melancholia likewise are weak and lacking in objectivity. They differ however in temporal course, being more nearly fixed and monotonous and are difficult of evocation. The author differs however from Kraepelin in his explanation of the manic-depressive psychoses. Mania and melancholia cannot be at basis exaggerated automatisms and psychic paralysis for the reason that in pure mania and pure melancholia we rarely find hallucinations and the hallucination itself is closely bound up with motor activity. The hallucination has its origin in the automatisms which bind presentations together and to the personality, on the one hand; and on the other, in a difficulty of judgment, thought, and the feelings of transformation and of dominance which prevent a clear recognition of phenomena. The author promises future studies upon the confirmed hallucinations.

Poyer (11) presents a single case of hypnagogic hallucination

in a girl of 14, showing a mystical character in keeping with her instruction in catechism. It is pronounced pathological since it is associated with a state of fatigue and nervous debility. The visions show a tendency to stereotypy.

Courbon (3) shows the importance of kinæsthesis in perception by the interpretations of delirium. Every object at the time of its perception produces both a sensorial and a kinæsthetic impression. In melancholia the kinæsthesis is altered resulting in difficulty of interpretation.

Pick (10), closely following Külpe's experiments on abstraction, finds in two of his patients excellent illustrations of the presence of a sensory quality and its consequent movement effects, when the object as such is not present to consciousness. As against Sigwart's solution of the origin of the impersonal sentence by an examination of the single case, the author, in the second section of his paper, directs attention to the possibility of evidence to be gained from mental pathology. Patients of the paranoid dementia form, and also dementia præcox, usually express their replies to questions in the impersonal form, and thereby indicate causation by mysterious forces or persons unknown. As soon as patients learn the true causes of their ideas, the impersonal form of expression ceases. Also in the normal, it is likely that the impersonal is not a form first learned, then acquiring meaning. But it is an expression analogous to those forms unconsidered by Sigwart (such as "*mich friert*"), which are meant to express a condition of which the cause is unknown, unfamiliar or mysterious. Another case brings the question of musical plagiarism into scientific consideration. The patient "recognized" the work of composers as his own. Upon hearing a Mozart concert, the musical forms were suffused with a "feeling of familiarity." The explanation of this in paranoia is to be found in the disturbance of personality. The music heard is not merely recognized but comes with a *quale* of having been self-produced.

Bahr (1) presents an outline of hallucinations, as taught by Professor Th. Ziehen in Berlin. In a pamphlet of 24 pages he attempts a logical and scientific orientation of the field of study and some of the methodological necessities of procedure. In diagnosis, for example, hallucinations must be demonstrated by distinguishing them from actual perceptions, from dreams and the memory of dreams, from illusions, from delusional explanations and from phantasms.

Zingerle (17) finds that cases of specific and limited lesion of the brain are more productive of scientific data regarding disturbances of the perception of the body; whereas diffuse lesions yield little but suggestions. When the content, as found on clinical examination, is absurd, it avails little to dismiss it as a "disturbance of intelligence, disturbance of orientation," etc. What factor or factors in the total sphere of intelligence are chiefly responsible for the evocation of the absurd content? That all sensory and imaginal elements are not equally significant in the complex is obvious and it is necessary to look deeper. Three cases are then intensively analyzed and it is found that case I shows a disturbance of the static sense; cases II and III show confusion of sides of the body,—all resulting in disturbances of orientation, dimensions of body and unity of spatial experience. The study shows familiarity with the literature of space perception.

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SPECIAL REVIEWS

Die Psychologie des Verbrechens: Eine Kritik. M. Kauffmann. Berlin: Springer, 1912. Pp. 344.

In his *Vorwort* the author of this volume expresses the belief that erroneous conceptions concerning crime and its causes are traceable in a large measure to the fact that it has not been made clear where and by what means we should study crime. He therefore proposes to discuss, in this book, the methods of investigation in this field and to point out the numerous sources of error which beset the student of crime. But before he launches out upon this program he devotes thirty-seven pages of the text to a brief discussion of a number of concepts which are frequently employed in the course of the work. Among these are the following: will, motive, heredity, degeneracy, moral insanity, inborn egoism of the child, etc.

Following this are sixty pages devoted to the discussion and criticism of various sources of information. The prison physician and the psychiatrist, the intelligence test and laboratory experiment, the physiognomy and the lies of criminals, statistics and their sources of error, all these are among the topics that are brought forward in this portion of the text. No one source alone is adequate to afford a knowledge of the individual criminal. The psychiatrist and the prison physician are especially liable to the errors of analogy. Mental tests and laboratory experiments are inadequate for the purpose for which they are intended, because many criminals are the victims of weak wills and love of ease and these are qualities that scientific tests do not themselves reveal. Furthermore, in the reviewer's opinion, the author makes a strong point when he urges that laboratory experiments, intelligence tests and other mental tests applied to delinquents behind the bars are likely to be misleading because there the criminal is not at his best; he is constrained, depressed and uncertain. To compensate for these and other shortcomings of the sources under discussion, the

investigator is driven by necessity to mingling with delinquents in freedom and to observing them in such a situation throughout a considerable period of time. Dr. Kauffmann has consistently pursued this method. In the volume under review he now and then refers to his stenographic notes, that were made when he was thus conducting his work, and quotes from them, *e. g.*, page 92, where he quotes a stereotyped phrase from the conversation of criminals which recurred many hundreds of times in his notes. This phrase was to the effect that the delinquent had not thought about the nature and possible outcome of his criminal acts; that it was "all his own fault," etc.

In the second division of the text the author discusses criminal types. One who has learned to know criminals in all situations, he believes, can, without doing violence to the facts, classify them in general terms as the vagrant type and the energetic type. In connection with his description of the first type he discusses the psychology of work; the mental, physical, and social characteristics of the vagrant and the prostitute; the alcoholic criminal; the criminal by opportunity and the kleptomaniac. Throughout this section the author makes use of the results of statistical and laboratory investigations. He believes that we are not justified on the basis of intelligence tests in drawing the conclusion that the manner of life of the prostitute can be traced either to inborn mental weakness or to acquired weakness of intelligence (*Intelligenzschwäche*, p. 129).

The second type of criminal includes the robber, the thief, the impostor, the gentleman swindler and the juvenile criminal. That such delinquents, on the whole, are inferior in intelligence to the groups in which they belong, Dr. Kauffmann believes, is wholly untenable.

There is more or less transition from one type to another. It not infrequently happens that at the fortieth or fiftieth year of age the vagrant becomes energetic or the thief a vagrant.

Finally in this part the author discusses a certain atypical group among whom are murderers. He believes that murder is usually incidental to the commission of other crimes excepting in those cases in which the act is done by the insane.

In the third portion of the text Dr. Kauffmann treats the causes of crime. There are individual causes such as the social impulse, improvidence, weakness of will, juvenile mentality, neurasthenia, alcoholism. On the other hand there are social

causes, the effects of education and culture. Even punishment may be a cause of crime (p. 250) inasmuch as, if it is improperly chosen and administered, its psychological effect may be, not to awaken ideals of good conduct, nor to renew allegiance to ideals but to embitter the spirit of the one who endures the punishment. The last section is devoted to the discussion of the prevention of crime including the psychology of punishment.

In the final portion the author discusses the penal law, the prevention of crime, and the reform of the administration of punishment. He has little faith in the indeterminate sentence for, he asks, how can any one determine that a convict, who is under the rigid restraint of a prison where he is not permitted even moderate freedom of self-expression, either is or is not fit to enjoy the freedom of normal life? At this point Dr. Kauffmann does not appear to realize what seems to many of us to be the fact that the difficulty in this instance can be obviated by administrative means. Give a prisoner the limited freedom of the outdoor prison farm, and the still greater freedom of the honor squad if possible. In such situations it should be possible to determine exactly whether he has become fit for normal social life or not.

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Inheritance as a Factor in Criminality. A study of 1000 cases of young repeated offenders. E. R. SPAULDING AND W. HEALY. *J. of Crim. Law and Criminol.*, 1914, 4, 837–858.

Inheritance as a factor in criminality is considered under two heads: 1, the direct inheritance of criminalistic traits in otherwise normal individuals; 2, the indirect inheritance of criminalistic tendencies through such factors as epilepsy, insanity, feeble-mindedness, etc.

Out of the 1,000 cases which form the basis of this study there were 668 from whom sufficient data concerning environmental and ancestral factors could be obtained to form an adequate basis for conclusions. Of these 668, 245 showed such well recognized foundation for criminalism as mental deficiency and epilepsy. These, therefore, are put in a group by themselves. The remainder consists of 271 cases in which there was no known criminality in the antecedents and 152 cases in which there was known moral defect in the preceding generation. Interest centers especially about the group of 152 offenders with criminalistic ancestors.

When these individuals are examined in detail, the predominating causative factors in the criminality fall into nine classes. For comparison between the two last named groups they are charted separately. Class 1 includes those cases in which there is inheritance of nervous instability. Class 2, those cases in which developmental factors predominate. Class 3, those cases in which environmental factors appear to predominate. Class 4, in which there is a combination of heredity and bad environment. Class 5 includes those who have a bad inheritance and who have suffered in the course of development. Class 6 includes bad environment and unfortunate developmental conditions combined. Class 7 includes those cases in which the difficulty appears to be due to innate disposition not traceable to inheritance such as instability of purpose, suggestibility, temper, etc. Class 8 includes those who exhibit at least three causative factors of importance. Class 9 includes 15 cases which, after assigning the others to the above classes, remains suggestive of criminalistic inheritance.

One of these cases, more strongly than any other, suggests the direct inheritance of criminal characteristics. A close analysis of the family history, however, reveals an irregularity dating back to the early life of the child's mother which strongly suggests the possibility of the inheritance of an hysterical nature which promoted the development of criminal characteristics.

On the whole, it appears that in 35 per cent. of cases there is predominating a transmission of mental or physical defect among these delinquents and that in 9 per cent. such inheritance is partly responsible for the criminality. This makes a total of 44 per cent. in which heredity is undoubtedly responsible for crime. The authors have found no proof of the heredity of criminalistic traits as such. They foresee that by "other studies by the eugenists and advances in medical and psychological knowledge, crime will be found to be indirectly related to heredity in ways most important for society to recognize."

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La conscience morbide. Essai de psychopathologie générale. C. BLONDEL. Paris: Alcan, 1914. Pp. 336.

The seven cases of "morbid consciousness" here presented, are roughly diagnosed, or some characteristics indicated as follows:—(1) Hypochondriacal preoccupation; (2) mental confusion; (3) obsessions and cyclothymic constitution; (4) hypochondriacal, anxious

and disturbed; (5) systematic chronic delirium; (6) melancholic depression; (7) anxiety at menopause.

This group of more or less definitely alienated persons is studied as a group in order to ascertain what constitutes the difference between the normal and the morbid consciousness. The author is convinced that these differences cannot be discovered by the methods of analytical psychology. He claims to work with the methods and to use the criteria of the sociologist.

The essential difference of the morbid consciousness consists in the inability to use the collective images and concepts of the race as designed. The morbid is unable to crowd down into the background of his consciousness the purely individual or purely psychological elements of his experience. He therefore puts a subjective meaning into his concepts. Hence arise all his awkwardnesses and his motor and affective paradoxes.

Again the author characterizes his group as misusing the psychological,—as failing to use it merely as a means of passing from the physiological to the social, as does the normal consciousness. In this he seems simply to say in a more technical way that the morbid consciousness of which he treats is a kind of defective development wherein the higher mental development, which means socialization and character-formation, has not taken place. In other words the result of the study seems to be that the "morbid consciousness" is not socialized and lacks capacity to become socialized.

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L'hystérie et son traitement. P. SOLLIER. Paris: Alcan, 1914. Pp. x + 298.

This work is a complement of the author's earlier *Genèse et Nature de l'Hystérie.* As the necessary foundation of his "treatment" he must needs explain and amplify his "physiological theory" of hysteria. So while the work is especially designed for the use of the practitioner, it interests the psychologist also, in so far as he discusses the place of the mental factors in the etiology of hysteria.

The author regards his physiological theory as in no sense opposed to, or destroying, Janet's psychological theory. On the contrary he regards it as the necessary correction and completion of the same. He freely admits that the somatic phenomena may be made to appear and disappear by purely moral and psychological

causes. But he maintains that the psychological causes are not the only ones. Hysteric phenomena are produced and disappear by the action of factors which are purely physical. Hysteria is a *functional disease of the cerebral cortex*, and cannot be explained by any merely psychological theory. In fact all the psychological phenomena which are presented as causes are, in reality, effects or manifestations of the cerebral trouble which constitutes hysteria. The essence of hysteria is a kind of sleep of the cerebral centers (*engourdissement cérébral*).

About one fifth of the work is occupied with a discussion of the nature of hysteria. The rest is treatment.

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Diagnostic Symptoms in Nervous Diseases. EDWARD L. HUNT. Philadelphia: Saunders, 1914. Pp. 229.

This little work on neurological diagnostic methods contains chapters on deformities, paralyses, tremors, atrophic disorders, gaits, ataxia, convulsions, sensation, reflexes, the eye, disturbances of speech, aphasia, and electrical reaction. Although not strictly psychological, the consideration of these topics has interest for the psychologist, especially in view of the frequent necessity of determining mentality from reactions. The variety of abnormalities of action which are found in various nervous diseases are given in this book in a convenient and brief fashion. The chapter on sensation is unfortunately extremely short and devoted entirely to the sensations from the skin and the underlying tissues. Head's views are followed here, although it does not appear that the student will be able, by means of the directions, to carry on the tests with facility or exactness. The chapter on aphasia is one which is written from the older viewpoint and does not take into account those conditions which Marie and other have insisted upon. It is not to be expected in a book of this character that all exceptions should be noted, but on the other hand, it appears to the reviewer pedagogically bad that frequently the statements are made too definite. The discussion of some of the topics is not particularly complete, but this is not to be expected in view of the object of the volume as a help to students. On the whole, however, the book is to be recommended, although it classifies the symptoms in accordance with diseases, and is, therefore, more suited to the needs of the medical practitioner. S. I. F.

A Clinical Manual of Mental Diseases. FRANCIS X. DERCUM. Philadelphia: Saunders, 1913. Pp. 425.

To the student this work of Dercum will especially appeal. It is a clear exposition of the different forms of mental disease, mostly dealt with in accordance with the classification of Kraepelin. The book deals not only with the various forms of mental diseases, but includes certain of the borderline states with which the general practitioner, more frequently than the psychiatrist, comes in contact. The psychological portions of the book are neither particularly valuable nor exact, the chapter on the "psychologic interpretation of the symptoms" being largely a discussion of Freudian principles. S. I. F.

Pain: Its Origin, Conduction, Perception and Diagnostic Significance. R. J. BEHAN. New York, D. Appleton & Co., 1914. Pp. xxviii + 920.

For the clinician there is perhaps no one symptom which is of such great importance as pain. It is found in a great variety of diseases associated with a number of other symptoms, but frequently it is the only symptom which is apparent and at times it alone leads to a direct diagnosis. It is also the most effective symptom leading to the consultation of the physician by the patient. Because of these facts the consideration of this symptom is of very great importance in clinical medicine, and Behan's book is an attempt to include in a single volume all that the physician needs to know regarding it.

The present work deals with the subject very largely from the clinical aspect (28 chapters) but also partly from the general psychological aspect (7 chapters). For the psychologist who does not hesitate to accept facts from and who may be interested in psychopathology the clinical chapters are, however, of considerable importance. Here will be found descriptions of the localizations, general characteristics, and intensities of pain experienced by patients with different pathological conditions of the heart, circulatory system, glandular systems, nervous system, etc. In this part individual chapters have been written by specialists in the diseases of the nervous system, the eye, the ear, the nose, and the pharynx.

Although the treatment of the general portion is neither complete nor satisfactory from a psychological standpoint, it is perhaps made purposely simple and plain for the general practitioner. It is,

however, to be regretted that the statements are not always in accordance with the best modern physiological and psychological usages. Thus, the use of the term perception is an indication that the author has not felt bound by any considerations of historical and scientific terminology. He says that "there are two states of perception . . . of pain sensations . . . anæsthesia and . . . hyperæsthesia." It would have given the book value had the author concealed his own views and sought for these chapters the help of specialists as he did for the other special chapters which are noted above.

Not only are the symptoms of pain in the different diseases noted but such topics as subjective pain, habit pain, tenderness, reference of pains, etc., are discussed. At the same time due consideration is given to some of the factors which modify pain production, such as the mental and the physical, and there are discussions of the reactions of the respiratory and circulatory systems, and of the trophic and temperature changes which are frequent concomitants of pain. Notwithstanding the author's apparent lack of knowledge of recent psychological facts, there are to be found in this work many clinical facts which the psychologist may profit from and throughout the book there will be found many suggestive discussions.

Not the least valuable portion of the work is the list of about twelve hundred references which take 63 pages of space. These, as may be expected from the general character of the book, are largely clinical. In some cases the references are not as exact as they might be, but the few errors which have been noted do not reduce the value of this part of the work to any great extent.

S. I. F.

Psycho-Analysis. P. JANET. *Proc. XVII Intern. Cong. of Medicine*, 1913, Section 13, 13–64.

Abandoning for the time being, the descriptive and nosological methods of dealing with mental disorders, psychiatrists have within recent years devoted more attention to analysis of their cases and interpretation of the symptoms presented and none of the systems advocated has aroused more discussion than the psychoanalytic method. We have had, on one hand, the protean activities and the infectious enthusiasm of the founder of the school, Freud himself, combined with his scarcely less enthusiastic disciples and followers who differ in minor points, but accept the theory as a whole, Jung,

Stekel, Ferenczi and others, and, on the other hand, the outbursts of scientific and virtuous indignation of which an article by Dercum may be taken as fairly typical.

It is illuminating to turn from such diametrically opposed views to the criticism by a man who cannot be indicted as an opposing fanatic. The work of Janet is well known and bears a striking similarity to that of the Freudian school which it in general antedates.

In his contribution Dr. Janet first of all alludes to the analytical system which he designated as "psychological analysis" and states that on his first acquaintance with "psychoanalysis" he failed to see any startling variations in this new method. He particularly discusses his theory of traumatic souvenirs which he compares to the sexual traumas of Freud. In this connection he quotes several cases to which he had applied his own method with the resulting discovery of etiological facts in the previous psychic life of the individual.

It is noteworthy that in describing the methods he has used in examining these cases for years, he says: "It was necessary to examine even the hidden memories which the patient preserves in his mind without being aware of them himself. One was led to suspect them sometimes by his gestures, by his attitudes, his intonations," etc. This of course will be recognized as identical with the phraseology of the Freudian school. Janet states that after a number of exhaustive investigations he finally admitted the rôle of the traumatic souvenir in certain cases, but only in certain cases. It was at this point in his study that the investigations of Breuer and Freud came into prominence and he was at first inclined to regard them as interesting confirmations of his own studies. He found at first only a few changes in terms: psychoanalysis for psychological analysis, complex for psychological system and catharsis for disassociation of fixed ideas.

An increasing familiarity with and a fuller development of the new method showed that it contained new ideas. These were not, as some thought at first, such things as the insistence upon the prolonged examination of the patient. [This had been emphasized by Janet many times. In fact the examination procedures advocated by psychoanalysists such as placing the patient in a certain position and instructing him to talk on while the physician listened, Janet criticizes because it places the patient on his guard.] Nor was it such things as the association tests whose value he thinks is

problematical. He finds the first striking differences in the psychoanalytic method in the transformation of partial hypotheses into generalizations. Other observers, as Charma, 1851, and Maury, 1861, had supposed that many dreams represented the gratification of desires; Freud said boldly that all dreams do. Psychological analysis grants that the traumatic souvenirs combined with other conditions play a part in determining the symptomatology of certain neuroses; Freud states that it is the *sine qua non* of all neuroses.

But the first real modification of Janet's own studies was the theory of the psychoanalysts that when an unbearable idea was repressed into the subconscious a fear was added to it, with the consequent generalization that every morbid fear is a repressed desire. Janet states that he himself fails to see how a simple effort of the will such as is exerted in repressing a disagreeable or unbearable thought can give rise to phenomena resembling the subconscious phenomena of hysteria, but he can see how repression might play a very interesting rôle where a depression already exists or the field of consciousness is narrowed. He says: "The psychoanalysis does not embarrass itself with these subtleties because it assumes, if I do not deceive myself, a totally different point of view. It adopts two notions, that of transference and that of subconsciousness by repression, and considers them as fundamental notions entering into the definition of every neurosis. These definitions being admitted once for all, the psychoanalysis limits itself to seeking in what manner and by following what symbolic interpretation it is possible to connect a symptom with those fundamental notions of transference and repression. One is astonished to find the psychoanalysis interpreting facts as simple symbols which one transforms at will, as though it is convinced before all study that there is behind these facts a transference and a repression without which the neurosis would be impossible."

Many examples of this mode of interpretation can be found in the works of this school. It is well known, for example, that certain neuropaths, the hysterics and the psychasthenics, manifest a very peculiar and sometimes bizarre attachment for the physician who has succeeded in gaining some influence over their minds. This attachment manifests itself in various ways and seems to depend on very diverse sorts of psychological motives in which according to the case suggestions, abulias, the incapacity to form conclusions, the need to be understood, the need to be directed and above all the need to be excited, so important with those who are depressed,

take part. The psychoanalysis explains the facts much more simply by the transference of a sentiment of love which the subject had felt for another person and which he now transfers to the physician. Suggestion and hypnotism are then very simple phenomena which consist in the transference of the sexual tendencies of the complex "child-parent" to the complex "subject-hypnotizer." It is evident that if one admits once for all that every exhibition of docility whatever may be a symbol of erotic sentiments, that in each neurosis there is an unconscious transference of something, it is possible to explain the thing in this manner.

When the psychoanalyst speaks of sexual troubles he does not use the word in any physical or physiological sense, but refers to sexual adventures attached to which are painful memories. This, of course, has long been recognized as contributing to hysteria and other borderland states, but here again comes a bold generalization: the sexual troubles are not one of the causes of the malady, but the essential and sole cause! Janet seems disposed to agree with other observers, such as Loewenfeld and Ladame, that sexual disturbances occur in neuropaths in about three fourths of the cases, but not in all cases, as Freud states, and he adds that perhaps the Viennese atmosphere is somewhat more conducive to sexuality than that of Paris.

Janet also protests against the misuse of words by the new school as exemplified by the application of the term "love" to all varieties of emotion and he doubts that some of these emotions are at all allied to the sexual in spite of the symbolic construction which may be placed upon them. Janet designates some of these constructions as arbitrary and says they only show how the thing might be explained if the sexual origin of all neuroses is proved, which is by no means the case.

In conclusion Janet sums up the situation in a sentence: "I see clearly that it is necessary to have *faith* in order to understand well the symbolic interpretations of psychoanalysis." He also likens the indefinite application of the term "sexuality" to the infinite utilization of the term "suggestion" thirty years ago. He admits that the Freudians have cured millions of sick, but so have the Christian Scientists and the followers of other cults, but how about the millions who remain ill? And how about the persons who practice the panacea of the psychoanalytic, and are or become neuropathic?

His chief objections then to the psychoanalytic school are its

unproved generalizations, its mystic or ambiguous terms, its too loose application of the term sexuality and its often impracticable therapy. The contributions to psychological analysis which he acknowledges to be of value are the studies of mental evolution in childhood and of diverse forms of sexual sentiment.

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The Psychoneuroses and Their Treatment by Psychotherapy. J. DEJERINE AND E. GAUCKLER. (Trans. by S. E. JELLIFFE.) Philadelphia: Lippincott, 1913. Pp. xiii + 395.

"With the establishment of firmer foundations, it became worth while to delve into psychic problems, with some hope of sound deductions and practical results, and within the past few generations we have seen scientific medicine take its place in this domain heretofore left to the thousand and one uninformed and quasi-scientific cults which have for centuries constituted parasitic foci in every community" (p. iii). This statement, made in the translator's preface, expresses the mission of the book before us. A glance at its table of contents shows the systematic way in which the field of unusual or abnormal psychoneuroses and their treatment is covered and a careful reading of the text bears out this indication. The scheme of presentation is embodied in the last three paragraphs of the Introduction (p. xiii): "The first (part), which is *analytical*, will be devoted to the study of the functional manifestations, that is to the study of all the symptoms which are observed in the course of the psychoneuroses, whose exact nature we wish to ascertain. In the second, the *synthetic*, we shall endeavor to make plain the general mechanism of the foundation of the psychoneuroses, as well as their variations and nature. In the third, which is *therapeutic*, will be set forth the psychotherapeutic proceedings and helps which we feel are the only measures which should be used in the treatment of the psychoneuroses."

In the first part a chapter is devoted to each one of the following groups of functional disturbances: digestive, urinary, genital, respiratory, cardiovascular, cutaneous, neuro-muscular, an- and hyperæsthesias, sensory, nervous, and psychical disorders. The eleventh and twelfth chapters deal with the relation of functional manifestations to general organic states and with a diagnosis of the symptoms involved.

The second part is called a "synthetic study of the psycho-

neuroses and their functional manifestations." While the first part gave a detailed description of each separate symptom manifested in a psychoneurosis, the second part aims to consider the psychoneurosis as a total state. After a discussion of the rôle of the emotions in diseases of the nervous system, neurasthenia and hysteria are described at length in the course of several chapters. Neurasthenia involves an "emphatically constitutional predisposition," in which an emotional tendency, a "taking things to heart," emotional fatigue, disturbances due to auto- and hetero-suggestion, and "symptoms of all kinds which are the immediate or remote results of functional troubles previously created," are the characteristic factors. Hysteria, on the other hand, is an "emotional discharge," with little suggestive influence in the matter of the initiation of symptoms, small consideration or knowledge of the symptoms involved, and unstability of mental constitution. In both cases emotion is directly or indirectly responsible for the psychoneuroses, but the outcome in terms of the symptoms is different. The essential features of the psychoneuroses are (p. 284): "1. A mental and moral foundation which is either constitutional or acquired, and due to some emotional stimulus. 2. Neuropathic symptoms properly so called, or functional manifestations, grafted on to the psychic stock which has hitherto been established. 3. Additional phenomena, expressing the persistence of functional manifestations in the organs."

The third part concerns itself more directly with the general problems of psychotherapy: the tendency to counteract the pathogenic factors rather than the outward manifestations, the individual and social influence of hypnotic treatment, the general relations of physician and patient, specific treatment of functional manifestations, and the insistence on strict psychotherapy without recourse to fictitious medicaments. The main thesis of the book seems to be the insistence on the influence of the emotions as a provocative factor in the initiation of the psychoneuroses.

A particular virtue of the work is the complete description it gives of pathological cases which are cited as illustrations under each section. The style is virile, in fact trenchant in places, and the general topic seems to be comprehensively treated. If any negative criticism can be formulated, it would find expression in the statement that very often psychological concepts are rather carelessly or ambiguously handled. An instance of this, picked at random from a number of possible cases which have been noted,

is found in the remark (p. 223): "After having seen what are the immediate psychological actions, we would like to continue the discussion by inquiring into the later psychological actions exercized by the emotions." That the translation appears to be well done is attested by the fact that the work does not read like a translation.

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UNIVERSITY OF ILLINOIS

BOOKS RECEIVED

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NOTES AND NEWS

Dr. William H. Hickson, who has been associated with Dr. H. H. Goddard at Vineland, N. J., has been called to take charge of a research laboratory connected with the Court of Domestic Relations of Chicago.

The first number of a new magazine, *Zeitschrift für Individualpsychologie*, appeared in April. It is edited by Dr. Alfred Adler and Dr. Carl Furtmüller, of Vienna, and is published by Ernst Reinhardt, Munich, Germany. It will be devoted to studies and discussions in individual psychology, including psychotherapy and pedagogy.

We have received the first number of the *Zentralblatt für Psychologie und psychologische Pädagogik (mit Einschluss der Heilpädogogik)* which also appeared in April. The *Zentralblatt* is edited by Dr. W. Peters, of Würzburg, with the coöperation of an international board, and is published by C. Kabitsch, Würzburg, Germany. It will contain only summaries, not critical reviews, of articles and books dealing with psychology, pedagogy, physiology, psychiatry, mental hygiene, etc., which are of interest to psychologists.

The responsibility for the continuation of the work of the Chicago Psychopathic Institute has been assumed by the authorities of Cook County, and the work will henceforth be carried on officially in connection with the Juvenile Court of that county. Dr. William Healy will remain in charge of the work of the Institute, and Augusta F. Bronner, formerly of Columbia University, continues as assistant director.

At the University of Washington an entire building has been secured for the use of the Psychological Clinic which is under the direction of Professor Stevenson Smith. Madge W. Wilkinson has been appointed assistant in clinical psychology.

Dr. H. L. Hollingworth, instructor in psychology at Barnard College, has been advanced to the grade of assistant professor.

Announcement is made of a new journal, *Archiv für Frauenkunde und Eugenik*, dealing with the medical, biological, physiological, pathological, psychological, etc., conditions of women, under the editorship of Dr. M. Hirst, of Berlin. The *Archiv* is published by C. Kabitzsch, Würzburg, at M. 16 a volume.

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THE

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GENERAL REVIEWS

VISUAL SPACE

BY GEORGE M. STRATTON

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Degenkolb (4, 5) treats of the personal differences which appear in attempting to bisect a line—personal differences which promise, he believes, to have value for the diagnosis of cerebral disturbances. The line to be bisected is set at various angles upon a wall, or the top of a table and a fresh determination is made for each of the 18 or 36 positions which it occupies as it boxes the compass. And the results he thus obtains for each person are expressed in the form of an interesting graph, made by plotting in all directions around a central point the amount and direction of the error for each of the angles used in the original experiments. A line connecting these points gives a surface of various sizes and shapes, and with various directions of elongation and of nicking,—a surface which he calls the "*Raumumgangsfeld*."

He has experimented upon a number of patients with symptoms of disturbance of the aural labyrinth, and upon normal persons whose labyrinths have been artificially stimulated by rotation or by the galvanic current, and finds certain characteristic developments of the graph according to the nature and severity of the disturbance. The form of this graph or "field" differs for the same person under various conditions, and yet maintains a notable constancy of form—although not of size or of direction of elongation —for the same person. Persons are grouped by him according to the types of field which they display. The form of the "field" is modified not merely by the disturbances already noted, but ac-

cording as the bisection is made by the subject's right hand or by his left hand, or by the experimenter's hand guided by the word of the subject; it is modified also by the position of the head in relation to the neck and trunk as well as by the position of these other parts of the body. Indeed Degenkolb claims for his method a remarkable nicety and sensitiveness. These and various other normal and pathological observations point, so Degenkolb believes, to the existence of a special centripetal tract assumed by Sachs, passing to the parietal lobe,—a tract not concerned with light or color but only with sensations from the ocular muscles, the spinal joints, and the vestibular nerve. This hypothetical center in the parietal lobe, in which are represented (he supposes) the "goals" of all our ocular movements, Degenkolb proposes to call the "parietal retina."

Osborn, an expert on the identification of handwriting and of legal documents generally, sets forth in a brief and popular way, (13) the differences which observers show in the recognition and discrimination of such forms as are found in handwriting and typing. Material is described and illustrated for testing persons on their ability rapidly to select specimens that are from an identical source and to discriminate them from specimens from other sources. With different persons the number of the errors made and the length of time required varies greatly.

Mayfield (12) applies to the visual field the statistical method used by Urban with lifted weights. Experimenting upon the visual comparison of lines, he finds that some persons underestimate, while others overestimate; and therefore he can find no constant direction of error. The discriminative threshold for such lines has a mean amount of about 1.25 to 2.0 per cent. of the standard line he used.

Hoppeler (10) sought to determine the elevation at which one would judge a point of light in a dark room to be horizontal to the eye. With twenty observers of various ages and degrees of education, he found this elevation to be in general actually below the horizontal, the limits of the subjective horizon for all his observers being 2° above and 5° below the reality. The author would explain this result by the fact that the ocular muscles find their state of rest when the line of sight is slightly lowered,—that is, when the eye is in "the primary position" of the eye; and also because there is so little practical need of estimating by eye alone the precise horizontal direction.

Angell and Root (2) have ingeniously measured the distance to

which the after-image is projected in the field of the closed eyes. With the different persons on whom they experimented, this distance varies from about 6 cm. to 17 cm. Angell (1) discusses the discrepancy between these findings and those of Meyerhausen, whose measure of the distance was 2 meters. Angell, even when using Meyerhausen's method, is unable to arrive at any such result, nor is he able to explain the discrepancy. He lays some stress on the fact, however, that in Meyerhausen's case convergence seemed to have played a far more important part than it did with any of Angell's own observers.

A number of experiments of the year are as usual concerned with binocular depth. Dufour who annually reports facts, many of which are well known, this year emphasizes (6, 8) the amount of "play" which there is in what we call the "identity" of retinal points; he finds that impressions upon the two retinæ may fall upon points that are without geometrical or anatomical correspondence, and yet be binocularly fused. Such fusion sometimes occurs after the surgical removal of the lens from one eye and when there has been a correction by common glasses; although now the images in the two eyes differ in size. He also takes stereoscopic cards and rotates one of the views in its own plane to find the limit beyond which the two views can no longer be combined. The eye, he finds, will tolerate a rotation of about 10° in either direction, a total of 20°; and this he adduces to show how little of anatomic or geometrical precision there is in the "identity" of retinal points. He seems quite to overlook how much of this angle is compensated by actual torsion of the eye-ball, and cannot therefore represent the retinal disparity which binocular fusion must overcome. He finds, however, that this angular limit beyond which the stereoscopic views cease to combine varies from day today, is markedly increased by practice, and is diminished by fatigue. The rôle played by fatigue in producing diplopia in his own case when there is latent heterophoria is also reported by Dufour (7).

Binocular fusion with no retinal disparity whatever,—the converse of that with which Dufour was mainly concerned—is the theme of Werner's report (14). Presenting to the two eyes patterns that are geometrically identical, he rediscovers the well-known fact that the apparent distance and size of the resultant object is affected by changes of convergence. When the patterns are such as to permit binocular fusion of certain parts only, so that these appear sharp and the rest is blurred, these sharper lines obtain what he

calls a "purely optical," as distinguished from an "oculomotor" stereoscopy.

Blumenfeld's investigation (3) is a development, in several new ways, of Hillebrand's "*Allee*" experiment, which has for years been a mild storm-center. The reader will recollect that when an observer looks between two rows of objects going off into the distance from his eye, and attempts to arrange these so that they shall seem to form two exactly parallel rows, certain remarkable errors occur, which for Hillebrand indicate how important is convergence for the estimation of the distance-apart of the successive pairs of objects that form the "*Allee*." Blumenfeld, after a historical survey, sets forth his own experiments which bring out afresh the fact that the two rows of objects must actually diverge as they go into the distance if they are to seem parallel; and moreover must be not straight lines, but curved; Blumenfeld finds that the direction of the curvature, however, differs with the mode of judging the relation of the receding objects, being mutually *inward* at the center when the subject attends to the general direction of the rows and tries to make these directions the same; but the curvature is *outward* if he tries to compare, one by one, the distance between the successive pairs of objects forming the two rows, and to make these distances equal. Since the form of the resultant "*Allee*" is thus so dependent upon the character of the attentive act, Blumenfeld contends (and, it would seem, justly) that it is idle to make convergence the sole determiner. Less important, although adduced by Blumenfeld to support his position, are his farther findings that the form of the "*Allee*" is influenced by the position of the eyes,—whether they are in the plane of the objects to be compared or are above them; and moreover shows the same general kind of variation when the observer uses but one eye as when he uses both. Blumenfeld is on the whole therefore opposed to Hillebrand's inferences, and looks sympathetically at the general method of explanation that makes much of the attention, as in the paper by Jaensch reported a year ago. Blumenfeld points out the interesting mathematical incongruity in his observer's judgments, inasmuch as an arrangement of points giving apparently parallel lines is nevertheless not seen to the observer to be equidistant; that is, the judgment of the *direction* of the rows does not exactly harmonize with the judgment of the lateral *distance* of their members.

Katz (11) found that in looking at paintings with a certain friend the depth-interpretation of the two observers was markedly

different. This led Katz to careful experiment upon his companion, using various drawings that in different degrees suggest a third dimension. The outcome is, that this subject is far readier than are most observers to accept such figures as "flat." And yet by willing it he can give them an exceptionally vivid plastic character. There is in his case an absence of the spontaneous interpretation of the signs of depth, possibly connected with the fact that he is a visualizer of a high order, but perhaps rather due to his special mode of attention. Katz points out the similarity of these findings to those of Karpinska, reported a year ago, who, working now with identical, now with disparate stereoscopic cards, found some individuals far more prone than others to give to these pictures a plastic form. Katz believes that his results tend to reduce the importance of lateral disparity for the perception of depth.

Dunan's long contribution (9) deals more with the psychology and even the metaphysics of space in general, and more especially with the long-standing conflict between Nativism and Empiricism. Defining Empiricism as the assumption that a given extension is perceived successively and by putting together the parts, while Nativism is the view that in our representation the whole exists before the parts, he surveys the discussion of space in modern philosophy. Expressing finally his own belief, he finds that in every attempt to define position—the position, say, where the *Titanic* went down—we push outward step by step toward a purely ideal system of positions which do not "exist" at all and yet are by no means mere nonentities. This ideal non-existent absolute space is therefore logically presupposed by us in all existent and empirical spaces. Thus he arrives at and defends anew a form of "Nativism."

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TACTUAL AND KINÆSTHETIC SPACE

BY HELEN D. COOK

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Ponzo is continuing his work on cutaneous localization. He presents a study (4, 8) of the localization of sensations of warmth and cold. Selected cold and warmth spots on the finger, forearm, and upper arm were localized by the Weber method, and the results compared with similar tests in the localization of pressure and of pain sensations. The results show that (contrary to the usual view) pain is the most accurately localized, next pressure, then cold, and lastly warmth. For all four sensation qualities, the errors of localization are both more numerous and larger in the longitudinal than in the transverse direction. The author calls attention to the fact that this agrees in general with his earlier findings on the error of localization in the intercostal spaces,[1] since in the arm the largest nerve-trunks run in the longitudinal direction. Nervous innervation in the forearm is, however, much more complex than that of the intercostal spaces. Ponzo's study (7) of the effects of practice on the accuracy of localization merely repeats material already reported in another place.[2]

The same author (5, 6) attacks the problem as to whether or not a tactile sensation comes into consciousness with its "local sign" already given, i. e., whether the consciousness of the localization of a touch sensation is simultaneous with the consciousness of the quality

[1] *Arch. ital. de biol.*, 1911, 56, 193–201; reviewed in this BULLETIN, 1913, 10, 259–261.

[2] *Riv. di. psicol.*, 1912, 8, 390–407, reviewed in this BULLETIN, 1913, 10, 260.

of the sensation, or whether it involves a more complicated process, and therefore comes into consciousness after the sensation itself has been registered. His method is that of measuring reaction times: the length of time taken for a "localization reaction" is compared with that required for a simple sensorial reaction to the tactile stimulus. In the sensorial reaction the subject was instructed to react to the "tactile quality of the sensation"; in the localization reaction, he reacted "at the moment of the appearance in his consciousness of the representation of the space touched." Subjectively both of the two subjects tested thought that the tactile impression itself and the awareness of its localization came into consciousness simultaneously, but the numerical results show that the localization reaction is slower than the sensorial by an average of about 50 σ. Further experiments show that the reaction time for distinguishing two points further apart than the two-point threshold is longer than the simple sensorial reaction, but shorter than the localization reaction. Ponzo concludes that the process of distinguishing between two sensations in more complex than that of sensing one sensation, and the process of localizing a sensation is still more complex. He thinks that "the results of the experiments exclude . . . the possibility of a localization simultaneous with the simple perception of a tactual sensation," but notes that the problem of the localization of a touch sensation is entirely distinct from that of the spatial nature of the sensation itself. The former has to do with spatial *order*, and probably involves rather complex associations; the latter with the bare spatialness of a touch sensation, which may well come into consciousness simultaneously with the quality of the sensation.

Benussi (2) offers a preliminary investigation of illusions of movement in the field of touch sensations, analogous to the well-known ones in the visual field. Two points of the skin (4 to 10 cm. apart) were stimulated successively, with intervals between the two stimulations varying from 2 sec. to 1/20 sec. With the long intervals the subject felt two distinct sensations, referred to two different sources. With the shortest intervals either he felt one sensation which apparently lay between the two points stimulated, and sometimes seemed to be revolving there in a tiny circle, or else he had the impression of a single object moving quickly across the skin. With the intermediate intervals between the two stimulations one object seemed to jump quickly from one point to the other. At the same time the two points appeared to be closer together than they really were.

The threshold for the perception of movement across the skin is investigated by Basler (1). He finds that the shortest distance at which the movement is perceptible is .02 mm., the slowest rate 0.1 mm. per sec.

Mme. Lipska-Librach (3) reports a lengthy study of 420 school children of Brussels in regard to the relation between intelligence and various sorts of sensory acuity. In the cutaneous field she investigates the two-point threshold, and finds that the more intelligent children show a smaller average threshold than do the less intelligent, regardless of age (9 to 12 years). The difference is small, however, in comparison with the wide variations among individual children of each grade of intelligence, and therefore a determination of the two-point threshold cannot serve as a test of intelligence.

The only work on kinæsthetic space perception is that of Szymanski (9), who is interested in the sense of direction alleged to be shown by various primitive peoples, and lacking in European races. His work is suggestive for method rather than for results obtained. He tests the sense of direction of Polish school children (13 to 15 years of age) by the simple device of having them attempt to walk straight forward (with eyes and ears closed) for a distance of 15 m., and then turn and come back to the starting-point. The floor over which the subject walks is marked in squares, so that each step of his progress can be recorded. The method is thus relatively accurate in spite of its simplicity. As the author himself suggests the results obtained by him can be interpreted only in comparison with corresponding tests performed on people of other countries and races.

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SPACE ILLUSIONS

BY HARVEY CARR

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Barenne (1) presents an historical account of the facts and theories of alloæsthesia, which is defined as the localization of a tactual sensation on the side of the body opposite to that on which the stimulus was applied. Experiments were performed on animals. The phenomenon occurred with a unilateral section of the sensory spinal tracts, coupled with a hyperexcitability of the posterior grey substance lying caudal to the hemisection, which excitability was induced by applications of strychnine.

In Stevens's illusion (11) two observers sleeping in a tent overlooking the water awoke at the same time with the feeling that the tent and cots were floating on the water. The illusion was visual as well as organic. The tent was placed on a platform fastened to trees and both the subjects had passed the preceding evening on the water. The organic after-effects of the boat's motion was stimulated by the swaying of the trees to which the platform was attached. The illusion occurred after waking and was not preceded by a similar dream.

The attempt (15) is made to correlate the suggestibility of defectives to the size-weight illusion with the mental age per the Binet scale. The percentage who failed because of a lack of comprehension of the task decreased with the mental age and became zero at 4 or 5 years. The percentage of failures with comprehension increased at first and then decreased to zero with age, while the percentage subject to the illusion increased with age, becoming 100 at 8 years.

Starting with the known illusion that of two equal circles placed within an angle, that nearest the apex appears the larger, Ponzo (9) finds that the overestimation persists when one circle is placed outside the angle and the two are compared successively. He now assumes that the moon at the horizon appears larger than at the zenith because it appears in the former case at the apex of the intersecting planes of the sky and the earth.

In writing there is a tendency on unruled paper to slant the lines, i. e., to deviate from the horizontal. The tendency is present in drawing a series of oblique parallel lines of equal length. Ponzo (10) finds that the direction of the deviation depends upon the kind of obliquity, while its extent varies with the degree of obliquity and the length of lines. It tends to disappear with practice. In drawing any line the subject determines its point of origin by an eye movement from the end of the previous line. The eye tends to move perpendicularly from the preceding line and consequently the succeeding line is started either too high or too low according to the direction of the obliquity.

In the Poggendorf figure, Hasserodt (6) finds that the illusion is much greater with children than with adults; it varies in size directly with the distance between, and the length of, the two parallels; it decreases as the length of the intersecting line is increased. In the process of adjusting one half of the intersecting line to secure apparent continuity, the illusion varies in size with the direction of the adjustment and its size varies according to whether or not this adjustment is perceived. As a basis of explanation he finds that an acute angular figure suggests a movement in the apical direction. The exact direction is a function of the relative lengths of the two sides, the longer side exerting a predominant influence. In the Poggendorf figure we have two such angles, the movement tendencies of which are antagonistic. The illusory displacement, however, is opposite to these movement tendencies. The "*Blick*" or attention attempts to follow the suggested movement, but suffers a "*Hemmung*" or reversal and this is the cause of the illusion. The fact that the illusion varies with the direction of the adjustment is regarded as a strong proof of the correctness of the theory.

Gemelli (4) summarizes the article cited in (5). He presents a careful piece of work on the illusion of filled *vs.* empty space in the tactual field. His apparatus and methods seem excellent. Among his subjects were those blind from birth. Using point limited and filled extents, he finds overestimation of unfilled space for both simultaneous and successive comparisons, though in the latter case the first stimulus tends to be magnified. The effect is greater for the shorter presentations. A maximum of effect is secured with a certain "filling in." A symmetrical filling gives the greater effect when the presentation is prolonged. The effect varies with the character of the stimulus points. Practice decreases the illusion and

eliminates it entirely with prolonged exposures. Substitution of short lines for points does not affect the results. An accessory stimulus (points or lines) tends to increase that one of the extents near which it is placed. The illusion can thus be increased or decreased. Using point limited empty extents with an accessory line stimulus for each, he found an overestimation of that one with the longer line, which overestimation varies directly with the relative inequality of the two lines. Comparing two linear (filled) extents of unequal thickness, there results an illusion in favor of the thicker one and the effect is proportionate to the length of the two lines. The experiments are regarded as incomplete and the conclusions as tentative. The causal factors are many and are both physiological and psychical.

Polimanti (8) describes two illusions: (1) On each of two horizontals are erected at right angles a series of equidistant parallels, the two series differing only in length. All segments of the horizontals are equal in length, but those between the longer parallels appear the shorter. (2) When two parallels are joined at any place by a solid black rectangle, both members of the parallels extending above and below the rectangle appear divergent. Both illusions are explained on the principle that filled space is overestimated. In the first illusion the eye is attracted toward the top of the parallels; when these are long, the distance is empty, while with short parallels the subject regards the linear segments per se. In the second case neither the illusion nor the application of the principle was evident to the reviewer.

Flügel, Zimmer, and Thierfelder are concerned with the illusion of reversible perspective. Thierfelder (12) notes three aspects of the phenomenon as exhibited in a rotating wheel and gives them the following order as to importance:—reversal of the two edges in relative depth, rotation of the plane in which the wheel is perceived, and the reversal of the direction of the rotary movement. The paper is concerned with the second aspect, and it was found that the degree of this plane rotation varies directly with the angle of elevation. The extent of the rotation can be determined from the formula, $180°-2a$, where "a" is the angle formed by the real plane of the wheel and the line of vision directed to the more distant edge. Roughly this means that the plane of the wheel in either of its two positions (real and apparent) is always viewed at the same angle. Zimmer (14) presents a historical statement and critique of the various theories. He secured a simultaneous registration of re-

versals, eye movements, and accommodatory changes, and finds that these adjustments are present with most reversals but are subsequent to the illusion while their extent is less than that demanded by motor theories. Reversals occur independently in two simultaneously perceived figures; they also occur in after-images. These facts are incompatible with the motor hypothesis, and the movements are regarded as compensatory and not causal. From the introspections in the after-image tests, he advances three causal factors, direction of attention, the apperceptive idea, and an unknown non-volitional process, the relative importance of which varies with individuals. Flügel (2) also found independent reversibility of two simultaneously perceived figures, and the fact eliminates such explanations as that of Wundt or an attentive hypothesis in so far as the fluctuations of attention are due to the Traube-Hering waves. Various drawings complicated with a graded series of details were observed with a number of attentive attitudes. Direction of attention, defined as clearness, is the main cause of the reversals. Those parts of the figure receiving the maximum of attentive stress are perceived as forward, but the direction of attention is largely independent of fixation and eye movement. The ability to control the reversals is slight though the power varies with individuals. Since attention is the cause of the reversals, the above fact means that the direction of attention is largely involuntary. In the second paper (3) the hypothesis that these reversals are due to local fatigue is tested. After fatiguing for one set of conditions in which one perspective is predominant, he turns to conditions in which normally neither perspective is predominant. Local fatigue induced in the first condition should manifest itself in a predominance of the opposite perspective in the second test. Such effects were present for less than half of the observers and in many of these it occurred for but one perspective. Fluctuations of attention are thus largely independent of local fatigue.

Holt (7) and Woodbridge (13) discuss the philosophical implications of illusions. Holt's article contains an excellent discussion of a psychological topic which belongs to the domain of sensation rather than illusion. He criticizes extensively the specific energy theory, maintains that nerve impulses are vibratory, as it were, in character, and concludes that difference in frequency of nerve impulse underlies difference in sensational quality. In support of the latter view he utilizes two main facts:—the significance of binaural phase difference in the localization of sound, and the

rhythmical character of muscular contractions in response to an intermittent electrical stimulus applied to a nerve trunk.

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PSYCHOLOGY OF TESTIMONY AND REPORT

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The references to Hegge and Franken are repeated from last year's list because of my inability to review them at that time. Hegge (10) deals with the problem of scoring the picture test, with special reference to the computation of P (the number of possible items). For the well-known *Bauernstube* picture Stern selected

76 items, but some observers report 164 items, and Hegge obtained 289 different items from eight observers. Hegge recommends computing *P* by this empirical method. He also calls attention to the fact that the several coefficients of report, range, fidelity, etc., calculated for any given test do not have a constant value for the observers, but merely a relative value for the given test, as, for instance, in comparison of sex, age, race, etc. Other analyses are made by Hegge, who shows, for example, that good reporters give more items and hence suffer greater liability of error, but may actually make fewer errors because they are more cautious and critical.

Franken's article (8) is an elaborate extension of his work by the *Methode der Entscheidungs- und Bestimmungsfragen*, already explained (this BULLETIN, 1912). A distinction is made between right and wrong and between true and false answers. Answers to the *Bestimmungsfragen* ("What is the capital of France?") may be right or wrong: answers to the *Entscheidungsfragen* ("Do you know what city is the capital of France?") may be true or false. The following are some of the main conclusions: 1. Those who give many right answers usually also give many wrong, but few false answers. 2. Those who give many false answers usually also give many wrong answers. 3. Range of memory and class standing usually show good agreement. 4. The formal characteristics of memory (range, readiness and fidelity) are as a rule positively correlated. 5. Those persons whose information is of average amount usually exhibit the least truthfulness, whereas those with a small amount of information owe their greater truthfulness to their lack of ambition, while the gifted resist opportunities to false report through their great cautiousness. 6. The well-informed are, as a rule, more ambitious, but also more truthful than the poorly informed. Other conclusions refer to the effect of allowing shorter or longer periods for reflection before the answer is demanded.

Dallenbach (5) used the picture test, supplemented by a test of memory for geometrical forms of different sizes, shapes and colors, with 20 college men for the purpose of investigating the effect of various time-intervals (zero, 5, 15 and 45 days or zero, 1, 3 and 6 days) between exposure and report. In general, errors increase with time-interval, rapidly at first, then more gradually: thus, for one picture, the per cent. of error in the narrative was 10.5, 14.3, 18.0, and 22.4 for intervals of 0, 5, 15 and 45 days, respectively. Dallenbach also found fidelity and certainty positively correlated,

regardless of time-interval. In his test with forms, errors were greatest with colors, next with position, next size and lastly shape. Errors were greatest in the green and least in the yellow tones.

An elaborate qualitative analysis of report has been contributed by Schultz (17). The analysis is based upon reports gathered from university students and also from teachers in description of a pre-arranged episode in the classroom of Professor Aall. The following are some of the forces at work in determining the nature of report. (1) What things are noted depend partly on the observer's mental state at the time, partly on the objective complex in which the things occur. (2) Attention is caught by novelty and by the logical significance of the impression. (3) The actual items noted and reported are more extensive than what the observer is aiming to perceive: there is a "spread" of observation outside the main objects of attention. (4) Optimal conditions for report are given when novelty supplies a motive, but familiarity of details affords ease of comprehension. (5) When a strange event irrupts suddenly into a familar and commonplace setting, a certain amount of time is necessary before attention can be readjusted to the new situation. For this period of readjustment reports are bad. (6) Reports show the presence of perseverative tendencies, enough to make it probable that "perseveration plays an important rôle in the errors of witnesses." Since this tendency decreases with time, it follows that reports given directly after an event need not be the best. (7) Reports are affected by a process of logical elaboration, emphasis of the essential, dropping of the unessential (principle of economy of consciousness). (8) Descriptions of persons tend to fall into more or less preconceived types. (9) Some persons embellish their reports to secure better literary form and may thus distort them unintentionally. (10) Emotion produces decided distortion, especially of verbal items (quotations). (11) Better reports are secured when the reporter believes himself seriously responsible for his statements.

The lecture given by Pick (16) at Vienna is another discussion of the qualitative aspects of report, but is confined to pathological aspects, such as retrograde amnesia, the erroneous filling of gaps in memory, resistance to attempts to fill in such gaps, false feeling of familiarity or lack of familiarity (cryptamnesia). Pick points out that these phenomena are characteristic of hysteria and other pathological conditions, but that they may also be developed in normal persons under the stress of strong emotion.

Two books testify to the progress made in jurisprudence in assimilating psychological facts and principles. That by Arnold (1), however, can scarcely be said to reflect or embody any of the recent experimental work, as its author apologizes for the inability to read German and makes up in this second edition for his lack of acquaintance with Stern's work by quoting freely from Münsterberg's *Psychology and Crime*. On the other hand, Wigmore's large volume (26) is a work of the first water: he has drawn freely from modern discussions and presents a constructive program for the better training of students of law and others interested in disentangling masses of mixed evidence.[1]

The remaining references can be passed over more briefly. Gross (9), v. Mach (12), v. Beneckendorff and v. Hindenburg (3), Mothes (13) and Türkel (23, 24), all are confined to citations of cases or experiences that have come up in their daily work illustrative of this or that feature of the psychology of testimony. Boden (4), Stöhr (19) and Sturm (21, 22) have given excellent summaries of those portions of the psychologist's work on testimony of special concern for jurists. These contributions are refreshing examples of the genuine interest taken by some jurists in the scientific examination of testimony, and have the additional merit of setting a number of constructive problems for the psychologist.

Basch (2) gives some account of the errors that appear in testimony relative to nuncupative wills. Näcke (15) points out that the unreliability of the statements of persons who have taken alcohol depends to a great extent upon individual susceptibility as well as upon the absolute amounts consumed. Storch (20) tried the picture test as a means of diagnozing manic and depressive states of insanity and concludes that the method furnishes a useful supplement to the other devices of the alienist. Both types are below normal in spontaneity and range of knowledge: manics are incautious and unreliable, but depressives are cautious and reliable. V. Kármán (11) protests against the low rating given by many psychologists to the testimony of children, and agrees with Gross that under some circumstances they are quite valuable witnesses. Winch (27) reports briefly upon experiments with English school children by the aid of the regulation picture test. Fiore (6, 7) has taken up the psychology of testimony in Italy: his general review summarizes the contributions made in that country since

[1] The present writer has reviewed this important work more extendedly for a forthcoming issue of the *Journal of Criminal Law and Criminology*.

1906. Münsterberg (14) had students estimate which of two cards had the greater number of spots on it, and then revise their estimates after a discussion of their opinions. He claims that such a test presents a good counterpart of the situation facing a jury and that the fact that his men students voted more nearly right after the discussions substantiates the general faith in the value of jury-trials. Unfortunately for the other sex, his experiments showed that women were unconvinced by such discussions, whence he argues that there exists a sex difference that "makes men fit and women unfit for the task that society requires from jurymen." Weber's lecture before a pedagogical society at Chemnitz (25) shows the relation between pathological and normal lying, with special reference to the transition between the two. He believes that truthfulness has to be developed in every child, that parents must avoid getting children into situations that incite to lying and by continued training gradually develop a respect for truth.

For a more extended and critical survey of the work in the field of testimony during the years 1911–1913 the reader should consult the valuable general review of Stern (18).

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SUGGESTION

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Bunnemann's two articles (**2, 3**) are an attempt to explain the extreme working of suggestion in such phenomena as hysterical anesthesia and "psychical" pains. His explanation is assumed to be adequate to account for all normal activity as well as for all abnormal. He asserts that all human action (including all physiological activity in men and animals—possibly also in plants) is analyzable into three factors, *i. e.*, stimulus, interpretation, and reaction. The middle term is spoken of as subjective and as logical but is thought of as particularly dynamic. It is asserted to be the most important and yet the one factor most neglected in modern psychological conceptions. He is desirous of swinging the pendulum away as far as possible from the behaviorist's point of view. Suggestion is regarded as an unusual working of "interpretation" due to expectancy or to some emotional disturbance. Although nor-

mally interpretation leads to a reaction having a direct relationship to the stimulus, in extreme cases the interpretation may be practically independent of the stimulus and may produce reactions which normally are produced only by bodily injuries, etc. In hypnosis the operator produces his results by means of his control of this factor of interpretation. If a postage stamp stuck on the back of the subject is actually interpreted as a substance that will produce a blister, the only possible result would be the creation of the blister. Suggestion is primarily an affective phenomenon which influences the central factor of interpretation.

Cornelius (4, 5) agrees with Bunnemann in regarding suggestion as fundamentally an affective phenomenon, but otherwise these two authors are in irreconcilable disagreement. By autosuggestion Cornelius has in mind such phenomena as insomnia, anxiety, fears and pains which seem to have no adequate physical basis: hence are assumed to be due to the abnormal workings of the mind. Cornelius asserts that these mental phenomena are merely secondary and result from a deranged condition of the body. He declares that the only satisfactory method of treating these autosuggestions is to restore the body to its normal condition. The cause of emotions is bodily changes. Fear, anxiety, etc., are produced by particular bodily changes. The reverse is not the case. Accordingly he does not sympathize with such modern psychotherapeutists as Dr. Dubois who attempt to remove autosuggestions by appeals to the intellect. Dr. Bunnemann (2, 3) asserts that the mental factor may produce any or all bodily changes. Dr. Cornelius on the contrary seems to regard the action of the mind as incapable of producing the bodily changes that result in emotions and such phenomena as dread, insomnia and "psychical" pains.

Brugeilles (1) attempts to reconcile the three theories concerning the nature of social influence, i. e., Tarde's theory of imitation, Durkheim's of compulsion, and Worm's of cooperation. He asserts that each theory is but a partial truth and that the final reconciliation is to be found in the fact that each of the three is but an aspect of the explanatory factor which is suggestion. Thereupon he defines suggestion in such a broad way that it includes all of imitation, cooperation and compulsion. "Disons d'abord que par suggestion nous entendons toute pensée, tout fait pouvant produire sur un cerveau une impression plus ou moins forte, et tendant à passer à l'acte." This definition is however so broad that it includes all mental processes and hence ceases to have any explanatory value.

As a student of the feeble-minded Johnson (6) calls attention to the necessity of avoiding suggestion (betraying the answer?) in giving mental tests to the feeble-minded. He also cites an interesting and instructive instance of the extreme working of suggestion in the case of a feeble-minded girl. The reviewer, who has found normal individuals highly suggestible, is inclined to believe that Johnson might have substituted "also" for "especially" in the following sentence. "The influence of suggestion is especially strong with the mentally defective."

Langfield (7) in experiments with a tracing board similar to Whipple's found that the accuracy of movement was modified by the form in which the directions were put. The positive instruction: "Go down the middle of the grove," resulted in more accurate movements than the negative instruction: "Do not touch the sides."

Miss Washburn (9) defends and explains more fully experiments previously reported (8) and reviewed in this BULLETIN in July, 1913. The slight degree to which suggestion influenced the judgments of the students is fully explained by the announcement that the suggestions were not given by Professor Washburn herself but "by Miss I. Powelson, a fellow student of the observers, who did not in their eyes have any special prestige as a judge of the affective values of color."

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TESTS

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This report will deal only with questions regarding the technique and validity of test methods as distinguished from the results which are obtained.

A valuable discussion of the problems which are to be met in testing intelligence is presented by Stern (17). He distinguishes between single tests, none of which by itself is reliable, and test series and test groups. Test series, such as the Binet scale, are of use chiefly to distinguish larger differences in intelligence, such as the differences between children of successive ages, while test groups which have been found to distinguish fine differences may be used to differentiate children of the same age. The suitability of tests for membership in such groups is determined by applying the method of correlation. Tests are better selected on the basis of correlation with an independent rating, such as may be made by a competent teacher, than on the basis of correlation between the tests themselves. The latter method results in a one-sided selection, whereas different tests in the group should compensate for one another by measuring different abilities. Wells (22) calls attention to the need of correlating tests with independent ratings and urges testing not only intelligence but also the subject's manner of working and emotional reaction.

The application of tests to determine the mental function in which backward children are weak and to furnish the basis for their formal training is described by Morgan (13). Fernald (7) on the other hand emphasizes other data than those which are obtained in a formal psychological examination as a means of judging mental deficiency.

The greatest amount of attention continues to be given to the Binet scale. While some writers continue to be content with the scale as it is, and others indulge in destructive criticism, the majority of the writers accept the scale in principle but are concerned with its improvement in content or with the development of the technique of using it. Stern (17) in his extended discussion discusses the technique most fully. His most important contribution consists in the proposal to express an individual's status in terms of a "mental quotient" rather than in terms of the number of years

which he is retarded or advanced. The mental quotient is the ratio of the mental age to the chronological age. This takes account of the fact that differences between the mental advancement of children of successive ages becomes progressively less from birth to maturity. Kuhlmann (12) gives a table, based on this principle, which shows the mental status of individuals at each chronological age who will finally attain different degrees of intellectual ability. Both Stern and Kuhlmann justify their formulæ by applying them to the results obtained from the application of the Binet scale.

Stern (17) and Terman (19) discuss the percentage of children who should pass a test or group of tests at age in order that the test or tests may be regarded as satisfactory. Terman holds that the 75 per cent. standard set up by Bobertag is arbitrary since the number testing at age depends on the fineness of the yearly unit. Since the unit is finer in the upper ages fewer should there test at age than in the lower years. He suggests reducing the units in the earlier years by using fractions of years and then using a 50 per cent. standard. A similar correction could be made by the use of the mental quotient. Stern does not discuss this point but accepts the 75 per cent. standard as a rough measure.

Stern finds in the discrepancy between the results of the Binet tests and school standing neither a criticism of the school grading nor of the scale but merely an indication of the fact that the school grade is based in part on other factors than intelligence. In making recommendations for an extension of the scale he suggests that the tests which Chotzen and Kuhlmann found to be least affected by age differences as distinguished from differences in intelligence be chosen. He agrees with Terman in computing mental ages in terms of fractional units, and further recommends that in computing mental age by crediting tests above the age used as the basis for calculation extra weight should be given to the tests belonging to the higher ages. In making up the tests for a given age he suggests pertinently that they should comprehend a variety of sorts of abilities.

Other suggestions for the extension and use of the Binet scale are made by Terman and others (19, 20), by Goddard (8, 9) and by Strong (15). Wallin (21) emphasizes again the need of competent examiners, in contrast to Goddard's belief and practice (8) and cautions against the hasty substitution of new tests for the 1908 series. Berry (3), on the other hand, finds that the 1911 series gives better results than the 1908 series and attributes the superior-

ity to the omission of certain tests and to the changed method of scoring.

Three articles deal with tests of proficiency in the school subjects. Courtis (4) replies to a previous article in the Elementary School Teacher by Otis and Davidson in which they showed that a first test with the addition test gave pupils widely different relative rank from that attained in the twenty-fifth consecutive test with the same material. They conclude that the first test does not give an accurate measure of the child's ability. Courtis confines his reply almost entirely to the production of evidence in support of the position that a single test "accurately reflects the degree of that quality (the quality being measured) at the time the measurement is being made." He is dealing with chance variations while the criticism deals with an entirely different matter, viz., the different positions in the practice curve which a single test finds different persons. In his other article (5) Courtis discusses the methodology of his tests.

Starch (16) puts forward a new method of grading the legibility of writing by measuring the time required to read isolated letters. He measures the specimens of the Ayers and the Thorndike scales by way of testing his method and finds correlations of .97 and .74 respectively. Examination, however, shows that while there is a correspondence in the order of rating indicated by the coefficients the amount of difference found is much greater in the lower than in the upper part of the scale. Thus between the first and the fifth steps of the Ayers scale the average difference found was .02 second, and between the fifth and ninth grades .004 second. The average difference between the lower five ranks of the Thorndike scale was .115 second, and between the upper ten ranks .0055 second. Starch also compared the variability of judgments made with the Ayers and Thorndike scales and without any scale and found the variability with a scale to be about 60 per cent. of the variability without a scale.

Sylvester (18) has standardized the form-board test and an anonymous writer (1), presumably Goddard, finds the A test not to be suitable for diagnosing feeble-mindedness. Gray (10) describes a new substitution test and Rowland (14) has roughly standardized some common tests for the diagnosis of mental defect.

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ÆSTHETICS

BY ETHEL PUFFER HOWES

With a dearth of systematic works in æsthetics, the output of 1913 presents valuable special undertakings, notably in the visual and auditory fields.

First among articles on general theory, is to be marked Volkelt's (20) criticism of the various ascriptions of validity to the æsthetic intuition. He himself finds its ground in the æsthetic demand for harmony or reconciliation. It belongs to the meaning of human life and endeavor that means and powers shall exist to resolve discords into harmony. "The intuitive certainty of the harmonious import of human life" is the æsthetic ground-intuition.

An animated exhortation by Major (8), to progress beyond the "passive" categories of pleasure-displeasure, enjoyment, etc., for the æsthetic experience, finds a certain sympathetic echo in Wirtz (21). The definition of the æsthetic as the "end-in-itself" cannot stand against the facts. The very *Einfühlung*-theory shows the need of envisaging the spectator as in some way productive. Moreover any fruitful æsthetics must work with the spirit of the times, which runs to the most intense emphasis on all energies. This needed productive principle Major finds in the love-concept—the erotic concept, in fact. "*Alle Lust will Ewigkeit*" (Nietzsche),—which is to say that the work of art is the fulfillment of our desire of beauty, achieved through its perpetuation. Wirtz, on the other hand, through a series of very suggestive reports by gifted observers, believes himself able to demonstrate the "*Schaffensdrang*" as the strongest element in the æsthetic reaction. A surprising correspondence exists between the psychic factors in the experience of the creative artist, and the art-enjoyer. These two papers are less interesting, perhaps, from their intrinsic excellence, than as indications of a tendency to press forward into new fields.

In explicit extension and amendment of Volkelt's views on the modifications of the æsthetic (the Tragic, Comic, Beautiful, Sublime, Ugly, etc.), Laurila (4) holds that the doctrine of these modifications, although the favorite field for speculative æsthetics, is emphatically not a central question, such as is that of the nature of the æsthetic experience. The æsthetic modifications should be considered as æsthetic types. The Beautiful is not the inclusive concept of all that is æsthetic, but that which immediately pleases in its sense-form; while the æsthetic is all that can be æsthetically contemplated, even the Ugly. Volkelt's definition of the Tragic as the downfall of human greatness is both too wide and too narrow. The doom of any one, great or not, who in our eyes has especial need, claim, expectation—presumption—of a fulfilled life, is tragic. The view of so many æstheticians that the Tragic is pleasurable, is due to their starting from the false ground that the æsthetic must

be pleasurable—the Tragic is æsthetic, therefore they think it must be pleasurable.

An interesting treatise on the Comic by Levi (5) devotes a full half to a critical treatment of previous theories, with emphasis on Kraepelin, Sully, Lipps and Freud as exponents of a naturalistic view; Bergson, Schütze (1817) who is quoted with approval, Plato, Hobbes and Shaftesbury. The constructive theory is based on the distinction between "taking-seriously" and the opposite—a distinction within the field of ethical reality. To acknowledge the moral reality of anyone is to enter into responsible relations with him; this involves effort, and to be freed from such effort is agreeable. Hence the pleasure of the comic, the "not-taken-seriously." This is given when appearance and reality are manifestly in contradiction, when responsible existence is not ascribed (automatic actions), or when we cannot or will not go behind appearance—in other words, when free and responsible action is not imputed to the person observed. In these cases our spiritual activity "lets itself go," hence the vivacity of perception in the comic experience, etc. The author considers that this theory contains the valuable elements of preceding ones, in particular those of Bergson and Schütze.

Somewhat analogous to the foregoing in its argument for literature is the suggestive theory of MacDougall (7) that the artist who has to express human emotion in literary forms is dealing with refractory material, which originally took shape only for logical, conceptual purposes. He therefore has to seek his end, the suggestion of a will-attitude, in loosening the will's habitual transitive connections. This he achieves by the use of language that startles and arrests, in which the musical values take attention, and the logical procedure is inhibited. In this state the emotional qualities come to their own, without interference of logical purposes.

Volkelt (19) criticizes current theories of style as too thin in treatment, taking too little account of content. If style is defined as typical form-determination, and we may neglect the style-differences due to the development of arts in different periods, races, cultures or individuals, we may still distinguish five pairs of antagonistic possibilities for every art-problem:—Elementary vs. reasoned, naïve vs. sentimental, objective vs. subjective, actual vs. heightened, individualizing vs. typifying. The rest of the paper is given to the explication of these pairs.

The formative factors for the great poetic types are, according

to Müller-Freienfels (11) the outer conditions; *i. e.*, the constitution of their public, the necessary manner of presentation, and the kind of object dealt with. The drama is moulded to the physical and mental limits of listening (necessity of pauses, hence inner logical divisions, continuity, unified action); to the simultaneous activity of eye and ear (words fitting and issuing in action, use of symbols); psychology of the crowd (suggested emotion, relative lack of logic, conflict as the strongest emotional lever). Parallel analyses are carried out for epic and *Roman*.

A book [Eastman (2)], the professed aim of which is "to increase enjoyment," need not be criticized here were it not that it also proposes to contribute "to scientific truth." From this point of view it should be said that the work is in no way a contribution to æsthetics; what is sound in it is not new, and crucial unsolved problems are whiffed lightly away with cock-sure precociousness.

The only experimental work I have found in this field is that of Sterzinger (15), which is based on the quantitative judgments and accompanying self-observation, by several objects, of a series of poetic figures (in German). He concludes that the most important elements in the æsthetic enjoyment are, in order, fusion of elements of the presentation, pseudo-sensation, and feelings (notably of power and of rest). Very little *Einfühlung* was detected.

Tenner (16) offers some lucid criticisms of the form of the question of verse-melody, as first propounded by Sievers. In speech-music, tone-color takes the rôle filled by pitch in real music; verse-melody has no scale, no tonic, no time. Tenner's contention is that the essential element in tone-color is the emotional shading, and that verse-melody is therefore dependent on the right emotional interpretation. This conclusion seems to the reviewer erroneous if verse-melody is to be understood as the æsthetically satisfactory sound-element in verse.

The title of Lach's work (3) gives an inadequate idea of its monumental character, or of the tremendous field covered. The central thought is that in the "ornament" of music we have the vestiges of the most primitive musical utterance, and that a study of the development of ornament will therefore reveal at every level, in every period, the way of transition from the primitive, through the "*primär-æsthetisch*" to the fully formed beautiful melody. This development is traced in the three main divisions of the book; first analytically, as an hypothesis; then historically and genetically over the whole earth; finally systematically, on a critical and

psychological basis. An appendix contains examples to the number of thousands. The book requires more extended notice than is here possible.

Valentine's experiments (17) on the appreciation of musical intervals yield results which can be noted only in part. The apparent pitch of an interval is for most people determined approximately by the pitch of its higher note. The major third is preferred by adults; then a group of four,—minor third, octave, major and minor sixth—are found "pleasing"; a third group, the fourth tritone and fifth, "slightly pleasing";—this order being by no means that of the degree of consonance. Among children of the Elementary Schools, no appreciable preference for concords over discords appears before the age of nine, but at twelve or thirteen the order of preference is remarkably like that given by adults.

Siebeck (14) finds the true aim and achievement of music in replacing the oppressive feelings of real life by an harmonious sequence of moods and sentiments (*not* emotions), so æsthetically ordered as to give the impression of a personal revelation.

In the visual field, Bühler's (1) important intensive study, the first of several projected works, though complete in itself, is a psychological analysis laying foundations for æsthetic principles; its final aim is a "Logic of (sense) Form presentations." Model experiments demonstrate the primary visual form to be a straight line, its straightness psychically primary to its direction. The amazing lowness of the straightness-threshold leads to the hypothesis that the straightness-impression arises in the stimulation of certain rows of retinal elements which have a peculiarly close connection. Thereafter are traced the forming of the curve-impression and the magnitude-impression. The centre of gravity of the book is however in its treatment of the perception of proportion. The difference-threshold here is found to be below that of sense-discrimination of lengths. The proportion-impression depends on a "*Proportions-Einstellung*" or setting, for which the physiological hypothesis proposed is a cerebral setting of a "modulating" character, such that the comparison of magnitudes rests on the production of a secondary effect, dependent on the state of stimulation of two separated receptors. This "*Einstellungs*"-theory conceives Weber's Law as a special case of the general law of proportion. The significance for æsthetics of this fundamental character assumed for the law of proportion is obvious.

Sander's experiments (13) aimed to present æsthetically inter-

esting forms of sufficient complication so that the elements could be continuously varied. The particular objects were rectangles of constant base but variable height, topped by a triangle of variable height. In the experience of the two preferred combinations ("optima," O_1, O_2), no tension feelings or will-impulses were observed. "The form does not strive upwards . . . but embodies a modest, restful and self-contained existence." On the other hand, vivid tension-feelings accompanied combinations in which a dominating influence of certain lines obtained, instead of the balance of the optima. It appeared that O_1 and O_2 correspond with the proportions of the Greek temple, and the larger with those of Romanesque and Gothic windows.

Müller's (10) observations show children as standing at the lowest æsthetic grade, with no discernible relation between school ability and æsthetic judgment, or between the latter and æsthetic sensibility. Valentine (18) finds good evidence that at the age of three months an infant may experience the sensations of red, yellow, brown, green and blue, with an order of preference as follows: (1) yellow, (2) white and pink, (3) red, (4) brown and black, (5) blue and green, (6) violet. As the order of preference cannot be explained entirely by reference to brightness or to novelty, it is suggested by Valentine that it is partly determined by the relative powers of the various colors as stimuli to the organism.

In continuation of Everth's writings on the æsthetic values of the frame, Marcus (9) asserts the reciprocal relation of frame and picture, and notes the properties of the perspective, which itself brings the frame-principle within the picture. Luquet (6) formulates a destructive criticism of the "magic" theory of palæolithic art. The essential question as to primitive—chronologically primitive, that is—art is whether it is disinterested or wholly practical. From the facts we possess the question is still open.

The brochure of Myers (12) has not yet been received but will be dealt with in the next review.

The year 1913 was signalized by the first International Congress for Æsthetics, which was held in Berlin, October 6–9. Its inception and successful issue was due primarily to the activity of Professor Max Dessoir, who in 1906 founded the *Zeitschrift für Æsthetik u. Allgemeine Kunstwissenschaft.* The four sections of the Congress were devoted respectively to general æsthetics or the philosophy of art, the plastic, literary and dramatic, and musical arts. The proceedings are to be published.

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SPECIAL REVIEWS

Psychology in Daily Life. Carl Emil Seashore. New York: Appleton, 1913. Pp. xviii + 226.

This book is one of the *Conduct of the Mind Series* edited by Joseph Jastrow and contains a preface by Professor Jastrow explaining the purpose of the series, which is "to provide readily intelligible surveys of selected aspects of the study of mind and its applications."

The author considers play the basis of our life and therefore devotes the first chapter to that topic. In play we have the overcoming of difficulties and thus it is the principal instrument of growth. Even in adult life play has an important rôle, not only in fostering the spirit of fellowship, but in taking a man out of the drudgery and narrowness of work and affording him a wider scope for the exercise of his natural instincts. Play encourages the development of personality and self-realization, which makes it closely akin to religion.

In the chapter on "Servicable Memory" rules and corollaries are given to cultivate greater efficiency with the least possible fatigue, such as the systematic training of the senses and the proper control of the attention. There should be a strong determination and a wise selection of useful material as well as the proper mode of expression. Vacation and rest periods are also discussed and the afternoon nap advised.

In the chapter on "Mental Health" we read that bodily health depends upon mental health as well as the latter upon the former. Ten rules of wise living are proposed such as self-control, generosity, etc.

The next chapter is devoted to an elucidation of the meaning and significance of "Mental Law." Every thing leaves an impression upon our system and always in some way affects our life. These impressions reoccur according to the laws of association, which the author thinks it advisable to arrange under the headings of similarity, contiguity and contrast. Finally the fact that all action leads to automatism suggests care in the formation of habits.

The chapter on "Illusions" is an extensive illustration of the subject of the previous chapter, *i. e.* the working of the laws of mind.

The book closes with the topic of "Mental Measurement" and its significance for vocational guidance. The familiar work of the author on the measure of a singer is included as an illustration.

The aim of the book has not been toward a systematic treatment. The author has selected those topics which he deemed of greatest interest and importance for practical life and he has presented them in a clear style free from all technical language. The laboratory psychologist will recognize the origin of many of the principles set forth, he will also feel that much has sprung from the personality of the author. In other words Professor Seashore has relied to a great extent upon his excellent common sense. Throughout the book there is a strong ethical note.

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REPORT OF MEETING—THE SIXTH CONGRESS FOR EXPERIMENTAL PSYCHOLOGY

The sixth Congress for Experimental Psychology was held in Göttingen, April 15 to 18, 1914. It was well attended by psychologists of a number of different nationalities, representing most of the important psychological laboratories of Europe. The greater number of those present were, of course, German, though Austria-Hungary, Italy, England, Russia, Holland, Belgium, Norway, Sweden, and the United States were also represented in the attendance.

The congress was held in the auditorium building of the university which furnished convenient quarters, the meetings taking place in the auditorium itself. The work of the local committee in arranging for the convenience and entertainment of those who attended is deserving of praise. Aside from the following of a prearranged program and limiting the time of discussions, the congress was made as informal as possible. The program consisted of twenty-nine addresses and four general reviews of special topics. The first part of the report of the congress, consisting in brief abstracts of the papers that were read, had already been printed and was distributed among those present.

The congress was opened by a short address of welcome by the president, Professor G. E. Müller. The various subjects treated by the different speakers who followed are rather widely scattered and fairly evenly divided among the fields of psychological investigation. By far the greater number were reports of research,

some of these involving a demonstration of apparatus and method. If any subject stood out above the others by reason of the thoroughness with which it was treated, it was tone-psychology which occupied a prominent place on the program. A general review of recent experimental work in this realm was given by Professor Stumpf, and four of the addresses were in this field. An interesting paper on the experimental determination of individual characteristics was read by Professor Heymans of Groningen, Holland. Laying stress upon the necessity of having as great a number of subjects as possible in an investigation of this sort, he invited the coöperation of other psychologists. He suggested as a beginning the investigation of the ability voluntarily to concentrate the attention, and offered to send to anyone who cared to take part in the work a questionary and some simple apparatus for experimental investigation. Among the apparatus demonstrated in the course of the addresses were several variations of the tachistoscope and a method of demonstrating the independent existence of heat sensations. No effort was made on the part of the local committee to have a general exhibition of apparatus, but two individual exhibitions were set out in the auditorium building by the Göttingen firms of Ruhstrat and Spindler & Hoyer. During the days of the congress the laboratory of the Göttingen institute was open to the inspection of the guests.

The social feature of the congress included a general reception on the evening before the opening session, a banquet followed by a dance on the third evening, and an "*Ausflug*" on foot through some of the beautiful environs of Göttingen on the afternoon of the last day.

The full report of the congress is now being prepared for the press and will probably appear some time in the course of the summer. The next congress for experimental psychology is to be held in Turin, Italy, April 25–29, 1916. The addresses are to be given in German and may be announced through Professor Kiesow.

JOHN T. METCALF

MUNICH

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BEST, H. *The Deaf. Their Position in Society.* New York: Crowell, 1914. Pp. xviii + 340.

BLONDEL, C. *La psycho-physiologie de Gall: ses idées directrices.* Paris: Alcan, 1914. Pp. 167. 2 fr. 50.

GAROFALO, R. *Criminology.* (Trans. by R. W. Millar. Introd. by E. R. Stevens.) Boston: Little, Brown & Co., 1914. Pp. xl + 478. $4.50.

FERRERO, G. *Ancient Rome and Modern America. A Comparative Study of Morals and Manners.* New York: Putnams, 1914. Pp. vi + 352. $2.50.

WOOD, A. *The Physical Basis of Music.* (The Cambridge Manuals of Science and Literature.) New York: Putnams, 1913. Pp. 163. $0.40.

MOSBY, T. S. *Causes and Cures of Crime.* St. Louis: C. V. Mosby Co., 1913. Pp. x + 354.

LOWRY, E. B. *Teaching Sex Hygiene in the Public Schools.* Chicago: Forbes & Co., 1914. Pp. 94. $0.50.

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THILLY, F. *A History of Philosophy.* New York: Holt, 1914. Pp. xv + 612.

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WEININGER, O. *Sex and Character.* (Trans. from 6th Germ. ed.) New York: Putnams, 1914. Pp. xxii + 356. $3.

COIT, S. *The Soul of America. A Constructive Essay in the Sociology of Religion.* New York: Macmillan, 1914. Pp. x + 405. $2.

VARISCO, B. *The Great Problems.* (Trans. by R. C. Lodge.) New York: Macmillan, 1914. Pp. xi + 370. $2.75.

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WALLIN, J. E. W. *The Mental Health of the School Child.* New Haven, Conn.: Yale Univ. Press, 1914. Pp. xiii + 463. $2.

NAYRAC, J. P. *Physiologie et psychologie de l'attention. Évolution, dissolution, rééducation, éducation.* (Pref. by Th. Ribot.) 2 ed. Paris: Alcan, 1914. Pp. xii + 238. 3 fr. 75.

WALLAS, G. *The Great Society. A Psychological Analysis.* New York: Macmillan, 1914. Pp. xii + 383. $2.

DRAGHICESCO, D. *L'idéal créateur: essai psycho-sociologique sur l'évolution sociale.* Paris: Alcan, 1914. Pp. xv + 440. 7 fr. 50.

NOTES AND NEWS

A CONGRESS of the International Society for Sexual Research is planned to be held in Berlin in October, under the presidency of Dr. Julius Wolf. One section will probably be devoted to papers dealing with the philosophical, psychological, and pedagogical aspects of sexual matters. Details of arrangements may be obtained from the secretary, Dr. M. Marcuse, 85 Lützowstr., Berlin, W. 35.

JOHN T. METCALF, PH.D. (Yale), has been appointed instructor in psychology at Princeton University.

THE Fourth International Congress on Home Education will be held in Philadelphia, September 22–29. Announcements of papers should be sent to the president, Dr. Martin G. Brumbaugh, Superintendent of Schools, Philadelphia, Pa. Membership cards ($2) are to be obtained from Mr. George H. Frazier, care of Brown Bros. and Co., Philadelphia.

A NEW bi-monthly journal devoted especially to criminology and allied topics, and entitled *Revista de criminología, psiquiatría y medicina-legal*, is being published as an organ of the Institute of Criminology of the National Penetentiary, Buenos Aires, under the editorship of Dr. H. Fernández.

PROFESSOR JUNE E. DOWNEY, of the University of Wyoming, has been granted a sabbatical year's leave of absence, which she will spend mostly in Germany. Dr. Carl L. Rahn will have charge of the department of psychology during Professor Downey's absence.

THE following items are taken from the press:

AT Boulogne-sur-Seine, in the park of the Institute which bears his name, there was recently unveiled a statue of Marey, the physiologist who was largely instrumental in the development of the graphic methods which are widely used in physiological and psychological investigations.

ON JUNE 5, there died L. Hermann, of Königsberg, and H. Kronecker, of Bern, two physiologists whose investigations have been of psychological interest and importance.

THE nomination of Professor J. R. Angell as lecturer at the Sorbonne in 1915 has been approved by the University of Paris.

THE North Carolina School for Feeble-Minded, Kingston, N. C., was opened July 1, under the directorship of Dr. C. B. McNairy. It is expected that a psychological clinic will be established in connection with the school.

THE thirty-eighth annual meeting of the American Association for the Study of the Feeble-Minded was held in Columbus, O., June 18. Dr. H. H. Goddard was elected president.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

RECENT LITERATURE OF A GENERAL NATURE ON ANIMAL BEHAVIOR

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Summaries of Behavior Literature.—The object of practically all recent text-books of animal behavior has been either the detailed presentation of the results in some limited field or the concise definition of the general problems of behavior, with experimental work presented only as illustrative material. Kafka's Introduction to Animal Psychology has a somewhat more ambitious program in attempting to review in some detail the work in all fields of behavior. The first volume (7), which is devoted primarily to the sensory equipment of invertebrates, offers the most extensive treatment of this field that has yet appeared. It is divided into eight sections dealing with the tactile, static, auditory, temperature, chemical, light, spacial, and temporal senses, each carried through the phylogenetic series of invertebrates. Extensive descriptions and figures of sensory mechanisms are included with discussions of the experiments bearing upon their functioning. While this is the primary subject of the book, it involves the presentation of the simpler action systems and types of reaction. The arrangement of the book does not permit of systematic treatment of the latter or of the general problems of differential sensibility, tropisms and orientation, modifiability of behavior, etc., but brief discussions of these are scattered through the different sections under the descriptions of the organisms which have contributed most to the solution of the problems. In general the author tends to avoid the extreme

simplification in theories of reactions which has been introduced by Loeb and his followers. The more complex activities of invertebrates, instincts and habit, are reserved for the second volume of the work. In this the author proposes to deal with the senses of vertebrates and with the more general problems of behavior. The value of the present volume is chiefly as a summary of recent experimental literature and in this respect it is certainly the most thorough and comprehensive general work which is available. When supplemented by a more systematic treatment of the problems of behavior such as the author, perhaps, intends the second volume to be, the book should prove invaluable as a means of orientation in the literature of behavior.

Of scarcely less importance for students of invertebrate behavior is Jordan's Comparative Physiology of Invertebrates (6). Only one volume of this series has appeared, that dealing with nutrition. A good bit of behavior material connected with food taking is included in this and the close relation of the problems of behavior and metabolism in the lower invertebrates gives interest to the remainder of the volume. Like Kafka's book, this is almost encyclopedic in size and scope (760 pages) and a brief review of its contents must be quite inadequate. The introduction of the book is devoted to the chemistry of foods and digestion. This is followed by chapters dealing with each of the invertebrate phyla and summarizing the chief experimental work upon food taking, digestion, assimilation, and excretion.

The appearance of the ninth volume of the fourth edition of Brehm's *Tierleben* (18) completes the section devoted to birds, which has been revised chiefly by Marshall. The new edition has been modified considerably from the earlier ones. A complete rearrangement of the material in correspondence with present ideas of genetic relationships has led to the emphasizing of this phase of the revision with the insertion of a considerable amount of systematic material. An attempt has been made to bring the discussions of behavior into accord with newer ideals in animal psychology but the anecdotal method of Brehm has not lent itself well to such treatment. This is particularly true of the volumes on birds, the earlier editions of which contain a large amount of behavior material. Something of the readableness of the books has been sacrificed in the attempt to avoid anthromorphic terminology, without the compensation of an increased insight into behavior mechanisms. "Die Papageien sind befiederte Affen," says Brehm in the second

edition. The omission of such picturesque expressions seems a needless sacrifice in a book of this character.

One volume dealing with Mammals (Bd. X), revised by L. Heck, has appeared. It is devoted chiefly to monotremes, marsupials, and insectivora and contains a large and valuable amount of new material dealing with the habits of these mostly rare and primitive forms. The volumes dealing with the amphibia and reptilia (Bd. IV–V) have been greatly extended, from 673 to 1,170 pages, by the addition of new material which is very largely made up of studies of behavior.

The extensive investigations of Pawlow and his students, most of which have been reported in Russian, are not readily available and the review of this work by Mme. Dontchef-Dezeuze (2) is most welcome at this time. The first section of her book is devoted to a description of the method of Pawlow, which has already been made familiar to American readers by the review of Yerkes and Morgulis.[1] Pawlow's new laboratory near Nevka is described briefly. In it the arrangements are so made that the animals may be kept in absolute isolation in sound-proof rooms under uniform conditions of light and temperature. An improvement in the method of collecting the saliva makes it possible for the experimenter to watch the reactions while in a room completely separated from the animal. A somewhat uncritical review of the results obtained by the salivary reflex method follows this description. No adequate description of the technique of stimulation is given and no consideration of the errors to which the method is subject. The experiments of Biélakov showing a sensitivity to a difference of $\frac{1}{8}$ tone in the dog are reviewed in detail, as are the studies of Orbeli on visual, and Kasherininova upon the tactile sense in the dog. Some recent experiments by Bohn upon the "transformation of stimuli" are recorded for the first time. Bohn subjected dogs to an electric shock and obtained an association of this with food. As soon as the conditioned reflex was established the electric stimulus had no further effect than the production of a flow of saliva, although it had at first been followed by violent avoiding reactions. The extirpation experiments of Toropov are reviewed at some length, the general conclusion being in support of localization of sensory function, at least as concerns the perception of form. A chapter is devoted to the experiments upon the extinction of the conditioned reflex by repetition of the stimulus, to its inhibition by

[1] This BULLETIN, 1909.

other stimuli and to its reappearance after the dying out of the effects of inhibition or after "inhibition of the inhibitors." In view of the fact that experimenters employing other methods have not been able to verify the results obtained from the study of the salivary reflex either in the field of audition or in that of cerebral localization, and that the salivary reflex is, at best, somewhat evanescent, it is unfortunate that Dontchef-Dezeuze has not given more attention to the technique of the Russian school. She seems to imply that the ideal methods of Pawlow's new laboratory were employed in the experiments reported, whereas in much of the work the methods of stimulation were crude and the possibility of the animal's reacting to "cues" other than the intended stimulus was not rigidly eliminated. The second half of the book of Dontchef-Dezeuze is devoted to a correlation of the physiological results of Pawlow with the phenomena of imagery in man.

The More Complex Behavior of Animals.—In the introduction to the volume reviewed above, reprinted in a somewhat extended form (8), Kafka discusses the interpretation of animal behavior. He supports the argument from analogy for consciousness in animals but points out the failure of the objective tests for consciousness of Loeb and Bethe, the presence of "associative memory," and of Driesch's argument for a non-material agent in behavior from the "individuality of correspondence" between stimulus and response.

De Lanessau (10) gives a brief summary of the conception of the intellectual and moral faculties of animals and man which was advanced by Buffon. Buffon followed Descartes in denying a soul to the animal and developed somewhat the latter's mechanical explanation of animal behavior. He recognized many involuntary movements in man (reflexes) and their dependence upon stimulation. He held that volition is the result of similar stimulation and described the balancing of motives as a purely mechanical process. His system of ethics is a consequence of this attitude for, while he ascribed a soul to man, "he appeared, even when he affirmed his belief in a divinity and in the human soul, to wish to inspire his hearers with the conviction that both are absolutely useless."

Hachet-Souplet (3) attempts an extensive comparison of the more complex activities of animals with those of the human infant. The point of view of the author is primarily educational and much space is given to the description of methods of training and the similarity of methods of learning in animals and in the infant.

The mental activities of the child have been chosen as a basis for the comparison rather than the behavior of the animal and in consequence there is an attempt to find in the animal analogies for the higher intellectual processes for which there is as yet no experimental or observational justification. The chapters dealing with the animal's conception of causality and of his physical ego, with his processes of abstraction and his æsthetic tastes are characterized by sweeping conclusions based upon wholly inadequate experiments, thus: "A dog is seated upon a bench. I call, 'Here.' He comes immediately. Six dogs are on the same bench, among them the first. Again I call, 'Here,' in the same tone as before. Not one of them moves. They wait until I call 'Dick,' 'Tom,' or 'Pompon.' They know that there are other dogs than themselves, and this seems to prove that they have a clear idea of their physical personality." Many experiments are described in which the most elementary precautions were omitted and from the results of these a high degree of intellectual development in animals is deduced. The chapter upon the laws of association lays a much needed emphasis upon the "law of recurrence," the progressive fixation of sensory impressions in the inverse order from that in which they are experienced. The section devoted to the infant is concerned chiefly with a comparison of the methods of training and teaching, and to tracing the development of the child's ideas, particularly in matters of ethics, to the influence of environment.

In a brief communication Pfungst (11) outlines his work with a variety of apes, carried out chiefly at the Berlin Zoological Garden. He was able to observe the development of six individuals from infancy and found no evidence that any of the young received instruction from the mother or profited greatly by imitation. He found that they did not imitate the trainer at all. There was no prevailing use of either hand in some hundreds of animals which he examined, except in a few cases which were found to be pathological. Some observations were made upon the expression of the emotions. A playful showing of the teeth, analogous to the human smile, is a sign of friendliness as is the turning of the posterior part of the body. In general Pfungst finds that the apes are capable of more ready and complex habit formation than lower orders of animals but finds no evidence that they are able to make generalizations.

As a book written by a lover of animals for animal lovers Unruh's *Leben mit Tieren* (15) offers many interesting points. It consists

almost exclusively of the author's reminiscences of his own horses and dogs with casual observations upon other domestic animals. The experimental method is criticized as unsympathetic and hence lacking in understanding of the animal. The interest of such a volume lies fully as much in the personality of its author as in the thesis of the book itself and in his anecdotes Unruh provides enough personal data to give some insight into the development of his attitude toward his animal friends.

Under the somewhat comprehensive title of *Beiträge zur modernen Tierpsychologie* Dexler (1) gives a severe criticism of Krall's *Denkende Tiere*. The greater part of the book is dismissed as belonging to the region of the miraculous and the critic contents himself with an examination of Krall's tests of his animal's sensory equipment. He finds the experiments wholly inadequate for the purpose for which they were devised, the exclusion of possible "cues" which might influence the horses' replies to questions.

Haenel (4) points out many sins of omission and commission in Dexler's review but scarcely answers the criticism of Krall's sensory physiology.

The great mass of literature dealing with the horses of Elberfeld has inspired the launching of a new journal under the editorship of Karl Krall (9). The program of the journal includes the publication of articles upon anatomy and physiology, accredited observations upon the mental life of animals, reviews of behavior literature, and articles dealing with human conceptions of the animal and with the part played by these in folklore and popular literature. The first numbers are devoted largely to discussions of the horses of Elberfeld and similar animals. Whatever may be the ultimate fate of these animal prodigies the journal promises much of value in the last article of its program and in its editor's policy of reprinting old and rare discussions of animal intelligence.

Literature of General Biological Significance.—Yerkes (16) reports the results of a preliminary study of the inheritance of wildness, savageness, and timidity in rats. Wild rats and hooded rats of two different strains were employed. The characters proved to be definitely heritable entities and the degree to which they were developed was found to be roughly proportional to the amount of wild blood present in the different strains. This is almost the first attempt by a trained psychologist to apply to animal behavior the facts and theories so rapidly accumulating in the field of genetics. Chauvin, Schroeder, Kammerer, and Haecker

have accumulated a small amount of evidence upon the inheritance of variations in instincts but the interests of these investigators are primarily in the inheritance of acquired characters and their studies of behavior are not always above criticism.

As yet the study of animal behavior has received far more than it has given to other branches of biological science but it is rapidly coming to a place where it can return all that it has borrowed. The field in which it can, at present, contribute most to the general theories of biology is probably that of organic selection, for the solution of whose problems a knowledge of the sensory equipment of animals is essential. Some of the most striking problems of evolution are presented in the facts of sexual dimorphism. Pycroft (12) has collected a large amount of material upon this subject and his book is particularly rich in its descriptions of the behavior differences between the sexes. In his explanation of these differences Pycroft follows Wallace, substituting the secretion of hormones for Wallace's theory of the excessive energy of the male, and emphasizing particularly the indifference of variations in the characters with respect to preference on the part of the undifferentiated mate. Only one experiment upon the problem of sexual selection is given, that of Mayer upon the moth. Indeed, practically all the theories to account for sexual dimorphism have been unsupported by experimental evidence for or against sexual selection and the experimental work is restricted entirely to arthropods. There is great need for a study of the problem in vertebrates and Pycroft's book will furnish an excellent starting point for such work.

Slonaker (14) studied the total amount of activity of the albino rat from birth to death by means of specially devised apparatus. This consisted of a cylindrical cage, revolving about a stationary axle upon which were placed the food and nest boxes, and of apparatus which recorded the number and temporal position of the revolutions of the cage. Records of all movements of the animals outside the nest boxes were thus obtained. It was found that during the first six months of life the activity of the albino rat is distributed irregularly throughout the day and night. From the sixth to the twenty-fifth month the greater part of the activity is confined to the hours between 3 p. m. and 3 a. m. With the beginning of senility at twenty-one to twenty-five months the rat's activity decreases greatly and nocturnal running, which during the prime of life sometimes amounts to as much as 14 miles per day, almost disappears. The greatest amount of activity occurs in

males at the age of ten months and in females at the age of twelve months and the total amount of activity of the females during their lifetime is about three times as great as that of the males. Almost three-fourths of the total amount of activity appears during the first half of the rat's life. A group of unexercised rats was kept as a control upon those in the revolving cages. They became heavier and showed an average longer life than those which were able to run freely.

Rothmann (13) removed the cerebrum of a dog, leaving the optic tracts intact, together with a small amount of the basal portion of the cerebrum which could not be removed without destroying the optic chiasma. The dog was kept alive for three years at the end of which time the report was made. Three days after the operation the animal could walk a little and soon recovered the ability to run and jump. He retained sensitivity to pain and heavy pressure (these were not localized), to kinæsthesia, and to taste. Many of the higher reflexes were retained or reestablished. In food taking at first only the sucking reflex was retained but later mastication was restored and the dog ate if his nose were placed in contact with food. He distinguished between food and moist sand. Rothmann suggests that the regions of the oral sense of Edinger may not have been destroyed. Periods of sleep and waking were normal. The dog learned to inhibit movement when brought against an obstruction, to leap a hurdle, elevating his hind legs to a height equal to that determined by his fore legs, and to walk upon his hind legs when his fore feet were placed upon a stool and the latter was drawn across the floor.

Definitions.—Huxley (5) devotes a small volume to the discussion of the problem of individuality in animals. For him the mark of individuality is the degree of independence of environmental fluctuations attained. This is brought about first by the specialization of parts, the organization of the living being. It is made more perfect by increase in size, by further differentiation, and by increase in adaptability. After the development of this conception the author goes on to show the application of it to different types of organisms, the method employed by various organisms to attain a greater degree of individuality and the diverse ways in which it is manifest.

Yerkes (17) suggests some changes in the terminology of animal psychology, chiefly the divorcing of the expression "comparative psychology" from its common usage as a substitute for "animal

psychology" and its application in a logical sense to any psychological studies employing the comparative method. He also insists that the student of behavior is quite unjustified in his application of the term psychology to behavior material. If this latter view is accepted it surely means that a science of "animal psychology" is impossible.

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RECENT LITERATURE ON TROPISMS AND INSTINCTIVE ACTIVITIES

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Tropisms

Chemotropism.—By placing a few drops of a chemical in the water that contained leeches, Gee (12) discovered that, for each chemical, there is a certain strength above which the leeches exhibit pronounced negative chemotaxis and below which they are indifferent. For nitric acid this is 1/80 per cent.; for copper sulphate, 1/320 per cent.; for sodium chloride, 1/5 per cent. Cane sugar, up to 5 per cent., induced no chemotactic response. Evidently, in leeches injurious chemicals induce negative chemotaxis.

Geotropism.—Gee (12) found that leeches are normally positively geotactic, but that the blood leech, when kept in an aquarium, is indifferently geotactic.

Weiss (26) placed a glass cage containing hibernating specimens of the "lace bug" (*Corythuca ciliata* Say) in a warm room. On awakening, these bugs climbed upwards, one over the other, until there was a column several bugs high. Usually, when the tower was six bugs high it swayed and toppled. When the temperature was sufficiently high, this negative geotropism occurred in both light and darkness.

This same investigator deprived certain beetles (*Adalia bipunctata*, *Coccinella 9-notata*, and *Megilla fuscilabris*) of food for a short while and then placed them at the foot of a vertical rod 15 feet high. Negative geotropism caused them to climb up the rod for seven to nine feet. The ascension occurred in both sunshine and shadow.

Phototropism.—According to Gee (12), leeches exhibit marked negative phototaxis.

Torrey and Hays (24) find that, correlated with its nocturnal habits, the sow bug (*Porcellio scaber*) is negatively phototropic. By manipulating a light in its rear, it is possible to guide the crustacean in circles or spirals, at the will of the investigator. A perpendicular beam of light flashed on the side of a leech moving away from a light in the rear almost invariably caused it to move away from the lateral glare. This was true whether the light in the

rear was extinguished or allowed to shine. Extinguishing the light in the rear and simultaneously flashing one in front caused *Porcellio* to move away from the new light. When both eyes were blinded with a mixture of charcoal and glue, there were no responses to light. Evidently this behavior is negative phototaxis.

Holmes (15) has devised two types of experiments for analyzing phototactic responses. In the first type, a glass jar, the sides of which were lined with opaque white paper, was covered with an opaque white cone, the apex of which covered an electric light bulb. An insect, one eye of which had been blinded, was placed in a circular dish in the center of the floor of this jar and stimulated to activity by jarring the container. By means of a small peep hole, every movement could be watched. Under all conditions this insect was exposed to diffused light of uniform intensity. Dissimilar species behaved differently. Several beetles, of three species, turned towards the blackened eye; a Jerusalem cricket invariably rotated toward the left; two specimens of a tachina fly and a specimen of *Eristalis tenax* made circus movements toward the normal eye. In the second type, a light-running turntable was constructed out of cardboard. An insect was so held that its feet touched the cardboard and its head faced either the center or the periphery of the turntable. A bright light was then placed on either side. Any attempt on the part of the insect to turn either towards or away from the light would cause the table to rotate in the opposite direction. When the light was on its left, the cabbage butterfly rotated the table toward the right; when the light was on the right, it rotated the table toward the left. Similar results were obtained with several other species of insects. These experiments caused Holmes to conclude: "It is not possible, we believe, to construe phototaxis entirely in terms of differential sensibility. Responses to the shock of transition, whether in the direction of an increase or a decrease of stimulation, may play a part in the orientation of many forms; but the continuous stimulating influence of light appears to be, in several cases at least, a factor of major importance."

Riley (18) finds that young toads respond negatively to the light from a 10,000 candlemeter projection lantern, and that the response is prompt and definite; but to a 16 candlemeter light, to diffuse daylight and to sunlight they respond positively. He thinks it probable that both light intensity and ray direction are factors in these photic responses.

Rheotropism.—By means of artificially induced circular currents Gee (12) has demonstrated that the leech is positively rheotactic.

Allee (1, 2) has experimentally proven that the sign of the rheotactic responses of the common *Asellus* varies with the efficiency of the response of the animal; the higher the efficiency, the greater the number of positive responses. During molting, there are no rheotactic responses. In conjunction with Tashiro (3), this same investigator has demonstrated that the rheotactic reaction is an expression of the relative metabolic activity of the animal under the conditions to which it is acclimated for the time being.

Thigmotropism.—According to Gee (12), it is positive thigmotropism which causes leeches to collect under stones and to gather in groups.

Feeding and Hunting Instincts

Hargitt (14) informs us that the tree toads (*Hyla versicolor* and *H. arborea*), which attack none but moving objects, never stalk their prey, but leap upon it from ambush. They seem to be farsighted; for, although a tree toad will leap upon insects several feet away, similar insects may run over its legs and body without invoking a response.

Breed (7) deprived newly hatched incubator chicks of water for several days and then placed before them, in a watch glass resting on a piece of white paper, some bubble-free clear water. Particles of food were scattered over the paper. At first the chicks did not react to the water; but gave the drinking reaction to a variety of objects before drink of any sort had touched their mouths. Chicks left to develop naturally in the presence of water and food, usually found the water by fortuitous pecking or by forming drinking movements in imitation of others. These and other experiments, a description of which is omitted on account of limited space, caused Breed to conclude: (1) "Drinking usually does begin as a result of contact stimulation mediated by the prior activity of the pecking and imitating instincts." (2) "Experiments show clearly that the drinking instinct is self-independent in so far as its relation to these other instincts is concerned." (3) "The drinking instinct does not, therefore, have to be supplemented by imitation, accident, intelligence, instruction, etc., in order to act."

According to the same investigator, the pecking instinct of chicks is very imperfect at birth; but it improves rapidly in accuracy. In his first conclusion he is in harmony with both Morgan

and Thorndike; in the latter he is in agreement with Morgan and opposed to Thorndike.

Shepard and Breed (22) confined newly hatched incubator chicks in a dark-room for from three to six days. At stated intervals they were given water, by means of a pipette, and food was placed in their mouths. These chicks, which had had no opportunity to develop the pecking reaction, were placed on a table which had been especially designed for pecking experiments. The first attempts at pecking were indifferent and very inaccurate; but after a chick had once swallowed a grain energetic pecking followed, and improvement in accuracy was exceptionally rapid. This caused these investigators to assert that Spalding's statement of the accuracy of the first pecking reactions of chicks, the pecking instinct of which had been deferred, is an exaggeration.

Beebe (4) cites two interesting cases of birds securing food by using tools. In Africa a raven secures the contents of ostrich eggs by dropping stones upon the eggs; in Australia the black-breasted buzzard breaks a hole in an emu egg by dropping a stone upon it. Into this hole the bird inserts its foot and carries the egg off to its nest.

Homing Instinct

On the side of a road, Cornetz (9) discovered a nest of an ant of the genus *Myrmecocystus*. On a support, about five meters from the nest, he placed some sugar as a bait. The nest, the bait, and the intermediate territory were in the sunlight. About 75 meters away was an enclosed yard in which no *Myrmecocysti* had been seen that year. The roof of a shed and a high wall cast a dense shadow upon the yard. Since the shed was open on the west and north, the sun, which was in the southwest, illuminated the ground under the shed. In the open, the brightest part of the sky was in the southwest; in this yard, the brightest portion of the sky was towards the northwest. While a foraging ant was on the bait, the support was transported to the enclosure just described. On descending from the bait, the ant found herself in a strange environment. Twelve ants were used. Each hesitated more or less, each made several random movements, and then moved off in the direction that the nest lay from the original position of the bait. Cornetz thinks this proves his contention that ants are guided home by an internal factor that is derived from neither visual, olfactory, nor tactile stimuli.

Prior to the publication of the above paper, Santschi (21) published an article supporting a different view. He found that covering ants with an opaque screen affected their orientation; but that covering them with a glass plate did not. This, he thinks, militates against Cornetz's contention for an internal guiding mechanism. He believes that ants orient themselves, when placed in a shadow, by utilizing distant reference points. On account of the peculiar structure of its eye, points on the sky which have a similar blue color to us may be quite unlike to the ant. He thinks that ants utilize as reference data even the stars, and that they associate the position of the sun with the time of day.[1]

Parental Instinct

Gee (12) is convinced that leeches do not exhibit a parental instinct, because, if you separate the attached eggs from the body of a leech it pays no more attention to the eggs, even though it happens to rub against them.

By careful observations, Stevens (23) finds that the spider crab (*Oregonia gracilis*) does actually "plant out" algæ, etc., upon its body; but that it does not "plant out" sponges. Triton eggs are the only animal products "planted out."

Hartmann (13) finds that the potter wasp, *Eumenes belfragei* Cress., obtains the mud for its nest by moistening a clod with fluid from its mouth and then biting out a piece. It returns to the same clod for all of the dirt needed.

Bénard (5) discovered a large dung beetle (*Scarabaeus sacre* L.) rolling a ball about the size of a small apple. With pieces of tile, Bénard constructed a tight enclosure and placed the beetle and her ball therein. The beetle seemed to lose interest in the ball. She was then placed outside of the enclosure. After starting to run away, she halted and then returned. After trying in vain to scale the tile, she reached her ball by tunneling beneath the wall.

Wheeler (27) describes a wasp (*Aphilanthops frigidus*, F. Smith) which, in behavior, is intermediate between those wasps which lay their eggs in well provisioned nests and desert them and *Bembex*, which busies herself collecting flies and feeding them to her rapidly growing young. This wasp collects winged queen ants of the genus *Formica*, on their nuptial flight, and stores them away in subter-

[1] Those interested in the homing of ants will find an axcellent resumé in a recent paper by Santschi (20).

ranean cells. Later she lays an egg in a separate cell. When the egg has hatched, she feeds the larva with pieces of the stored ants.

Craig (10) has demonstrated that the egg-laying instinct of the ring-dove may be aroused by the courting behavior of the male, by the preening of her head and neck by a human being, or by the abnormal mating behavior of another female.

Mating Instincts

F. R. Lillie and Just (16) find that the sexual forms of *Nereis limbata* swarm on the dark of the moon; but are not in evidence on the light of the moon.

Anna Morgan (17) discusses the mating of the May fly, *Baetis*.

By rearing four male birds in isolation, Craig (11) discovered that: (1) The various notes uttered by the species and all accompanying expressive movements, including the sexual responses of the male, developed perfectly in those isolated individuals; proving that young doves do not need to learn the sounds or gestures of their species. In their motor aspects, the vocal and gesture reactions are completely and definitely fixed by the ultimate organization of the nervous system. (2) On the other hand, the innate sensory inlets to these reactions must be very indefinite and flexible; for the doves gave their cries to a large variety of objects. They made their social cries, and even their mating behavior to the human hand. (3) The object to which the doves direct their social behavior becomes a symbol, or a fetich to which they cling tenaciously, and to which they attach a great complex of reactions. In all four cases the human being became such a symbol.

Miscellaneous Instincts

Bénard (5) noticed a line of beetles approach the charred remains of a former fire. Each selected a bit of wood of its shape and color and clung quietly to its shaded side.

Hibernation.—Hargitt (14) states that the hibernation of the tree toad is similar to that of other amphibians. In a warm laboratory the toads show no tendency to hibernate.

Riley (18) found that handling with undue pressure and roughness, or placing them on the back and holding them in that position for a few minutes causes young toads to letisimulate.

According to current theories, migrating birds flock for one or all of the following reasons: (1) to secure companionship; (2) to

profit by the experience of the older birds; (3) for the protection that large numbers afford. Trowbridge (**25**) dissertates that these theories ignore two important factors; (1) a large flock, by virtue of its numbers, automatically maintains the right direction; (2) in the case of large birds, the mode of arrangement is an automatic protection against enemies.

The following quotation shows that Robertson (**19**) believes that the entomophilous flora is better pollinated where some of the bees are oligotropic than where all are polytropic. "My view is that the bee fauna is all that the flora will support, but that there is constant competition between bees, and that natural selection favors those which are the most diversified; *i. e.*, the least competitive in their food habits." Speaking of the Andrenidae and the Panurgidæ, he writes: "The early maximum, the short flight, the non-competitive phenological distribution, and the frequently oligotropic habits indicate that these bees have managed to hold their own by dividing up the remaining field and occupying the most favorable corners left by their parental polytropic competitors."

Savagery.—By well-planned experiments with wild rats, tame rats and two generations of hybrids, Yerkes (**28**) has demonstrated that savagness, wildness and timidity are heritable behavior complexes and hence instincts.

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SENSATION AND SENSORY DISCRIMINATION IN ANIMALS

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The greater part of the literature of the year concerns vision but there are two papers on sound which may be mentioned. Parker (37) thinks fishes hear and that such sounds as reach fishes not only influence their movements but also the direction of their movements. His stimulus was an iron ball pendulum weighing

4,300 gr. which struck the exact middle of an end of an experiment tank with a momentum of 361,200 C.G.S. units and produced a low booming noise. The reviewer questions whether this is proof of sound sensitivity. Peter (39), from two years' observation of butterflies, has come to believe that there is a possibility of hearing in these insects. At least, the females hear the "*knacken*" of the males.

The relation between common chemical sensitivity and taste has been made the object of an experimental study by Parker (38) who agrees with some others that chemical sensitivity is a function of the spinal nerves.

In the line of food reactions, Hadley (22) offers an additional note to his previous work on the food reactions of young lobsters. Reese (41) uses another form, the spotted newt. He thinks that it employs both sight and olfaction in securing food but that the latter is the more important. Copeland (8), from a study of the same animal, believes that the approach to an object is a visual response, but that the nosing of an object is an attempt to test its edibility by the sense of smell and that the snapping at a stationary object depends upon olfactory stimulation from substances in solution. He concludes that vision functions in the following of a moving object whereas food located through vision is afterward recognized as such by smell. The reactions of the puffer or swell-fish (7) to concealed food cease when the olfactory apparatus becomes inoperative and such behavior is only seen when the organs again become functional.

The first article on vision which will be mentioned is a study of adaptation by means of the pupil-motor reflex in the eyes of owls (33). Light from a Nernst lamp, passing through a variable and easily controlled opening, was filtered through colored gelatine plates. Owls kept long in the dark upon being tested with very weak light showed a strength of motor reflex which varied as follows from strong to weak: YG, G, GB, R and O, BR. The valence was practically the same as that of the investigators. There was also no essential difference under bright adaptation. Owls' eyes do undergo adaptation changes and show the Purkinje phenomena. Tested with different intensities under dark adaptation they show a real increase in pupil-motor excitability inasmuch as the absolute threshold lies much lower. The authors think that the difference between rod and cone vision is not so great as has previously been supposed.

Bingham (4) studied the perception of size and form in another bird using the Yerkes-Watson apparatus. It will be remembered that with this apparatus not only the brightness but also the size, form and relative position of the stimulus areas can be independently varied and controlled. The two complex stimuli employed by Bingham were changed little by little until the only distinction was that of size. Under these conditions the birds learned to discriminate circles whose diameter differed from the standard 6 cm. by $\frac{1}{4}$ to $\frac{1}{6}$. The form tests were completed with but one bird. This bird learned to discriminate between a triangle and a circle but the habit broke down when the triangle was inverted or circumscribed by the circle. The conclusion was drawn that the discrimination was made on some other basis than that of form and probably depended upon the unequal stimulation of different parts of the retina. Quite in a line with this work Hunter (31) argues that animals do not perceive forms but patterns, *i. e.*, the form stimulus against a background, that pure form perception is a later and more abstract thing. He insists that the outlined field against which the form to be discriminated is set must be varied in order to prove form discrimination.

The main work of the year, however, seems to have been in the realm of color vision. The Watsons (48), with the apparatus mentioned above, undertook some experimentation with rodents designed to prove whether, in the use of color, the differential response is made on the basis of wave-length. Two rats were trained to react positively to R when the alternative color was G. When the relative intensity was varied or one color was cut out altogether it was found that the animals were reacting to G and that the R had no stimulus value whatever. Animals trained for B and Y failed to perfect the discrimination when both stimuli were present at full intensity. B light evidently had a much higher stimulating power than Y. They conclude that the long wave lengths offer a very slight stimulus to rodents and that they have good if not conclusive proof that the response was made to differences in intensity.

Babák (1), who had previously used the breathing reactions of frogs to study the temperature sensitivity, in his latest work employs the same method to investigate their sensitivity to color. He finds that the stimulating effect of V is extraordinarily great even in weak intensities while R gives a result exactly opposite.

There are three articles on the color sense of bees which may be

mentioned. Von Frisch (19) worked in the open air and in the sunlight. He trained bees to come to strips of yellow paper. After two days' training he put the Y papers among 30 grades of gray papers of the same size. There was sweetened water on the papers of the same brightness. The bees chose the Y. The investigator thinks, therefore, that they must see color. He obtained the same results with B but the bees could not be trained for R and confused RV and B as well as dark R and dark gray. Hess (26) criticizes this work, saying that the odor of the paper itself or that acquired through handling was not excluded. He asks also, how von Frisch knew that the bees which came the third day were the trained bees or how he knew that the bees which came later on a particular day were not attracted by the presence on the paper of those which came first and not by the color. Hess made some similar experiments but caught and carefully marked the bees which came to the particular color, the first days, and in the concluding tests found no evidence of training. In spectral lights he finds that the bees congregate in the area which appears brightest to color-blind men. Lovell (34), after a long series of experiments with honey bees, says: "Any surface whether it is bright or dull colored on which there is nectar or honey will be freely visited by bees for stores after these liquids have once been discovered but they will not be discovered as quickly on a surface which does not contrast in hue with its surroundings as on one which does so contrast." "When honey bees are given the choice between a conspicuous and an inconspicuous object under similar conditions they exhibit a preference for the former."

In connection with the work of von Frisch, Mrs. Franklin (12) suggested that these results indicated a dichromatic color sense and asked that he try with his bees a BG paper, the complementary of his R. He did so and found a completely non-chromatic region for the bees in this part of the color spectrum. According to von Frisch, then, the bees see only Y and B and are RG blind. Mrs. Franklin shows how this is related to her color theory.

Hess (25, 27) and von Frisch (15, 16, 17, 18, 20), in a number of papers, continue their controversy over the color sense of fishes. Each reports some new experimentation and each clings to his previous opinion. Von Frisch thinks that fishes have a color vision as proved by color adaptations, *Hochzeitkleid* and feeding experiments with colored food. Hess insists that the vision of fishes is like that of a totally color-blind man. He argues that the facts of

color changes do not prove that fish perceive such color differences. These may be protective devices against carnivora, birds, etc. He points out the fact that fishes which spawn at great depths where all colors would appear as gray have highly ornamental patterns and concludes from his feeding experiments that the choice of food is made on a basis of brightness. Von Frisch used histological methods, sectioning of nerves, and other experimental procedure as foundation for his statement that the expansion of pigment cells is, within limits, independent of the brightness of the bottom on which the fish rests and depends alone on color value. Neither of these men controlled the intensity factor. Ewald (10) criticizes some of the conclusions of Hess. Hess reasons that if the curve for the stimulus value of spectral lights is the same for apes and man, for fish and color-blind men, the vision must be similar. Ewald says the proof is worthless, for eyeless shell-fish show the same reactions in spectral light. He also quotes from Magnus who says that the curve for the stimulus value of the iris sphincter in fish is normal even when it has no connection with the eye. The fact that photographic plates react differently to different ends of the spectrum is also mentioned in illustration of the weakness of Hess's proof. Color adaptations were also found by Stevens (45) in crabs. While studying the decorating instinct in crabs he suspended some crabs in pails the insides and bottoms of which had been painted with different colors. He reports that, under such conditions, the color reactions were markedly influenced by the color to which the animal had previously been exposed. He concluded, however, that the coëxistence of this specific chromatism with the decorating instinct is merely accidental and not causal.

Now we come to some articles dealing more or less with tropisms and the greater part of these concerns phototropism. Riley (42) studied the light reactions of young toads, Gross (21), arthropods including diptera, lepidoptera and orthoptera. Gross used the Laurens apparatus for monochromatic light with Boys' radiomicrometer to measure and equate the intensities of the colored lights. He gives the wave lengths employed. He concludes: "The relative stimulating efficiency of the rays of any part of the spectrum is independent of intensity and is not the same for all animals nor for the different ages of the same animal. The more refractive rays of the spectrum are not always the most effective in stimulating an organism. Prof. Holmes (29) noted the similarity between the behavior of *Bombilius* and the mourning-cloak

and other butterflies which are usually positively phototactic but when resting on the ground in the sunlight or hovering in the air assume a negative orientation.

A few of the papers deal more with the analysis of the response itself than with the proof of the response. Holmes (28) in a very interesting paper reports a study of the coordination of the activities of the tube feet and the spines of the sea urchin in movements toward or away from light. He shows that phototactic movements like those away from a mechanical stimulus depend upon the correlated activity of various organs of locomotion. Franz s (14) interest in aquatic migrations led him to examine those daily movements said to be due to phototaxis. He prefers to make his studies in free open life. From such observation of mollusks, echinoderms, insects and amphibians he asserts that the most frequently observed phenomena of phototaxis are of two kinds: (*a*) swarming movements of larval plankton up to fresh water, and (*b*) flight movements occasioned by cramped or confined quarters. He has never convinced himself of daily migration periods and thinks the evidence for this has been drawn from artificial and unnatural conditions.

Ewald (9), in a long series of experiments, examines the ways in which light reactions can be artificially modified. The effect of caffein, strychnin and atrophine was observed by Moore (30). Brundin (6) compared the reactions of two terrestrial amphipods one of which was positively phototropic, the other negative. It was found that heat and dryness favor the positive reactions and cold, moisture and quiet the negative. In other words they were fostered by their native environmental conditions.

Besides these studies on light reactions there are a number which have to do with other fields which will be mentioned briefly. MacCurdy (35) experimented with the acid and alkali relations of starfish in the light and dark respectively. The careful work which Vieweger (47) reports is divided into three parts: (*a*) a study of chemotaxis in paramoecium, (*b*) the motor responses of colphidium, (*c*) the effect of salts on taxis. Fasten (13) gives a study of a parasitic copepod of the brook trout. Bohn (5) found that in some copepods he could vary the sign of both geotropism and phototropism by pressure. Transehe (46) gives the curve for Daphnids of a day's adaptation to temperature. He says that the adaptation can be clearly seen after seven hours. Hutchinson (32) finds that in the protozoa examined each has a resistance to heat peculiarly

its own which under given conditions is quite constant. Pringsheim (40) makes an interesting comparison of the reactions of bacteria and the spermatozoa of ferns. Shelford (43, 44) from some prolonged experiments concludes that certain animals studied react to evaporation whether it is produced by movement, dryness or heat and that fishes react clearly to varying amounts of carbon dioxide, acids and to boiled water. Baunacke (3) says, concerning statocysts, that there are statical organs which have as their chief function the maintenance of equilibrium and there are others which release definite directive movements. From a study of the house snail, he thinks that there are statocysts which are centers for the righting reflexes and that the sinking of the head of the snail, in a positive direction, preparatory to righting, may be regarded as a reflex which is released by the free position of the planarian which excludes foot contact and reflex inhibition.

There are still a few contributions to mention and these deal more or less exclusively with the laws or principles of tropisms. Bancroft (2) defends Loeb's position of compulsory orientation as against Jennings's theory of trial and error. He makes Euglena, Jennings's own form, the object of his study. He gives a most careful analysis of the light reactions of this plant and concludes that the heliotropic mechanism and the mechanism for motor reactions are independent variables and can be modified independently. Holmes (36) from some ingenious experiments with butterflies comes to the conclusion that it is not possible to explain phototaxis entirely in terms of differential sensibility—the continuous stimulating effect of light appears to be the major factor.

Loeb is responsible for the statement that the light reactions of animals should follow the law of Bunsen and Roscoe—the effect should be proportional to the product of the intensity and the time. It has been said that animals do not follow this law but that the effect is proportional to changes of intensity only, *i. e.*, the amount of change per unit of time. Ewald (11) attacked this problem using as his object the eye movements of *Daphnia*. It has eye movements unusually well fitted for this purpose. The animal was placed under a microscope and conditions were so arranged, by means of diaphrams of different sizes and revolving sectors, that different light intensities could be combined with different times of exposure. Under these conditions it was found that for the eye movements of *Daphnia* the energy law holds within the limits of the experiment.

The Henris (23, 24) worked on the eye movements of cyclops under ultra-violet rays. They found that there exists a physiological excitability to these rays; that this can be studied with all the precision that excitability to electricity, retinal light, touch, and sound can be studied. The photo-excitability obeys the law of threshold, of minimum energy and of physiological induction. In the later work the same object and the same method was used to investigate Weber's Law and that of Jost.

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HABIT FORMATION, IMITATION AND HIGHER MENTAL PROCESSES OF ANIMALS

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The first part of Johnson's monograph (7) is devoted to a thorough and critical review of the work on pitch discrimination in the dog. The results of Pavloff and Selionyi, on the saliva-reflex, that of Goltz, Munk, Kalischer, Rothmann and Swift on the effects of removal of the temporal lobes, inferior corpora quadrigemina and one or both cochlea leave the problems in an unsatisfactory state. All have used very crude behavior tests a fact which explains their widely divergent conclusions. The results of Johnson's experiments make up the second part of the monograph. He found that in from 6 to 44 days two female mongrel dogs, sisters, nearly four years old, learned to make the discriminations required in the following problems: (1) Discrimination between two tones, middle C (256 d. v.) and A above (384 d. v.), sounded on tuning forks struck by hand. (2) Discrimination between the two tones sounded on blown variators. (3) Discrimination between the two tones sounded on forks and on large and small variators indifferently. (4) Discrimination between chords containing one and the other stimulus tones respectively.

To the deeper tone the animals were required to place the fore-feet on a chair at the operator's left; to the higher one to mount a low box at the operator's right. In the case of an incorrect choice the animal was not fed. About two days after birth the edges of

the lids of the eyes of both these dogs had been scarified and sewed together, thus assuring the continuance of temporary blindness. The results of these tests agree well with those of Kalischer and Rothmann.

Sixty days after learning the last problem each dog acted without error.

In another series of tests, 505 for each dog, in which experimenter, assistant, and stimulus-tone were outside the room in which the animal was placed when the tone was struck and in which she made her choice, there was little evidence of discrimination. They so behaved as to indicate that lack of attention and not inability to discriminate may be the explanation of their continued failure.

A stimulus-cage was constructed and electrically driven forks were used with König resonators to insure a practically pure tone-stimulus, non-localizable by the human subject, and almost free from accessory noise, overtones and partials. Considerable difficulty was had for some three weeks to accustom the four dogs (two other younger females now being used) to the electric shock which was the punishment received when they turned into the wrong pathway. The problem was not learned in ninety days nor was there any sign of improvement. Thinking that the two tones might be too nearly alike, the problem of associating a tone C (256 d. v.) with food in F and release without a stimulus-tone food in F′ was given; but the results in ten days (150 trials) were negative. It is an interesting fact that these four dogs in from 9 to 12 days did discriminate two noises made by two electric buzzers. Except in the case of dog 3 they learned in about the same time to discriminate the noises when the buzzers had been interchanged in position. Position-habits were to be observed in most of the experiments.

The second part of the investigation was devoted to a comparison of the learning-time and learning-methods in blind and normal dogs. Six different puzzle-boxes were used, each with a different latch. Four more dogs were used in these tests making eight in all. The blind dogs had learned to behave ordinarily as normal, although none of their world was visual. How would they differ from normal dogs? Dogs 7 and 8 were also made blind in the same way as described for 1 and 2. The data gathered show that the dog is capable of learning to make complex adjustments and a large number of instinctive movements without the aid of vision.

No dog lost more than ten per cent. in accuracy after a sixty-day interval. Control tests in total darkness gave results which indicate that the light had some stimulating effect on both blind and normal dogs. The other control test was to turn the box through 90° from its original position, the first change setting practically a new problem for the animal. Other turns of 90° disturb them less. This study shows that it is impracticable to attack the "Molyneux problem" by using dogs rendered temporarily blind. Tests on the blind dogs after their eyes were operated on to restore their sight and on normal dogs with rope and disoriented box suggest as to the experiments proper that even normal dogs may make little use of vision. They probably rely largely on kinæsthetic and muscular sense-processes. Given ten trials a day fewer days were required for learning than if twenty trials were given. Fatigue, monotony, and consequent lack of attention and effort are the probable explanations.

The experiments of Szymanski (15) were made to determine if dogs (fox terriers) and cats can discriminate the different positions of the sounds made by an electric buzzer and learn to go for food only to the place at which the sound is made. Odors were eliminated as possible stimuli. The results were negative, the chief reason assigned being the small size of the room. Place-habits were marked in both dogs and cats though broken in the latter in two weeks. Preliminary habits indicated influence of having been fed previously by the experimenter. In these animals as in the white rats and in fish the past behavior is a large factor in present reactions. There are two stages in learning: the negative or partial loss of habit or inborn connection which are directly opposed to the new and growing habit; the positive or completion of the new and loss of the old. In tests without the sound stimulus but with change of distance and direction of food-box it seems to be indicated that there are two types in dogs; one motor, the other visual. Cats seem to be visual. The suggested explanation is that the former are animals of chase, the latter lie in wait.

The study of Sackett (12) is a definite attempt to combine the experimental and the natural history methods. In all 16 porcupines were used, natural conditions being obtained by out-door caves, dark dens, and natural food. Frequent journeys to the woods were made in order to observe their natural behavior. These animals are nocturnal and show little tendency to hibernate. When born the young are well developed even to the quills. If they

play it is only while very young. Even the adults are easily tamed, eating out of the experimenter's hands one day after capture. They never throw their quills. They make excellent subjects for experimental study. When offered food they first try to grasp it with the mouth. If this is prevented they readily grasp with the hand. In 12 out of 14 series of tests they used the right hand if the experimenter used his and similarly with the left. This is evidence that this animal is neither right nor left handed. The habit of taking food with one hand is very readily and thoroughly broken. To re-establish this old habit is almost as difficult as its initial formation. They are readily trained to respond to one kind of food with one hand, to another kind with the other hand. They can change the hand as often as the kind of food is changed. Brightness is the probable stimulus, cubes of sweet potato and carrot or cabbage being the foods used.

They learn to operate puzzle-boxes with four locks in a series. The results with this apparatus as in all other experiments demonstrate that in ability to discriminate and learn the porcupine is practically on the same level as the raccoon and the monkey. Unsuccessful attempts were made to determine the porcupine's ability to discriminate tones of different pitch. The cochlea is complex and the sounds made by the animal itself cover a wide range. The forms used were made with the denning proclivities of the animal in mind. There was some evidence that but part of the form was the basis of discrimination which was probably kinæsthetic as well as visual. The brightness discrimination is about 10 shades of the Nendel series. It may be finer than this for the grays at the ends of the series. They probably can not discriminate color when tests are made with colored papers. No account of the area of acute vision has been found in the literature. Rotation of the maze 90° and later another 90° was a source of confusion to the animals though less following repeated rotation. After once learning the maze they were able to follow it in the dark. Learning it in darkness differed little from learning in daylight. Memory tests after a 100-day interval show little if any loss of ability. Tests in which there is more of the kinæsthetic in relation to the visual show better retention.

After verifying Graber's investigations, which proved that cockroaches avoid light and seek the dark Szymanski (13) sought to so modify by the punishment method the responses that these insects would seek the light and avoid the dark. The strength of shock

to be used was first carefully determined in preliminary trials. The insects used were male larvæ about one and a half years old, the apparatus being cleansed after each series of tests.

As the insect entered the dark end of the box the current was turned on, as it retreated to the light end the current was turned off. Learning was considered complete when the insect, being in the light, turned back to light ten times on the boundary line, without receiving a shock. The time required for training with all of the ten animals except nos. 3 and 5 was on the average from three quarters to one hour. These two suffered from such great fatigue that their training could not be completed in one day. The analysis of the results and curves gives two factors, *practice* and *fatigue* hence a special case of Kraepelin's "Arbeitscurve." In the length of time during which they retained this new habit they show marked individual differences. There is no evident relation of permanency of this new habit and the number of shocks required to establish it. The training is evident in their behavior for only a short time but they relearn the habit after only a few shocks. It is possible to establish the habit in an insect with the antennæ removed. These results do not support the statements of F. Plateau concerning bumble-bees and other insects.

A brief account of the same results is given in a second article by the author (14).

The purpose of the paper by Gregg and McPheeters (3) is critical. Cole's "card-displayer" apparatus was duplicated and experiments repeated but with the experimenters hidden by a screen and in the control series the color cards were removed and the levers used alone, the levers were so operated that they were not visible to the animals but still made their usual sound. A series of two sounds invariably called out the normal response in the raccoon. Four and five sounds were given and the results enable the authors to state that any completed series of sounds is the sensory stimulus. The two raccoons used may have and use images. The results obtained under the ingenious controls strongly suggest that the "stimulus-response" type of behavior is the only one exhibited by Cole's raccoons as well as by the two subjects of the present experiments.

The brief paper by Lashley (8) is a record of incomplete observations and experiments on a large Amazon (*Chrysotis* sp.) parrot imported in 1892 and which had learned to speak about 60 words some of which were combined into phrases. He made a number of

inarticulate sounds distinguishable from instinctive notes. These are given most often in response to a visual or auditory stimulus, more frequently the latter. These inarticulate sounds—"singing, whistling, barking, mewing, cuckling, and coughing"—offer the best material for experiment because of their wide qualitative range and they are given in response to auditory stimulation. In two series of experiments on timbre and one on pitch it was found that the bird distinguishes and reproduces the musical tones and the pitch of the stimulus. There was no evidence of imitation of two or more successive tones. Capacity for circular imitation may be developed largely by conditions of captivity. The impulse to imitate is probably connected with the sexual life.

Lashley and Watson (9) have reported notes regarding the physical and mental development of a monkey. The subject of these observations was a young *Macacus rhesus* monkey conceived and born in captivity. At birth the little monkey was far advanced physically. In sensory-motor development it was far superior to the human infant and the rate of development during the first fifteen weeks (the period observed) was remarkably rapid.

From general observations of the orangs and chimpanzees Haggerty (6) came to question the adequacy of the "sense-impulse" theory of animal learning. The animals experimented on were two strong, docile, female orangs and a quick nervous male chimpanzee. Betty at once and Nancy after some looking at the apparatus used in the best possible way a stick with a hook on the end to secure food which was on a table outside the cage and beyond their reach. Baldy made no effort to use the stick. Betty used a stick to get food from inside a pipe. Baldy failed in this also and showed no signs of imitating the successful behavior of the others. Nancy repeated the behavior of Betty in the pipe experiment in such a way as to lead the experimenter to conclude that she gave certain evidence of "inferential imitative behavior." With both orangs he obtained results which indicated that, though there is some use of the "trial and error" method there is also something above the mere sense-experience level, that is, a low order of rationality. One can not but wonder as to the previous experience of these animals in its bearing on the solution of the present problems.

The horses of Elberfeld continue to attract attention. Claparède (2) returned to Elberfeld for three days for new observations and to make the crucial test of putting to the horses numbers and problems on cards drawn at random and unknown to any one

present. It was found that of all the horses—Hans, Zarif, Muhamed, Hänschen, and blind Berto, the last made fewer mistakes than any other even when the assistant was not near him. There were mistakes both when the questioner knew the answer and when he did not. Since Claparède's first article in vol. 12 of the same *Archives* many others have appeared. A large part of his present paper is devoted to review and criticism. Fraud and trickery are dismissed as impossible as are also unconscious visual, auditory, or tactual signals. Some believe that the horses work out the answers to problems in cube root by themselves. Chance is ruled out and there are too many problems solved for memory to be the explanation.

The "protest" from Germany is dogmatic, unscientific, negative, unsympathetic. Instead of "protest" get other horses and investigate. Then refute. A letter by Dr. J. de Modzelewski is published in which he tries to refute all explanations except that of telepathy. He gives as the percentages of right answers in four series of tests with Zarif, Muhamed, Berto, and Hänschen, 11 per cent., 13 per cent., $7\frac{1}{2}$ per cent., and 11 per cent. One is, however, not convinced when he says telepathy explains it all. Professor Claparède concludes in favor of a process of thinking peculiar to these animals, the full proof for which has not yet been given.

Haenel (4) was present in experiments with the Elberfeld horses when the halter was no longer used by the trainer. He could see no signals. Other visitors could see none, particularly in the work of Krall, and the horses replied correctly. The gradual increase in the number of right answers, the changing mood of the horses, the types of mistakes, such as confusing units and tens, the phonetic spelling and consonant, ungrammatical method of expression, answers opposed to suggestion and expectation, and the exclusion of all mechanical and mental helps are conclusive proofs to Haenel that the horses "think."

The dog, Rolfe, whose performances are reported by Mackenzie (10) has been trained to reply to questions by tapping the floor with his foot, 11 times for G, 14 times for K, etc. The trainer is a woman of very delicate and artistic temperament and a semi-invalid. Other dogs and a cat have also been educated as "Rolfe" has. Of himself Rolfe began to make combinations which his trainer decided stood for letters. He never makes any errors and uses the patois of the Mannheim peasants and the smallest numbers for letters in most frequent use. He is said to have a system of

stenography as do the horses—s-n is essen. Vowels are often omitted. Not only is he said to know grammar but he can give sentences to illustrate rules. He is very easily fatigued.

At three separate times but with the trainer present the author tried the dog with pictures on cards which were drawn from envelopes so that no person, not even himself, could see. The dog after rapping 4, "tired," spelled "Rot, blau, Eck" which was correct. As many as ten resemblances between Rolfe and the Elberfeld horses are pointed out. The author rather characteristically closes his article with a plea for the return to the old dual conception of mind as reason and intuition. The order of increasing reason may be horse, dog, man, but the reverse for intuition.

Larguier des Bancels and Claparède succeeded in holding a single session with "Rolfe." From a series of cards previously prepared one was chosen and shown to the dog in such a way that the trainer or assistants probably could not see the picture on the card. After considerable reluctance the dog spelled out the words which described fairly well the pictured objects. The dog's illness prevented them from submitting him to more rigid tests on the following day. The question of his spontaneous use of speech thus remains unsolved.

Parker (11) discusses the subject of adaptation in relation to intelligence. No feature of organic life has received greater emphasis than adaptation. We are just learning that to think of an organism as a machine standing still is to divest it of that which is most distinctive. Adaptation is an essential of dynamic activity. But this activity which is continuous determines the adaptations. Classed alone adaptations have been unduly emphasized. Many reactions have been called adaptations which are not. Animal reactions, the author believes, are in the main free from adaptive restraint. They depend upon the fluctuating momentary conditions of the animal body. They are adaptive only in main outlines. If we attempt to explain this condition by assuming something like intelligence we are arguing in a circle, for intelligence is our own name for our own chief means of adaptation.

Burroughs's article (1) is written in criticism of the study of animal behavior in the laboratory as set forth in an earlier paper by Professor Haggerty.[1] In such study animals are drilled into forming new habits, the reasons for which they do not understand. Intelligence, strangely used by Mr. Burroughs, is, for the most part,

[1] *Atlantic Monthly*, May, 1913.

conspicuously lacking. The gulf between the mind of man and of animals is so great that he believes it is misleading to describe so-called animal psychology in terms of human psychology. The reason the laboratory student finds so little of "intelligence" in animals is that the problems he sets are human problems, the situations are so foreign to the animals. His use of the word intelligence is yet more strange when he says that plants show it in the devices for scattering seed, securing cross-fertilization, etc. The laboratory student has animal behavior in a nut-shell and is therefore without perspective. If an exact science of animal behavior is possible then the laboratory student has the advantage; yet such is an impossibility in the laboratory or out of it.

Those animals that are self-armed, like the porcupine, Burroughs asserts, are slow and dull of wit. The reviewer is here constrained to ask the author to examine the results obtained by Dr. Sackett on the porcupine, the review of which will be found above.

The experimentalists should prove or disprove that birds are color-blind and other like problems because such would furnish a crucial test of such large questions as Darwin's natural selection theory. He wishes that the experimentalists would determine what is the sense which enables one bird to pursue another so unerringly and how gregarious birds fly as a unit. The human experiences which we call telepathy are the survivals of this lost human capacity. He closes his discussion by saying that there is little or no value in such investigations as that of the tactual sensations of the white rat unless they yield the key to some larger problem.

Mr. Burroughs will find it difficult to justify his use of the term intelligence. He assumes that telepathy is a proven fact in human psychology and is I believe in error in his facts or interpretations concerning porcupines and the unity of response in the aerial evolution of birds. Other explanations should be long tried before resorting to mental telepathy.

Haggerty's article (5) gives the contrary viewpoint. Like Mr. Burroughs every student of animal behavior regrets that careful experimentation requires so much time. All would like to state the whole truth about tropisms or mental evolution in one sentence. Haggerty cites the experiments by Dr. Hamilton, the results of which have been published, on eight normal human beings—men, boys and girls,—two defectives, five monkeys, sixteen dogs, five cats, and one horse, which prove that any one who believes in a

qualitative difference between the animal and human mind has a difficult task to give a satisfactory explanation of such facts. These experiments would also seem to prove that animals do not respond in an invariable manner peculiar to their species while man has the possibility of wide variation. They also show that there is much animal behavior in man and some human behavior in dogs and monkeys. For Mr. Burroughs to deny that animal behavior can ever become an exact science is a denial of all real science. The experimental method must be used just because of the complexity of nature and it is being extended to even education, religion and eugenics. On its tangible results depends our entire social organization.

The movement for the experimental study of animal behavior has been created within the past decade or so and has accomplished much. A fact has no more or less virtue for having been discovered experimentally or by an observing naturalist.

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GENERAL REVIEWS AND SUMMARIES.

MEMORY, IMAGINATION, LEARNING, AND THE HIGHER MENTAL PROCESSES (EXPERIMENTAL)

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I. Memory and Imagination

(*a*) *Summaries and Systematic Treatises.*—Braunshausen's paper (7) summarizes certain of the well-known investigations of memory. The third edition of Offner's monograph (43) contains important additions dealing with the pathology of memory and with the intensity of memorial dispositions. Dürr's discussion of the phenomena of memory, imagination, thinking, believing and knowing (16) attempts to systematize and interpret the findings of the numerous recent investigations of these topics.

(*b*) *Discussion of General Questions.*—In a plea for the recognition of the existence of affective memory Sollier (52) appeals to clinical and to experimental findings. Patients who are subject to recurrent attacks frequently report a premonitory "feeling" before the onset. This feeling of *malaise* is affective rather than sensory, yet the patient recognizes that he has experienced it before; ideas may be superadded, but they are mediated to consciousness indirectly, through the medium of the directly reproduced affective states. The convalescent patient frequently reports phenomena which indicate that affective experiences leave an intensive after-effect, and that they are capable of subsequent revival. A remembrance of organic and cœnesthetic experiences is equally indisputable and equally important in general mental functioning,—indeed, it is the cœnesthetic memory which serves as the support

and the bond for the unification of remembrances. From a study of forty-five cases Miss Smith (51) shows that paramnesia is due to a partial amnesia of the associative processes in consequence of which the memory image becomes distorted and appears to be false. She differentiates and illustrates several varieties of paramnesia, and she discusses the significance of weakened or distracted attention in giving rise to the phenomenon. Paramnesia is not in itself an abnormal mental phenomenon, since it is but a special form of the weakening and blurring which are characteristic of all memory images. Hollingworth (24) describes the distinguishing characteristics of recognition and recall. In recognition, a datum is present as a focal component but its background or setting is lacking, while recall represents the opposite state of affairs,—where a cluster of associations is present but the desired focal component is missing. The determination to remember plays a much more important rôle in the case of recall than in the case of recognition; a single presentation has a greater imprinting value in the latter case than in the former, and the difference in imprinting value is greater in proportion as the materials employed are coherent and meaningful. In delayed recognition, various sorts of materials show characteristic differences in degree of recognizability and in effect of increased interval. Tait (56) investigated the influence of distractions, and of pleasantness-unpleasantness upon remembrance. It was found that pleasant impressions are remembered better than unpleasant, and both are remembered better than indifferent impressions; and not only is this true in so far as the impressions themselves are concerned, but they seem to exert the same facilitating or repressing influence on other impressions. Distractions are more effective in non-coherent materials than in coherent materials; forgotten words may be recovered even when their loss is apparently complete. The effect of the distraction is less when its introduction is delayed for a time after the act of learning. Bergson has differentiated active or motor and passive or imaginal memory and has asserted that the difference between these two sorts of remembrance is so fundamental as to constitute a difference in kind; Heymanns (22) points out that Bergson's distinction is at variance with the experimental findings of both normal and pathological psychology.

(*c*) *Imagery.*—Claparède (11) believes that the clinicians whose discussions of language and aphasia have sometimes led to the denial of the existence of verbal motor imagery have erred in that

they have not sufficiently differentiated the questions under discussion and in that they have not made sufficiently accurate observations of these exceedingly motile and elusive phenomena. Claparède is convinced of the existence of verbal motor images and he discusses the rôle which they play in language. Miss Fernald (18) investigated the mental imagery of two blind adults in an effort to determine whether they possessed tactual and visual imagery, and what individual differences were present. One subject, who was able to translate her tactual experiences into visual terms, made no supernormal use of tactual imagery; but the other subject, in whom this surrogate functioning was lacking, employed tactual imagery readily and successfully. Sylvester (55) employed eighty-five blind children in tests with the form-board. He found that those individuals who had always been blind showed the least ability in fitting the blocks into the appropriate compartments; the longer an individual had retained his vision the more successful was he in the test. It appears, therefore, that those who have ever had visual experiences retain their visual imagery and are assisted by it in interpreting their tactual impressions, while tactual imagery is less effective than a combination of tactual and visual imagery, even in those who are limited to tactual imagery alone. Ogden (44) undertook to determine what are the distinguishing characteristics of images of memory and images of imagination. Introspective descriptions, obtained from six observers in one hundred and thirty-eight memory images and seventy-four images of imagination, show that it is exceedingly difficult to discover the differentiæ of these two sorts of images; the author concludes that the differentiation eludes any attempt to reduce it to such factors and conditions as were investigated in his experiments, and he is tempted to refer the distinction to imageless acts and contents. In Miss Martin's investigation (32) simple figures were presented, and the observer was asked not only to draw his visual image, but also to draw the figure on the card as he remembered it. It turned out that the observer's knowledge of the figure was almost invariably more accurate and more complete than his visual image of the figure,—they knew details of which they had no image and they could sometimes fill out lacunæ in their imagery. The author believes that these findings constitute evidence of the existence of a non-sensory remembrance; and this evidence is confirmed by the testimony of her observers. In Hunter's experiments (28) with white rats, dogs, racoons and children, associations were first

established between the obtaining of food and the appearing of a light. The temporal interval between stimulus and reaction was gradually increased until a limit was reached beyond which successful reaction was impossible. The rats and the dogs "remembered" by maintaining gross motor attitudes of the whole or part of the body, but the behavior of the racoons and the children indicates the presence of ideas.

(*d*) *Association and Inhibition.*—Burr and Geissler (9) report an investigation in which the reagent selected either member of a pair of pictures or of stories or of groups of objects, and examined it carefully. In the association-reactions which followed, the longest reaction-times invariably occurred in response to critical words; but irrelevant stimulus-words were sometimes followed by delayed reactions, and critical stimulus-words by rapid and insignificant associations. Introspection shows that the "concealing of a complex" is but a special case of consciousness under negative instruction. Sutherland (54) included ambiguous and "indelicate" terms in his list of stimulus-words, and introspections were recorded. Fifteen thousand associations, obtained from twenty-five normal adults, show that the reaction is determined not by the content of the reagent's consciousness but by his habits and his ability to adapt himself to the experimental situation, which latter has an essentially social basis; sex traumata may play a part but they are far from being the only factors which give rise to failures to react. The author criticizes the current classifications of associations; and he suggests that an artificial prolongation and intensification of parts of the reaction might facilitate the work of analysis. Duprat (15) presented words and pictures which had been arranged in such a serial order that they fitted naturally into a consecutive context; and his reagents reported their trains of images, ideas and feelings rather than simply the first idea which was evoked in each case. He found that a stimulus-word may re-arouse the same group of images, ideas and feelings in successive sittings; these stereotyped associations indicate the presence of "centers of crystallization" around which experience tends to organize itself; and these "ideo-affective syntheses" are of paramount significance in normal as well as in pathological mental functioning. Rosanoff and Rosanoff (48) report that children are characterized by fewer common reactions but more doubtful, individual, and failing reactions, than adults; associative capacity is definitely correlated with mental capacity and with school grade.

Wohlgemuth (61) again discusses the phenomenon of reversibility in the direction of associations. Experiments with nonsense syllables have shown that a syllable is more intimately associated with its successor in the series than with its predecessor, i. e., the association operates chiefly in a forward direction. Wohlgemuth finds that when colors and diagrams, instead of nonsense syllables, are employed as materials, the associations are reversible,—they operate equally well in either direction; and he explains the reversibility from the fact that vocal-motor imagery played no part in the learning of his materials. Shepard and Vogelsonger (50) report an investigation of inhibition in which an ingenious variation of procedure was employed. Their lists of syllables were so constructed that, in certain acts of learning, an association was established between *a* and *b* and between *c* and *b*,—in this case *a* and *c* were presented either simultaneously or successively, in the subsequent test; in other cases, associations were established between *d* and *e* and between *f* and *g*,—here *d* and *f* were presented either simultaneously or successively in the subsequent test; an association was established between *h* and *i*,—in the subsequent test *h* was either presented alone or in combination with a wholly novel syllable, and in the latter case either simultaneously or successively; in other cases, syllables were learned in groups of three, and variations of combination of stimulus-syllables were presented in the test. The investigators hoped by this procedure to give rise to various forms and various degrees of reinforcement and inhibition of association. A comparison of the relative lengthening of *Treffer*-time and of the relative number of correct *Treffer* under these various conditions reveals the existence of a wholly unexpected state of affairs; and they bring to light the presence of a form of inhibition which can not be subsumed under the hitherto recognized forms of generative and effectual inhibitions, nor can it be explained in terms of a division or drainage of nervous energy.

(*e*) *Learning and Forgetting.*—Ballard (3) describes experiments in which materials of various sorts (poems, nonsense syllables, nonsense verses, geometrical forms, Latin-English vocabularies) were partially memorized; and retention was tested, by the method of free reproduction, immediately after learning and after various intervals extending up to fourteen days. Several thousand observers, ranging from five to nineteen or more years of age, took part in the experiments, the materials being presented simultaneously to all the members of the class-room. It was found that

reproduction was more efficient after two or three days than it had been immediately after learning. The author is convinced that this increased efficiency of recall with the lapse of time is a genuine phenomenon of memory; the phenomenon occurred in about forty per cent. of his younger learners, and it became more rare with increase in age; it appeared most frequently in the recall of coherent and meaningful materials, and "it is more frequently present in subjects who casually think of the materials during the interval between learning and recall." A somewhat similar finding by Radossawljewitsch fails to find confirmation in Finkenbinder's reinvestigation of the problem (19). Finkenbinder's experiments were essentially a repetition of the work of Radossawljewitsch with the significant variation that the experimental sittings were distributed over the whole day,—in order to rule out the influence of fatigue which proved to be present in relatively intensive form at certain hours of the day. His results show, in confirmation of the pioneer findings of Ebbinghaus, that the course of forgetting may be represented by a smooth and gradual curve which ascends rapidly at first, then progressively more and more slowly. Piéron (46) also reports the results of an investigation of the curve of forgetting. A list of fifty digits was learned and retention was measured,—by methods of free reproduction and of relearning,—after intervals of seven, fourteen, twenty-eight, sixty and one hundred and twenty days. The results show that the course of forgetting may be represented by a smooth and regular curve, which does not, however, show such an abrupt initial ascent as was present in the curve of Ebbinghaus. Since several previous investigators had reported that reproduction is more efficient a few seconds (four to fifteen) after presentation than it is at any antecedent or subsequent time, von Wartensleben (58) undertook a reinvestigation of this problem. Consonants were presented by means of a tachistoscope and retention was tested by the method of free reproduction immediately after presentation, and after various intervals extending up to sixty seconds. Her results fail to establish any definite relationship between efficiency of reproduction and length of temporal interval (within these narrow limits); intervals which were most advantageous for certain learners proved to be most disadvantageous for other learners, and indeed, there were variations in the case of the same observer from sitting to sitting. This negative result is to be explained from an analysis of the exceedingly variable mental processes which run their course during

the temporal interval; and so many circumstances play a part in these processes that the learner is subject to variation from experiment to experiment. The author describes the characteristics of the process of reproducing in each of her observers in the hope that an insight into their mental types and their modes of learning may aid in the solution of the problem.

In Strong's investigation (53) of the effect of temporal interval upon recognition capacity, lists of twenty significant words were presented and read aloud by the learner. Recognition was subsequently tested by a method which consisted in presenting a second list of forty words and having the learner mark those words which he recognized as having appeared in the original list. Five learners took part in the investigation; and the fourteen intervals employed ranged from immediacy to forty-two days. It was found that recognitive capacity decreases at first very rapidly, then more slowly,—eighty-four per cent. of the twenty words being recognized correctly immediately after presentation, while only ten per cent. were correctly recognized after an interval of seven days. Recognitions which are not accompanied by a feeling of absolute certainty are little more than random guesses; the number of incorrect recognitions is relatively small, and the percentage of incorrect recognitions increases but slightly with increase of temporal interval. In *Aussage* experiments with pictures and geometrical forms, Dallenbach (12) determined the dependence of memory error upon temporal interval for periods extending from zero to forty-five days. His results, obtained from thirty-four observers, show that memory error increases directly with the length of the time interval, the increase being more rapid at the outset; that the degree of subjective certainty bears a direct relation to the objective fidelity of remembrance; that of the various attributes, form is most accurately remembered, after which follow in descending order, size, position, order and color. Cionci (10) investigated the forgetting of pictures under conditions of concentrated and of distracted attention. Complex pictures were examined for one minute, after which reproduction was tested immediately and after the lapse of five, ten and fifteen days; in the distraction experiments, the observer attended to the reading of a poem while examining the picture. Cionci's results show that under normal conditions the amount forgotten increases in direct proportion to the length of the interval which has elapsed, the absolute amount depending, however, upon the individual and varying with his mental and physi-

cal condition; in the distraction experiments, the forgetting first decreases to a minimum from which it subsequently ascends.

Ebbinghaus and others have found that when a learner is assigned the task of memorizing variable amounts of material, the increase in time required for learning the longer lists is very much greater than the increase in the amount of material. Foucault (20) undertakes to determine what is the exact numerical relation between these two magnitudes. He presented nouns in lists, varying in length from four to fifteen members, and these materials were memorized by seven learners. The results show that the time required for learning varies as the square of the number of terms in the series; and the author cites results from Binet and from G. E. Müller which confirm this finding. In another investigation Foucault finds that the amount forgotten after a given interval is inversely proportional to the length of the series,—the product obtained by multiplying the number of terms in the series by the amount forgotten is constant.

A lengthy article by Piéron (46) discusses a variety of memorial phenomenon; the findings of other investigators are summarized and discussed, and the author presents the results of his own investigations in this field. The reactions of certain invertebrates to repeated obscurations indicate the presence of a primitive mnemic function; and the determination of the optimal interval between successive obscurations enables one to state in quantitative terms the conditions of the establishment of mnemic dispositions. In the case of man it has been found that certain intervals between repetitions prove to be more advantageous than others. Piéron seeks to discover what is the optimal interval; his learners memorized lists of syllables and digits, the experimental sittings being separated by intervals which varied from thirty seconds to forty-eight hours. The author concludes that intervals of ten to twenty minutes' duration represent the optimum,—a finding which is to be explained on the assumption that the establishing of the memorial disposition continues for a time after the presentation has ceased. Piéron next investigates the curve of learning in its relation to the amount of material to be learned. In cases of accumulated repetitions,—where the learning proceeds continuously, without any interval between successive repetitions,—he finds that the number of repetitions required per member of series increases very rapidly with increase in the length of the series; but when consecutive repetitions are separated by an interval of appropriate length the time required

for memorizing each term of the series decreases with increase in the length of the series.

Winch (60) reports the trite observation that processes of articulation may be of service in the learning of orthography. In an investigation of the reproduction of geometrical figures, Miss Meyer (36) found that the memory errors of children differ in certain typical ways from those of adults. Children's drawings tend more than adults' to reduction and less to enlargement; the former show many more partial inversions,—through ninety degrees or thereabouts, to right or left,—than the latter; both children and adults are more prone to errors of mirror-form than to above-below confusions.

Pyle (47) assigned the task of learning to transcribe passages of prose into an artificial language made up of twenty-six arbitrary characters. The periods of practice varied in length from fifteen minutes to sixty minutes. The thirty-minute period proved to be most advantageous for the acquisition of skill. In other experiments he found that daily practice was more advantageous than twice-a-day practice or practice upon alternate days; half-hour periods of practice, undertaken daily on each of fourteen consecutive days, proved to be much more economical than the same number of half-hour periods of practice accumulated within a single day (with intervals of thirty minutes between the practice periods); indeed, in the latter case, no further improvement appeared after the third period, and there was even a lapse of efficiency after the eleventh period. In an investigation by Misses Browning, Brown and Washburn (8), blindfolded subjects were trained to sort cards into compartments; in one case the successive sortings were made without interval, in another case, with distraction intervals of one minute. The results show that about one hundred and fifty per cent. more repetitions were required for the attainment of a given degree of skill in the 'no interval sortings' than in the 'interval sortings'; and the superior advantage of distributed repetitions is more marked in the learning of more difficult materials. Kline and Owens (30) publish a preliminary report of an investigation of the acquisition of skill in the sorting of cards. By ingenious variations in the nature of the task assigned to the learner, they aimed to analyze and differentiate the stages in the act of learning, and to throw light upon such factors as interference, transfer, attention and affective tone.

Horwitz (27) presented letters, words, and pairs of words which

were subsequently reproduced, either freely or by means of the *Treffermethode*, after intervals which varied from fifteen seconds to two minutes, with and without distraction during the interim. These experiments were performed upon twenty-seven abnormal subjects, including thirteen hystericals, thirteen psychopaths and one paranoiac; and three normal subjects were included for purposes of comparison. The results show that hysterical and psychopathic patients are not usually defective in remembrance of recent events within an interval of two minutes, although such a defect is sometimes present. The most markedly disadvantageous effect is due to a distraction of attention; and this effect manifests itself in a failure to remember the relative positions of the presented material rather than in a forgetting of the material itself. In Boring's investigation (4, 5, 6) eight dementia praecox patients were submitted to tests in order to measure their noting capacity, their immediate memory span, their apperception capacity, their capacity to follow instructions, and their motor control in such activities as tapping and aiming at a target. Then the author undertook an investigation of their acquisition of skill in reproducing an extent, in cancelling symbols, in finding their way through a printed maze, and in the weaving of rugs. In addition to the objective results, introspective descriptions were obtained from the patients. It was found that dementia praecox patients are capable of fairly accurate motor adjustments, but they show large individual variations in their ability to learn, in their mode of procedure, and in the consciousness which accompanies the performance. The course of consciousness which accompanies their learning of the maze is similar to that of the normal subject; visual and attitudinal factors dominate at the outset, but these usually give way subsequently to kinæsthetic factors, and these in turn finally lapse as the performance becomes automatized. The introspective descriptions of the dementia praecox patient are very incomplete as compared with those of the trained normal subject, and they are sometimes rendered unreliable by the interpolation of irrelevant statements. One may, however, obtain from the dement a reliable description of the general trend of his consciousness.

Abramowski (2) points out that according to the teachings of current psychology, no psychical vestige remains after a stimulation has ceased; all that is left is a physical modification in the nervous system, and nothing but a restimulation or a representative association can bring about a mental revival of this physical state. He

urges that this envisagement of the situation has been shown to be false by his investigations of "cryptamnesia."[1] Past experiences are conserved not only in the form of physiological processes but also in the form of mental contents which possess an essentially emotional character. Every experience leaves behind it an "emotional equivalent"; these "equivalents" accumulate and coëxist but they lose neither their individuality nor their power to reinstate remembrances. The author's "law of the emotional survival of forgotten data" states that in passing into obliviscence, perceptions are transformed into the affective equivalent of that which followed them in consciousness; the antecedent disappears as a perception but persists as an emotional survival of that which followed it. Haggerty's discussion (21) cites Jennings's familiar observation of modifiability of behavior in stentor; such a case of modified behavior can not, however, be adequately explained by supposing that the discrete stages are now "passed over rapidly and in a modified fashion," for there is no indication that these stages are now present at all. An appeal to the synapse, in the case of the higher animals, is equally unavailing because we still have upon our hands the mystery as to why the synaptic resistance to the passage of the nervous current should be greater or less at any one time than at any other time. The psychologist's difficulty is due to the fact that his conception of nervous functioning has been too static and too mechanical. The author advances the view that physiological states, instead of being isolated and self-contained, tend to radiate and to mingle with other physiological states and even to extend to states which are temporally removed from them. The single cortical cell, endowed with the properties of primitive animal protoplasm, may then become the vehicle of several physiological states at the same time; this conception of linear and lateral irradiation simplifies the explanation of the phenomena of learning.

Two important German contributions to this general topic have been made more accessible to American readers by Ruger's and Baird's translations (17, 35); Thorndike's *Psychology of Learning* (57) will be reviewed elsewhere in the BULLETIN.

(*f*) *Intention and Determination.*—Myers's study (42) of incidental memory consisted in determining the accuracy with which the sizes and dimensions of familiar objects (coins, stamps, bank notes) could be reproduced by a large number of individuals of

[1] For a summary of the results of these investigations see this BULLETIN, 1911, 8, 248; 1912, 9, 325 f.

different ages, occupations and degrees of education; and the accuracy with which materials could be reproduced when they had been perceived without the expectation that they were to be remembered. It was found that most observers wholly fail to remember their "incidental" experiences. The attitude of the subject is an important factor in perceiving and learning, both of which are essentially selective processes. Aall (1) presented objects and stories to six hundred children, ranging from seven to sixteen years of age. In one case the pupils were told that their reproduction of these materials would be tested after the lapse of several weeks or months; in another case they were given to understand that the test would be made on the following day but the test was really deferred for four or eight weeks. It turned out that the accuracy of reproduction was invariably greater in the case where the pupils had learned the material with the intent to remember it for a considerable period,—the difference being nine per cent. in the case of the objects, and twelve per cent. in the case of the stories. Langfeld (31) reports an investigation of voluntary movement under positive and negative instruction. In one case the reagent was instructed to trace a line along the middle of a groove; but in another case the instruction was negative: "Do not touch the sides of the groove." In most instances the movement proved to be more accurate under the positive instruction, but in certain reagents the opposite tendency appeared. Introspection showed that the mental content varied with the variation in the instruction; certain reagents required visual and kinæsthetic imagery in order to execute the movement, but an image of the intended movement was not necessary in every instance; the most frequent content was a representation of the result to be attained. The reagents who relied most upon a non-represented determining tendency were most successful in executing the movement,—which leads the author to suggest that progress in muscular control is inversely proportional to the amount of imagery employed.

(*g*) *Practice.*—G. E. Müller (38) reports the results of a recent reinvestigation of Dr. Rückle, the mathematical prodigy. The previous investigation had taken place six years before, and in the meantime, Rückle had been engaged for four years in giving public exhibitions of his feats with numbers. It seems probable, then, that any improvement which has taken place is to be regarded as a product of this daily practice. Rückle's memory for numbers (measured in terms of the time required for the memorization of

large groups of digits) has improved by approximately forty per cent. (He can now memorize a list of two hundred and four digits in less than nine minutes as compared with eighteen minutes in 1906!) But in the meantime, the time required for the memorizing of consonants, syllables and colors has increased by more than fifty per cent. This paradoxical result is doubtless to be explained from the fact that his learning of numbers is now almost exclusively of a rational and ingenious sort, and that he feels uncertain and unskilled in mechanical memorizing. Müller's paper also reports the results of an investigation of Rückle's processes of recognition, and of his present procedure in learning and reciting; a description of his marvelous feats in computation is added. In Kirby's investigation (29) pupils of the third and fourth-year classes were practiced in addition and division for periods of equal duration, but of different distribution,—the total practice-time being divided into from two to twenty-two equal divisions for different groups of children. It was found that in the addition experiments, with seven hundred and thirty-two pupils, the median ability of the group increased by approximately forty-five per cent. as a result of forty-five minutes' practice; in division a median percentual gain of seventy-five per cent. resulted from fifty minutes' practice. The shorter period of practice proved to be considerably more advantageous. The permanence of the practice effect was measured at the close of the school-year in June, and again after the re-opening of school in September (the practice experiments had been completed, in all classes but one, in April or May). It turned out that there was a considerable loss of ability both in addition and in division, during the summer vacation; but on resuming the practice it was found that an average of thirty minutes of practice was now sufficient to bring the group to the same degree of efficiency as had been attained at the end of fifty minutes of practice in the preceding spring. In Phillips's experiments (45) sixty-nine pupils of the sixth, seventh and eighth grades were tested in "arithmetical reasoning" and in "the fundamental operations of arithmetic"; employing the results of this test as a basis he divided the children into two groups of as nearly equal ability as possible. And one of the groups was given ten minutes' drill daily in "fundamental operations of arithmetic" and in "arithmetical reasoning," the drill continuing through two school months. Then the initial tests were repeated in both the drilled and the non-drilled groups, when it was found that the former had improved fifteen per cent. more than

the latter in "fundamentals," and fifty per cent. more than the latter in "reasoning." Donovan and Thorndike (14) report an investigation in which the adding of columns of digits was practiced by twenty-nine school boys of the fourth grade for a period of sixty minutes; the practice was distributed over thirty periods of two minutes each, and it was undertaken twice daily for the five school-days of the week. The average improvement of the group was approximately sixty-four per cent. as a result of the hour's practice; the gross amount of improvement is approximately identical in the case of the group which possesses the least initial ability and the group which possesses the greatest initial ability. Hill, Rejall and Thorndike (23) report an investigation of the acquisition of skill in typewriting; two subjects practiced the writing of both "old" and "new" material, daily for a period of five months. The results show that the learners improved progressively from an average initial efficiency of eight words per minute to an average final efficiency of thirty-nine words per minute, in the case of the old material; while in the case of the new material, the corresponding scores were seven and twenty-four. The curve of learning shows, in all four cases, an initial rapid ascent followed by an approximately straight line. In a subsequent test, four and a half years later, it was found that the improvement was relatively permanent; five hours of additional practice sufficed to attain the same degree of efficiency as had been attained in thirty hours of practice in the original experiment.

Meyer (37) argues that it is unjustifiable to carry over the concept of training from the muscles to the nervous system; nervous function is not capable of such an improvement and a facilitation as is muscular work. Neither the sense-organs nor the acquired nervous functions can be trained. The training of activities and feats of skill is wholly a matter of memory and of the establishing of associations between the aim of the movement and the execution of the movement. Mechanization comes about chiefly by means of constellations in the associative processes; and the volitional factor must be included among these constellating components, for the intention has a constellating effect throughout. A movement does not become involuntary as a result of practice; it merely becomes a component of a goal which includes it, and the will includes the whole series in a single act of consciousness. Attention and will can be trained only through memory; attention is improved in consequence of familiarity with the material, and the will is im-

proved exclusively as a result of habituation in definite action. All training is due to memory, but memory is not due to any form of training.

II. Intellectual Processes

The second edition of Meumann's *Intelligenz und Wille* (34) contains sixty-one additional pages of text, and a much-needed index has been added. The author's views are not essentially changed; the most important additions have been made to the sections which deal with wishing and acting, and with willing from the purely psychological point of view, although in numerous other sections the author's statement has been clarified and definitized.

Westphal's procedure (59) consisted in assigning a principal and a secondary *Aufgabe* to his observers; it was found that the content which represents the solution of the *Aufgabe* may be present to consciousness in widely different ways. These differences lead the author to differentiate five degrees or levels of consciousness: (1) the datum may be present to consciousness in such a vague and fragmentary fashion that its existence can only be inferred; (2) it may be present as an unrelated content, the observer being unaware of any activity on his part; (3) the datum may be observed under the direction of a specific *Aufgabe* in which case it gives rise immediately to a state (4) where the solution of the *Aufgabe* is potentially known—the observer knows the colors, the forms, etc., but he can not formulate his knowledge; and finally (5) these details are actually known, the knowledge being formulated in verbal or attitudinal terms. These degrees of consciousness do not represent mere differences in clearness of content; they have to do with the observer's relation to the content.

Hollingworth (25, 26) finds that the accuracy of the individual's judgment regarding the efficiency of his own performance varies with his degree of confidence; and that as we pass from relatively automatic motor activities to activities of a more strictly mental character, we find that progressively larger variations in performance must be present in order to give rise to judgments of a given degree of confidence. Judgments of the efficiency of one's own as well as of another's performance are based upon affective criteria. In discriminating weights, pitches and the like, the judgment tends to be directed toward the "positive" stimulus, although the second stimulus is also favored slightly. Judgments of similarity and of difference are based upon different criteria, the former upon grosser and more general properties and the latter

upon more minute details. Judgments of similarity and of difference are not merely two different forms of expression of a single intellectual act; each involves its own peculiar mental processes and criteria; that which is most similar is not for that reason the least different. Similarity seems to be a more fundamental, natural, easy and self-consistent category than difference.

Müller-Freienfels (39) calls attention to the fact that ideas never appear apart from attitudes, feelings and motor tendencies; the more consistently one's thinking is directed toward a goal, the more intensive are these attitudinal, affective and motor components,—it is only in the dream-life that the concrete content of ideas predominates. Processes of comparing and of generalizing are each the product of a specific attitude; and the investigation of memory has shown that attitudes and generic feelings are more permanently retained than sensory data. In a discussion of the general idea, the same author (40) points out that a perception is much more than a mere fusion of sensations. Feelings and movements also play a part, and the character of generality which attaches in some degree to all perceptions is the peculiar product of these affective and motor concomitants. Not only are these affective and motor concomitants reproduced in every reproduction of a perception, but they play a major rôle in the reproduction and the reproduced sensations play a minor rôle. A certain degree of typicalizing has already begun in the act of perceiving, and in the act of ideating the typicalization is carried to a higher degree. The general idea is usually a particular idea which has not only lost its details but which now appears in another context and with other affective concomitants; the general idea differs from the particular idea only in degree and in function. Our ready comprehension of figurative and ironical expressions shows that the understanding of meaning is not dependent upon concrete ideation,—indeed, in many instances, the current meaning of such expressions could not be understood if ideation took place; understanding consists essentially in an arousal of feelings and of a readiness for action. In a third paper (41) Müller-Freienfels undertakes to differentiate the chief types of imagination and thinking, on the basis of certain fundamental differences of apperception: (*a*) Certain individuals are interested chiefly in the special case with its peculiar characteristics, while others seize upon the typical in every experience. This difference reveals itself not only in external apperception but also in the highest levels of abstract thinking, because

apperception furnishes the material for all thinking. Impressionistic naturalism and typicalizing idealism in art, concrete empiricism and abstract idealism in philosophy are the product of thinkers of these two types. While this individual difference is largely a product of adaptation and adjustment, and is due in part to one's profession and to the needs of one's environment, yet there is usually a congenital bent toward one type or the other,—and this bent is probably to be explained from a keener sensitivity of the sense-organs or from a greater plasticity of the higher cortical centers. (*b*) A second differentiation of types is based upon the circumstance that certain individuals regard the world at large as being more static, while others regard it as being more dynamic; for the former type of individual, that which is at rest is more significant, while that which is in motion is more significant for the other type. This difference in type is to be explained psychologically from a more or less dominant motor endowment of the individual. (*c*) A third pair of types owes its differentiation to the fact that we tend to take up an attitude toward the objects of experience. The objective type of individual observes objects in an impersonal fashion and refrains from mingling his own feelings with them; the opposite type takes a definitely subjective attitude toward objects and adds a subjective component to the objective datum. The former type is attracted to the exact sciences, the latter to ethics, æsthetics and religion. In addition to these three fundamental pairs of types, the author discusses the possibility of various combinations of types.

Selz (**49**) points out that psychology has not succeeded until recently in accounting for the unity and the coherence which must characterize the creations of the genius if they are to prove acceptable. The course of ideating and thinking proceeds toward a goal; and the setting up of the goal is found to initiate such intellectual operations as are adapted to its attainment. These operations consist in the reproducing of a content and then in performing certain activities of abstracting, selecting and combining. A peculiar coöperation of a whole series of such activities is usually necessary if a problem is to be solved. In certain instances, this appropriate coöperation is made possible by the fact that problems of a somewhat similar nature have been solved before; in such cases of more or less definite knowledge of both means and end, the reinstatement of the appropriate operations in appropriate sequence is a relatively simple matter. The author also discusses cases in

which means and end are unknown but are discoverable, and cases in which accidental discoveries of the past are now either employed as means or are set up as ends.

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MEMORY, CONCEPT, JUDGMENT, LOGIC (THEORY)

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In succinct and classic form, Ward (16) treats of the problem of biological heredity and memory. The solution advanced depends on the doctrine that required traits are inherited, but it implies also, what Ward believes is too often forgotten, that no clear manifestation of heredity of acquired traits should be expected until "the functions that have led to structures have passed far beyond the initial stage where conscious control is essential to their performance." Weismann's theories are subjected to fundamental criticisms. The principle of continuity forbids the assumption that the developmental process abruptly changes when we pass from unicellular to multicellular organisms. There is no ground

for separating organic life from psychical. All life is experience. Ontogeny and heredity are aspects of a single process. What habit and memory are for the individual heredity is for the race. The key to the nature of the continuity between body and germ is to be found in social intercourse rather than in physical transmission. It is possible to hanker unduly after a physical explanation of the *modus operandi.* The mnemic theory requires not merely physical records or "engrams" but living experience or tradition.

Hollingworth's suggestive study (11) of the comparatively neglected process of recognition is based mainly on experimental data (secured for the most part in experiments performed for other purposes), the theoretical implications of which, however, are not wholly disregarded. It is held probable that schematically the mechanism of recall and of recognition involve a common neural pattern operating in reverse "directions" in the two cases; also, that a more careful study of the laws of recognition will throw light on various other processes concerning which there is still much to be learned.

Bréhier (4) attacks the prevalent intellectualistic view that concepts are relatively stable and fixed and that images are, in a depreciatory sense, relatively shifting and inconstant. This view overlooks a large range of data of quite the opposite implication. Bréhier points out that it has been often the case that it is the image that changes not, while the significance of the image, the ideas and the concepts, that were originally bound up with it, undergo profound alteration. Numbers (in the case of the early Pythagorians), early Greek myths, religious symbols of the Jewish faith, all afford instances of images which as images remain fixed while the meanings attached to them shift and develop. The main thesis is that because the image is permanent and because conceptual thought is transitory, an image tends to become symbolic. Three moments are distinguished: (1) image and idea as primitively associated, (2) a dissociation, and (3) a reassociation. The second moment arises through criticism through the effort to constitute in place of a world thinkable in terms of imagination a world thinkable in terms of logic. The influence of Comte seems to be plainly in evidence here; but in discussing the third moment Bréhier chooses not the Positivistic but the Realistic way. In the reaffirmation of the symbolic image he finds the characteristic of realism. From the standpoint of critical idealism the symbolic image is only an unnecessary duplication of the idea, whereas for realism it is a necessary method of approximating to reality.

Ribot (15) holds that the doctrine of imageless and wordless thought is an importation of metaphysics into psychology. After canvassing evidence adduced in support of the doctrine, paying especial attention to the data of mysticism, he concludes that the hypothesis is very improbable, and in any case is not proved. The partisans of this doctrine have, in his judgment, taken too simple a position in limiting themselves exclusively to what is in consciousness. They forget unconscious activity, which may have a psychic import. Here Ribot plainly inclines to the doctrine of unconscious cerebration. Thought entirely empty of any conscious image is not totally empty; unconscious activity has its own manner of working in the solving of problems; consciousness attests unconscious activity, but it does not constitute it.

The traditional study of logic continues to fare hard at the hands of those who are interested in a more psychological or scientific study of the subject. Müller-Freienfels (12) expresses the belief that the study of thought processes still suffers from the traditional view of ideas and concepts inspired by logic, and essays an analysis of concepts from a strictly psychological standpoint. He finds that thought processes when thus directly approached are seen to be not purely intellectual or ideational in the abstract sense, but are much more the expression of feeling and of preparation for action. Also in another article (13) he reaches a similar conclusion that the theory of the ideational processes has suffered from the domination of an intellectualistic interpretation. Thought is above all a reaction, an active attitude, not mere receptivity. And it lives in terms of feeling, not narrowly defined as pleasure-pain states of mind (or as if they corresponded to the black-white visual experiences of the color-blind), but with an infinite variety of shades, tones and combinations. Goblot (8) represents the tendency to free logic from embarrassing reminiscences of its ancestral form, language, to relieve it of all unnecessary linguistic impedimenta. His remarks are directed mainly to the modality and the quality of judgments. From a strictly logical point of view, he concludes, it is incorrect to admit the existence of modality of judgments. There are only judgments of modality. As to the quality of judgments, he rejects the view that there may be a third, indefinite sort, for this admission would destroy the principle of contradiction, the essential law of judgment. In a second article (9) Goblot points out again that verbalism has obscured what is essentially logical. A treatment of judgment forms stripped of their usual verbal

accompaniments is the desideratum. Then hypothetical judgments become in form categorical,—the assertion or the denial, as the case may be, of possibility, particular or general.

Anschütz (2) holds that the psychology of thought processes offers a field for scientific investigation which has only as yet begun to be cultivated. He offers a brief statement regarding methods of investigation: introspection, the interpretation of evidence furnished by other minds, both normal and pathological, and the utilization of the material afforded by the study of the development of language. This is incorporated in his book on Intelligence (3), in which he combines the results of a variety of theories and investigations bearing on the subject, introduced by an historical sketch of the problem. A summary of the psychology of attention is the backbone of this work. There are applications to educational and to individual psychology in methods of testing degrees of intelligence and in the determination of complex types of intelligence.

Anschütz's exposition of Lipps's new doctrine of the judgment (1) is demanded, according to the author, by the marked development which the doctrine has undergone since the issue of Lipps's work on logic in 1893. The earlier view of judgment defined it as an association of ideas. The later view emphasizes thought as a fundamental process of which judgment represents the highest stage of development. Anschütz has set forth the view with great detail, the first part of which is devoted to the psychological analysis of the judging process, and the second to a description of different species of judgments, both intellectual and affective.

Hicks (10) comes to the rescue of the principle of identity which as '*A* is *A*' has more than paid the penalty for the tautology of its formulation. "*A* is *A* is a predicative formula. It has betrayed modern logic into the error of treating identity solely as a predicative principle, whereas it is primarily a principle of stable values." After a critical review of modern discussions of identity, the author seems to regard the doctrine of evolution in its extreme, Heraclitean form to be the most serious menace to the principle of identity. Even here, however, we may successfully resort to Bosanquet's view that identity is a postulate and not a law. And this postulate is not out of harmony with actual conditions in a changing world, and at the same time quite sufficient for both epistemology and logic.

Driesch's monograph (7) is a contribution to logic conceived as *Ordungslehre*. Out of the Cartesian-like postulate "I experience

something" Driesch spins a web of concepts of ordered and ordering experience. Logic becomes the most explicit expression of the active and determining tendency of thought to order its world. Logic is the experience itself of the value of this ordering as a problem and also the experience of the will to solve this problem.

Couturat (6) maintains that it is beside the mark to oppose to logic the psychological fact of invention. The mind which invents is identical with the mind that demonstrates. Intuition is conceived of by the logisticians as intellectual intuition, in the Cartesian sense, not intuition in the Kantian sense. Couturat's algebra of logic, now translated (5), presents a brief and many-sided view of the subject; and is of value, also, in pointing out with great clearness its limitations: The algebra of logic marks an advance in breadth and universality over the traditional logic, to which it belongs, being at bottom the theory of classes considered in their relations of inclusion or identity. But logic ought to study many other kinds of concepts and relations. Thus the algebra of logic is a mathematical logic by its form and by its method, but it must not be mistaken for the logic of mathematics.

Translations of Poincaré's writings on Science and Hypothesis, The Value of Science, and Science and Method have been issued in a single volume with an introduction by Royce (14).

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READING

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The experiments of Wartensleben (5) are based on the earlier investigation of Finzi regarding the influence of the length of the interval between the perception and the reproduction of visual stimuli. Finzi has found that the best reproduction does not take place immediately after the first fading of the impressions and that an interval of four seconds is the most favorable one for correct reproduction. Wartensleben fails to confirm these results and finds no constant relation between the length of the interval and the correctness of reproduction. However, the interval has an undoubted influence which varies with the typical differences of the various subjects and with the nature of the processes which take place during the interval. The paper contains a detailed analysis of these processes and also a discussion of recognition and certainty based on the subject's introspective record.

Valentine (4) has made an investigation of the comparative merits of the word and phonic methods of teaching reading. The material used was English words expressed in Greek characters so as to approximate the conditions in which a learner is placed in beginning to read. In a preliminary test on training school students, he found that those who had been trained to read such words by the phonic method were slightly superior to those trained by the word method. In reading new material, the former were superior to the latter to the extent of 200 per cent.

With different classes of children of about eight years of age, the results were similar, so far as new words were concerned. The word method in general gave better results in the recognition of words on which the children had already been drilled. The difference in results, however, was not clear cut in every case and varied with the methods of the instructor in giving the lessons by the two methods.

The author puts especial emphasis on the results obtained from experiments on children who had been reading only a year. In this class, aged six and one half years on the average, the phonic method appeared the more effective, both in respect of old and new material. Some evidence is presented which appears to show that the word method is relatively more effective with duller children.

In view of the fact that the youngest children tested had already been learning to read for a year and because of the obvious difficulty of making the conditions of teaching the two methods fair to each, these results must be regarded as tentative, though the investigation is a very interesting attempt to reduce the problem to an experimental basis.

Brown (1) makes a more comprehensive and hopeful attack on the same problem. He proposes a unit of measurement for reading proficiency, based on rate of reading, and quantity and quality of reproduction. Experiments on schools of New Hampshire, where the children were taught reading according to different methods of instruction, appeared to show that the non-phonetic method is more valuable, especially in the lower grades. The present article is one of a series, the remaining numbers of which will appear later.

Pintner (3) makes a plea for more silent reading and less oral reading in the schools. The test of the ability of children of the fourth grade to reproduce the meaning of what was read orally and silently showed a slight superiority when silent reading was used.

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GRAPHIC FUNCTIONS

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The investigators of writing from the pedagogical side show increasingly a clearer and more definite conception of the problems to be solved. Brown (3) summarizes the investigations in progress on the psychology of handwriting and emphasizes Meumann's work as most significant, particularly his investigation on the various types of pressure curves. Rusk (12) urges the claim of speed as a present day requirement and hence the need of a study of the forms of movement most adapted to producing speed. Drever (7) also calls attention to the value of an investigation of writing-pressure as a means of studying "both the writing impulse itself, and the extent to which coördination of movement in response to the stimulus is present." Various methods of registration of writing pressure are given and a new method described of registering the pressure from the writing point instead of the pressure on a writing surface from the surface itself. Drever also emphasizes the need of an objective standard of merit for writing and criticizes as "scientifically unsatisfactory" such scales as those of Thorndike. We should seek a "numerical expression for facility of production, and for legibility." Starch (13) in a careful study suggests simple but accurate methods of evaluating legibility and productibility of writing. He finds that both the Thorndike and the Ayres scales are of value in measuring form and proves that measurements with such a scale as Thorndike's are, after practice, "from three to four times as accurate as evaluations made by the usual percentile marking system." Starch obtained samples, under laboratory conditions, of the writing of 2,190 children in the schools of Madison and measured these samples for speed, legibility and form with suggestions as to the possibility of working out a standard graph chart for each grade with reference to which the attainment of the individual pupil might be measured.

A most excellent study of pen-lapses is contributed by Stoll (14), who classifies these lapses into lapses of omission, addition, falsification, and substitution of words or word-parts, of letters or letter-parts. Stoll seeks to find the underlying causes for such lapses and makes much of inhibition of like or similar elements and

of perseverative tendencies. An interesting experiment in the artificial production of particular kinds of lapses is described.

A valuable historical work on the beginnings of writing is contributed by Danzel (4). Copious illustrations add to the value of the work. Throughout, the author shows the great significance of the religious motive in the origin and development of writing and takes issue with certain authorities relatively to the true antecedents of graphic expression. In the first chapter are described a number of devices (place-marks, number-marks, marks of ownership, etc.) which are analogous to writing inasmuch as they serve communication and as memory-props and so prepare for such a use of technical mnemonic symbolism as writing brings to completion. Drawing for purposes of communication does not develop from playful drawings as was supposed at one time. In the symbols of magic we find a proper foreshadowing of writing, for here we find an element of general and abstract significance which is conserved since the symbols of magic are religious objects. The second chapter discusses the various forms of picture-writing, which, for a long time, serves religious purposes almost exclusively. Little by little as a means of expression this becomes extended through linkage with forms learned from playful drawings and through application of gesture-speech. The predominatingly motor preoccupation of the negro caused the creation of a gesture speech-type in Africa through direct graphic fixation of a gesture; the necessity of creating a system adapted for communication with the absent explained the creation of a pantomimic picture-writing among the Eskimo. The third chapter discusses phonetic writing. On account of the increasingly manifold application of ideograms, in the course of development great ambiguity would arise. Speech would have attained much earlier a specialized and detailed expression, it would seek to appropriate picture-writing. At first, therefore, with the picture of an object one gives the name of a like-sounding, like-named object. Later a transition is made to a more complete phonetic analysis and to a linguistic assimilation of picture-writing, a transition prepared for by word-plays, rhymes, secret languages, for here already a phonetic analysis had taken place.

Barr and Crow (2) report the case of a man who "whenever he makes any complicated voluntary movements with the fingers or wrist of either hand the other hand involuntarily makes the same movements." As an instance of these associated movements of

the two hands left-hand mirror-writing results. The authors adopt the conventional but somewhat questionable explanation that mirror-writing is the natural left-hand writing of right-handed individuals and offer as a hypothetical explanation of the general condition the fact that inhibition by means of which restricted movements may take place is but slowly acquired and has never been acquired by the patient for hand movements.

Yoakum and Calfee (18) present a report which, while exhibiting primarily certain features of the learning process, shows that in discussion of the mental traits involved in voluntary mirror-drawing it is necessary to carry the test on beyond an initial one since the presence of distinctive learning types complicates the situation.

Meyer (9) gives a valuable account of results in reproducing a number of figures. Both adults and children were employed as reagents. A record is kept especially of the frequency and kinds of shift in position of the figures reproduced and a study made of the factors conditioning such shifts. Children, more frequently than adults, err in reproducing position, giving samples of mirror-figures or inverted figures or figures both inverted and reversed. Certain interesting errors in size also occur; children are more inclined to decrease and adults to increase the size in reproduction. Throughout, individual differences are shown to be very striking.

Interest in the development of drawing capacity in the child is still high as shown by the appearance of a second edition of Rouma's important work (11).

Thorndike (16) contributes a provisional scale for measuring achievement and improvement in drawing. "One merit, the unit of our scale, is the difference of merit in children's drawings which 75 per cent. of artists, teachers of art and intelligent judges generally can distinguish, and which 25 per cent. of them fail to distinguish." The scale was obtained by getting the ratings of three hundred and seventy-five judgments on fifteen chosen drawings. The limitations of the scale and the problem of its extension are discussed by the author.

Ballard (1) supplements a former report on the drawing preferences of London children by a second report on the preferences of children in the rural Celtic communities of Great Britain. Classification of 10,000 drawings gives results very similar to those obtained with the London children. A continuation of the report of Stern's statistical investigation of the drawings of school children produced in illustration of a given theme is made by Wagner (17).

Classification is made of the choices of possible motives and per cents of frequency are given for representations of movement, of the human figure, indications of humor and the like. Four stages in development are recognized: (1) Representations without spatial relations; (2) Unbroken series of pictures; (3) Sheets of pictures; (4) Clearly arranged rendering of a theme,—a comprehensive picture. The per cent. of frequency with which each stage occurs in the different school classes is given. The figures indicate the superiority of the boys over the girls. In two short articles Decroly (5, 6) analyzes the elements involved in drawing capacity and finds them dependent upon vision and oculo-motor functions. These elements include the notions of direction, of proportion, of movement, of perspective, and power of mental (visual) representation. A series of simple preliminary experiments are described to determine at what age capacity for handling these various elements appears. It is found that, in general, the normal child exhibits such capacity after the tenth year.

The most notable work of the year on drawing is Luquet's copiously illustrated volume (8) which gives a detailed biographical account of the development of drawing capacity in the author's daughter from whom he collected, in chronological order, some 1,700 drawings. Luquet urges the need of such biographic accounts and criticizes statistical studies because they fail to give the conditions which produce the drawings investigated. He points out, however, the great difficulties in the way of a complete biographic study. Many requirements must be met, the observer must have complete records of both drawing products and environmental conditions. The child's spontaneity must, moreover, be preserved absolutely; it must be uninfluenced by imitation of a child companion. Throughout, Luquet distinguishes in a most interesting way the child's intention from the child's interpretation and explains the curious conflicts that may arise between these two factors.

Every individual in the development of drawing capacity is thought to pass through four ages. First, that of involuntary drawing. The child perceives that the drawings of others represent objects and that he himself is capable of drawing lines but he does not perceive that he can represent objects. This phase closes when the intention to represent develops. The second age is characterized by synthetic incapacity; the child perceives the details but cannot assemble them in coherent fashion. Logical realism

characterizes the third stage; the child draws not what he sees but what he knows. In the fourth stage the child attains visual realism, as shown by the entrance of perspective into this work. His drawings now differ from those of the adult only in technical skill. Temporary regressions may take place, during development, from a higher to a lower stage. The same regressions occur in pathological cases. Art, historically, is found to pass through the same stages.

The child does not draw things as he sees them; he copies an internal model, a generic image, according to Luquet, who draws some interesting conclusions as to infantile psychology. These observations speak against associationism and brute empiricism; the fact that the drawing proceeds from the whole to the detail indicates that a selective activity directs the mind of the child.

In a critical article, Näcke (10) urges the importance of study of the drawings of the mentally diseased. Numerous obstacles stand in the way of accurate study; for example, the relatively small collections of such drawings that have been made up to the present time and the difficulties, as well as expense, involved in reproducing them. Näcke cites the characteristics of the drawings of patients suffering from different forms of mental disease so far as any general conclusions seem justified. The paranoics draw most frequently; catatonics produce few drawings, but these show repetition of motives and stereotypy to a high degree; mental weakness exhibits itself in evidences of failure of attention and of perception; maniacs exhibit incoherence. In all interpretation great caution must be observed and, if possible, drawings of the same patient in normal conditions should be used in comparison.

In his summary Näcke emphasizes the following points: Drawing and other artistic activities on the part of the mentally sick are comparatively rare, rarer than in the case of the normal person. The drawings that have been collected up to the present time are too few in number to justify dogmatic conclusions. Only after a comparison of such drawings with those produced by the same persons in health could one reach a satisfactory conclusion. In the case of a given patient as many drawings as possible from many different periods of his sickness should be collected. Normal drawings may alternate with the abnormal and the changes are important for diagnosis. Only at the height of the disease and for a certain intensity of the same do drawings show with moderate (never absolute) certainty the nature of the disease. In light sickness, in the

beginning of serious illness or in convalescence nothing characteristic is produced. In themselves all art products are more ambiguous than oral or graphic activities and the motives are often more obscure and hence of less significance. The infantile characters of many such drawings may be due to the low educational level of the patient and have nothing to do with atavism. Näcke is critical of the common view that pathological drawings show regression to earlier stages in the development of drawing capacity. Such regression could be shown only by a series of drawings. Artists and literary persons suffering from mental disease show in their art products the same deviations as the untrained but, in general, at a later stage and in less pronounced form for a psychosis of equal intensity. In both cases there is, fundamentally, only a departure from a personal style.

Trepsat (15) gives a resumé of the case history of a patient with dementia praecox and furnishes plates that reproduce the drawings and writing of the patient. Verbal incoherence is evident in the samples of writing and in the drawings both incoherence and stereotypy appear but in connection with some unusual features that show conservation of memory, excellent orientation and power of observation.

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VOCAL FUNCTIONS

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A sound psychology of the mechanism of speech is a primary desideratum of the phonetician, the corrector of speech defects, the psychiatrist confronted by aphasias, the teacher of foreign tongues. Yet, if one of these workers in applied psychology should join the student of pure theory in a rapid excursion through the literature of 1913, his first reaction might well be a mild bewilderment. What, for example, is the relation of the verbal image to the vocal act? And what share has the motor process in determining consciousness of word-meaning?

On these points, Bluemel (**2**) holds to the traditional views, while finding a novel application. With a fund of information about stammering gathered introspectively as well as at second hand, he writes a two volume treatise whose main thesis is that stammering is a form of auditory aphasia. Stammerers are always "auditory-moteurs"; and their failure to articulate is due to their inability to command the necessary auditory imagery. Their kinæsthetic imagery gives them control of the initial consonants, and then the aphasia which robs them of the auditory image of the vowel quality of the word, prohibits further progress in vocalization. Sound treatment will, then, undertake to reeducate the speech processes in such a manner that kinæsthetic imagery will

take the place of the troublesome auditory imagery, as the essential antecedent and guide of speech.

Meanwhile Froment and Monod (5) contend that there are no verbal-motor images, and undertake to explain both the phenomena of normal utterance and also the facts of motor aphasia without recourse to the motor image of the traditional theory of volition. Only the existence of sensorial images, visual- and auditory-verbal, can be demonstrated.

Claparède (3) leaps to the defense of the verbal-motor image, and makes it clear that verbal-motor phenomena may at least be independent of auditory and visual cues. Flagstad (4) swings to the extreme of maintaining, not merely that the verbal-motor image is an essential constituent of all word images, but also that "for the memory of a sound, the connected image of movement is of prime importance, and that the necessary condition for the union of the sound image with the rest of the content of consciousness is its fusion with the images of space, of material, and of movement."[1] Hence the necessity for active utterance in acquiring the sounds and meanings of a foreign language.

Wyczolkowska's (16) observations and experiments in the mechanism of speech were suggested by her general convictions regarding the place of motor factors in thought processes; but it is here a question, not of imagery, but of actual movement. Analysis of an elementary thought process discloses three stages in its development: (*a*) the automatic initiation of organic processes connected with attention, including muscular activity partly inhibitive and partly facilitatory; (*b*) a stage of unconscious tension and of only partially defined expectation of the results to follow upon attention; (*c*) the appearance of the articulate word-form which intellectualizes definitively the thought process. This third stage does not appear until the impulses connected with the activities of attention stimulate the speech organs to engage in synthetic action. The order of events is different when one hears a word pronounced. The hearer's speech mechanism is stimulated; and conscious understanding becomes clear only when the word is in this faint sympathetic fashion repeated by the hearer.

Dr. Wyczolkowska first describes a hitherto unnoted reflex connection between the thenar eminence of the thumb and the tip of the tongue. A possible nervous pathway by way of the cervical plexus is pointed out, and the reader is led to suspect that here we

[1] *Cf.* review by Sechrist. *Amer. J. of Psychol.*, 1914, 21, 295.

have some sort of direct phonetico-graphical connection. Anatomical details of the topography of the nerves supplying the tongue and the ear point toward the possibility of close interconnection between these organs also. Another portion of the study is concerned with graphically recorded lingual movements that accompany both the hearing of spoken words and melodies, and also the mere thinking or remembering of similar material. Every thought produced some movement of the tongue. Thinking words produced virtually the same curve as hearing them, though thinking revealed greater intensity of impulse. A reader already favorably disposed toward motor theories will find even the meagre data here given most suggestive.

The fortresses of our ignorance regarding the nature of vowels and voice registers are being bombarded from many angles, boldly surveyed from above and even surreptitiously attacked from the rear. The most recent models of siege appliances have been perfected by Benjamins and Peters, who share the general lack of confidence in any device that resorts to the use of a vibrating membrane. Peters (10) photographs on a falling plate a shadow cast by a tiny drop of alcohol in a capillary tube, and gets remarkable pictures of the voice vibrations that are actuating this tiny fluid object, pictures resembling somewhat those made with a string galvanometer. Benjamins (1) has discovered the feasibility of employing Kundt's tubes for determining the chief tone of a vowel clang, the partial tone that has the greatest energy. He finds that as the pitch of the fundamental rises, the pitch of this chief partial also rises until a point is reached where it drops, or to put it differently, its prominence is taken over by the partial next lower in pitch. Comparing the results obtained with eight different vowels, the author concludes that the energetically strongest tone cannot be taken as the characteristic tone of the vowel; that, indeed, the vowel is distinguished not by any one formant, but rather by the whole picture of the intensities of the partials, a picture which varies with change of the pitch of the fundamental. Attention is called to the change of size of the buccal cavity that occurs as one sings a vowel from low to high pitch.

Wittmann (15) has vindicated the worth of Marbe's smoking flame method for the investigation of speech-melodies and of vowel sounds. His determination of the pitch of the formants characteristic of five different vowels, confirms measurements Hermann and others have published, and harmonizes most happily with the

results of Jaensch's (6) vowel syntheses, ingeniously made by varying the light thrown upon a selenium cell in circuit with a telephone receiver.[2]

Ter Kuile (7) maintains that the vowel components are not properly tones but noises. Each separate stroke of the vibrating vocal cords actuates the vocal chamber and generates a characteristic noise which varies with the size of the chamber, with the nature of its walls, and particularly with the "acuity" of the actuating stroke and the rapidity with which its effect is damped. An ingenious artificial-vowel apparatus enables the experimenter to determine the relative importance of these different factors. On such a theory as his, the analysis of a vowel-curve into a Fourier's series of sinus curves is physiologically false although mathematically possible. Ter Kuile's theory of chest-register, head-register and falsetto is made in terms of the different positions and tensions of the sound-generating organs, particularly of the glottis and the thyroid cartilege.

A new journal, the *Archiv für experimentelle und klinische Phonetik*, was launched last September with Katzenstein of Berlin at the helm. Its first volume, with several important titles will be reviewed next year with the literature of 1914.

Vox continues to publish the invaluable *Bibliographica Phonetica* compiled by Panconcelli-Calzia. Beginning with the current year the many titles are conveniently grouped by subject instead of by author which facilitates the search for material of psychological interest. Every issue of the journal contains also original articles from which the student of the psychology of speech and song may glean suggestions (9, 13, 14). For example, one of Peters's (10) methods of enlarging gramophone records, suggests a simple attachment which could be added to Seashore's tonoscope,[3] to permit the taking of a permanent graphic record of critical tonoscopic experiments; and at the same time, one is led to speculate on the adaptability of that same device of Peters's, to facilitate making tonoscopic measurements of phonograms.

[2] See the description by R. M. Ogden, in his summary of the recent literature on Hearing in this BULLETIN, 1914, 11, 96.

[3] Seashore, C. E., *Psychol. Monog.*, 1914, No. 69. This recent important monograph will be reviewed in the next annual summary.

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SPECIAL REVIEWS

History of Psychology. A Sketch and an Interpretation. James Mark Baldwin. New York: Putnams, 2 vols. 1913.

In his *Darwin and the Humanities* Baldwin once declared natural selection to be a universal principle with varied applications in the sciences of life and mind. One application of the Darwinian principle is now furnished in Baldwin's latest work, a *History of Psychology*. The point of view adopted is that of a parallelism between racial reflection and individual thought in the theories about the mental principle or self. To get any advantage from such a principle we should have to discover that the racial stages in the interpretation of the self have been unrolled "concurrently," or in the same serial order, with the stages of development of individual self-consciousness. There is more than analogy in the parallelism between racial evolution and individual development. We speak of the childhood of the race and its growth into maturity. This suggests that in social evolution we may see a restatement of the great stages of individual development; that individual thought may show stages which recapitulate those of racial evolution—a parallel similar to the recapitulation recognized by biologists in the evolution of organisms. The individual's development in consciousness of self recapitulates, we should then say, the evolution of self-conscious reflection in the human race. We find, therefore, in the history of thought about the mind four great periods: The Prehistoric or Prelogical; the Ancient or Unscientific; the Medieval or Substantive; the Modern or Reflective.

Found among primitive peoples the prelogical period corresponds to the early a-dualistic period of the child's apprehension of the self. Deadness or lack of animation was overlooked in aboriginal times, all things being found to have a mysterious sort of agency similar to that of personal agents or actors. The infant repeats this in failing to distinguish between the bodies that are really selves or conscious beings and those which are merely dead or inanimate things. His fondling or striking inanimate bodies is like the savage who looks upon everything as having an indwelling soul—good or bad. But once the distinction is made between

thought and things, psychology as such is possible. Nevertheless, in the first stages of emergence, the race, like the child, still clings to the fringes of the past. Thus in the history of psychology the early Greek period corresponds to the unreflective stages of the child's thought of self, the period of the origin of dualism. It is unreflective in the sense that in this period the view of the self is not exact or critical, not the subject of distinct definition, but remains incidental to the larger view of the world or nature taken as a whole.

As the child is dependent upon society for the materials of his thought, so were the first philosophers. The child imitates social "copy" and absorbs social tradition. So Thales, the father of Greek philosophy, though having a mind full grown for reflection, still depended upon society and its institutions for the material of his thought. Called upon to explain what he understood the self to be, he would have pointed to some fluid and subtle physical agent, saying that the self or mind was like that. Indeed, the first of the Greek thinkers would not have distinguished between mind and matter, because there still lingered the primitive view that all nature is living, dynamic, semi-personal. Into this animistic way of thinking Thales was born; out of it he could not wholly emerge. So the earliest group of Greek thinkers—the Ionians—represented the "projective stages," where the word is neither subjective or objective, but simply a panorama of changes projected before the eyes. Its explaining principles are not in any way isolated or differentiated from one another. Life is a sort of first thing, a crude general term within which more positive meanings are later on to be differentiated. With the Ionians this appears in attempts to refine away the crude features of the elements which are taken to represent life and soul. Air, warm air, heat, fire, are more subtle and thinner than the other elements of nature.

The Pre-Socratics are followed by the Sophists, and the Sophistic stand is, for the development of racial interpretation, what the dawn of the subjective era is for that of the thinking individual. The mind is thrown back upon itself through the ineffectiveness of its first efforts to understand things. Now comes the subjective phase—represented by the Socratic motto, "Know Thyself." Here the Sophistical conclusion that "the senses deceive" reminds the genetic psychologist of the condition of embarrassment in which the growing individual finds himself as he confronts the puzzle of his own body. Upon this follows fast the beginnings of a sharper dualism between the subjective and the external world,

between the mind as the seat of ideas and the world of things and of practical interests and values.

With Aristotle, according to Baldwin, we have the rise of a real objectivism, where the world, and not merely the self, is to be explored and understood. Yet for the real ripening of dualism we must have recourse to the Middle Ages, for only here, it is claimed, are we in the presence of the transition in racial thought from the spontaneous to the reflective type. This critical period has already been called the substantive period, so named from the fact that in it the great distinction arose between the mind and body as different and distinct substances. It corresponds to the stretch of development of the individual which culminates in a similar dualism. In the stage of immature dualism the body is at once a mere thing and also the intimate seat of the subjective life, but in the development of dualism, the hardening of the mind and body terms, the problem then becomes the reflective one, how can this be? How are the two substances related to each other? How can mind and body interact one with the other? From the point of view of theory, we call it the psycho-physical problem.

Baldwin has presented a system of psychology from the prelogical to the logical, and all from a genetic point of view. It forms an attractive problem whose value lies in its enlightening application of the doctrine of recapitulation. There is indeed a sort of comparative mental embryology in the development of the doctrine of the self. In the child we find an infantile reproduction of tradition, since the child, like the savage in the prelogical period, is a microcosm reflecting the larger macrocosm of social values, beliefs, rights and values. And this points back to the racial period of magic and fearful religion when the prime distinction is not that between spirit and matter, mind and body; but that between the seen and the unseen, the evident and the hidden, the clear and the mystic. Behind the curtain of nature which is projected before the eyes there is a seething body of agencies working for good and ill. For psychology, the period is a-dualistic both to the child whose self is the animated body, and to the savage whose entire world is a mass of animated things.

It is not hard to accept this generalization, fortified by the opinions of the anthropologists, for it has the further advantage of throwing much light upon the obscure origins of our Western speculation. With the Greek thinkers before Socrates dualism means a departure from the flat, curtain-like vision of the pro-

jective period in the direction of the apprehension of a cleft in nature between the dead and the living, between agencies and effects. It brings forward the agencies which were behind the curtain, and defines them as in some sense minds. A first sketch is made of the distinction between those things that have a self and those that have not.

We can also agree with the statement that in the clearing up work of the pre-Socratic School the seed of subjectivism was sowed, for it led the Sophist to bring out the real meaning of the saying "The senses deceive," and it led Socrates to emphasize the need of individual self-consciousness. Baldwin can point out in the Greeks a capital instance of the dawning of the sense of subjective personality. But to leave the development of dualism to the Middle Ages is to leave the Hellenic race in a state of perpetual adolescence. The doctrine of the complete recapitulation can find no better illustration than in the Greek thinkers. Gomperz has pointed this out in his last volume on Aristotle. The Stagarite sounded the depths of dualism, but the post-Aristotelians, especially the Neo-Platonist, as if struck with a philosophic senility, became mere repeaters of that earliest period, the prelogical. But along with a small and yet complete cycle of recapitulation, as in the rounded history of Greek speculation, there is also to be considered the larger cycle evident in the general history of psychology. The inner wheel of Greek thought does not describe the full orbit of racial thought, nevertheless, as racially typical, it actually anticipated the path of later speculation. The author grants as much when he says: "Darwin took the problem of 'matter and form' out of the hands of the psychologist who treats of the individual, and made it again the genetic and historical problem that it had been to Aristotle and his Greek predecessors. . . . The Darwinian genetic naturalist asks: What are the stages of racial history through which the individual has acquired his endowment? The conclusion then is this: Thinking having appeared, it is evident that reflection may take on protean forms. Modern psychology reflects the alternatives which philosophy has worked out in its varied systems, so far as these concern the mind. Looking upon the movement of thought as it appears in perspective, we see the early alternatives reproduced each for itself, with critical and historical justification, in the modern period. It is in respect to variety and refinement of enterprise, to richness of data and power of criticism, to sobriety of method or its opposite—deliberate

speculative license—that the analogy with the individual now holds good. Positivism, rationalism, and immediatism—science, philosophy, and faith broadly understood—are the modern alternatives. As in modern culture, so also in individual thought, the choice among them is largely a matter of temperament."

In this historical résumé Baldwin presents the main thesis of his work. For those who adhere to the doctrine of recapitulation the genetic interpretation of the history of psychology is valid. But as that doctrine is impaired, so is the interpretation. Yet even in the latter case Baldwin's work would have value. Recapitulation would form a mnemonic scheme by means of which the student could quickly grasp the main lines of development in the successive interpretations of the mental principle. A knowledge of this development we hold to be extremely valuable at the present time. Our text books in psychology suffer from a lack of historical perspective. His work will supplement them, since it furnishes the background of controversy out of which various theories have arisen. The controversial tone of the ordinary book often confuses the beginner. He should be told against whom the author is fighting, otherwise much of the text seems a waste of energy, a battle against straw men.

Another advantage of such a presentation as this is as an antidote to narrowness; a knowledge of the history of psychology prevents adherence to any one school, and this preserves that state of suspended judgment which is the very atmosphere of scientific advance. In the recent attempt to divorce philosophy and psychology—which has gone so far in America and is threatened in Germany—it may be well to remember that there is such a thing as the metaphysics of psychology. Now in tracing the speculative connections between different psychological schools, in presenting the metaphysical difficulties from which psychologists have extricated themselves Baldwin has performed a notable service. Nevertheless we can hardly believe that in the modern alternatives as to the various schools the choice is "largely a matter of temperment." The author himself shows that it is not so much the temperamental as the logical which determines the issue. For example, he explains how psycho-physical parallelism was a compromise between the idealistic and materialistic interpretations in the body-mind controversy, and yet how, at present, it proves more and more difficult to hold either alternative, mechanical or vitalistic, as final. Again, in the conflict between the individualistic and social inter-

pretations, a genetic psychology includes both elements, revealing the state of the individual mind in given social conditions.

But compromise may be carried too far. So Baldwin is no mere board of conciliation. In his chapter on philosophical psychology be shows how certain points of view have disappeared for good and all. Thus the Herbartian mechanism displaced the faculty psychology, just as "organic selection" is displacing the lapsed intelligence theory. In the latter connection we may point out a slight misinterpretation of Bergson, when it is asserted that he supposes an intrinsic, internal directive force in the life-process, by which functions are determined "wholly or largely in independence of the action of environment." This is hardly borne out in Bergson's emphasis upon the stubborn and obdurate rôle of matter in creative evolution. A lapse like this is rare and more than compensated by the author's restoring to the balance of power such a thinker as Herbert Spencer. He points out how the psychologist's debt to the synthetic philosopher has been but grudgingly paid, and implies that the reason why many British writers find it impossible to do any sort of justice to Spencer is because of the vogue of Spencerianism in the Latin countries and the United States.

In these "general points of view" in the scientific psychology of the nineteenth century Baldwin has furnished what might be called a first reader for students of psychology. With Max Dessoir's work as a supplement upon the ancient thinkers, this should be made required reading in our colleges, in order to prevent that lamentable lack of historical perspective from which so many of our young experimenters suffer. In taking up "special lines of work" the author, except for his favorite social psychology, is cramped for space. Physiological, experimental, genetic, animal, comparative, affective, and æsthetic psychologies are crowded into two chapters. Much of this material has been previously treated by the author in his *Story of the Mind*. Here is need either of a revised edition of that popular work, or an enlargement of these crowded chapters in the present volume. Not only should students be shown their bearings in their own special lives of investigation, but the general reader should be informed of the wealth and variety of problems which modern psychology affords.

WOODBRIDGE RILEY

VASSAR COLLEGE

Grundzüge der Psychotechnik. HUGO MÜNSTERBERG. Leipzig: Barth, 1914. Pp. xii + 767.

This book is a rewriting of the lectures given by Professor Münsterberg as exchange professor at the University of Berlin. In the preface the author states that he strives to accomplish three things: to present the principles that underlie psychotechnics: to organize and systematize all the parts of psychotechnics: and to stimulate to further work in psychotechnics. The book is declared to meet the special needs of nine classes of readers: psychologists, lawyers, physicians, teachers, artists, manufacturers, politicians, historians, and natural scientists.

Although the book contains 779 closely printed pages, it is said to be but the sixth volume of a series on foundations of psychology. The titles of these six volumes as planned indicate the place intended for the present volume. In sequence the titles are as follows: *Grundzüge der Psychologie*, *Kausale Individualpsychologie*, *Kausale Sozialpsychologie*, *Teleologische Psychologie*, *Kulturpsychologie*, *Psychotechnik*. Psychotechnics is defined as the science of the practical application of psychology in the service of the tasks of civilization. Just how it is to be classified and interpreted is made clear by its relationship to the proposed volumes which are to accompany it. "Kulturpsychologie" like psychotechnics is a branch of applied psychology. But the former is merely theoretical and the latter practical. The former explains events already in existence; the latter assists in producing results in the future. Psychotechnics is totally different in point of view from the proposed volume on "Teleologische Psychologie." The former regards only causal relationship; the latter only purposes. This distinction is regarded as especially important by the author and is insisted on throughout the volume. Readers not interested in this philosophical distinction may feel that the author could have restricted the discussion to an appendix or have reserved it for the forthcoming volume on "Teleologische Psychologie."

Although the bibliography cites approximately seven hundred works having to do with applied psychology, the present volume is the first to attempt to present a general view of the entire field of psychotechnics. Following a discussion of the factors which have delayed the advance of applied psychology and of those which have favored it, the author ventures the prophecy that in the near future every higher institution of learning will have a professor and a laboratory of applied psychology.

Almost two hundred pages are devoted to the general discussion in which are taken up such topics as in the limits of psychotechnics, principles underlying mental tests, tests available for psychotechnics, methods of applying tests, correlations, influencing others, influencing one's self, etc. The main part of the book is the seven chapters dealing with these special fields: Social Control (Gesellschaftsordnung); Health, Industry, Law, Education, Art, Science. These individual chapters are neither condensations nor elaborations of previous writings bearing similar titles. Each chapter has points of similarity with the previous contributions, but this latest presentation is the work of maturer years and was written for a learned German audience.

Because of his universality of interests, his breadth of learning, and his prophetic vision Professor Münsterberg is peculiarly well adapted to write this work on Foundations of Psychotechnics. It crystallizes the scattered work of hundreds of independent workers and demonstrates the drift of modern psychology towards the practical.

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Zur Grundlegung der Tonpsychologie. G. RÉVÉSZ. Leipzig: Veit, 1913. Pp. 148.

Révész says, in the preface to this treatise, the traditional view is this, that "pitch or quality or whatever you call that musically interesting attribute of auditory sensation, as distinguished from intensity, timbre, and vocality" is to be represented by a curve without any inflexion points. This view he combats. The reviewer, however, fails to see that any psychologist during the last twenty years has really supported such a view, however common it may be among laymen in psychology. For example, tone "relationship," as Helmholtz calls it, is represented by Helmholtz by a curve having many inflexion points. According to Helmholtz, however, this tone relationship is nothing fundamental, but the result of habit, of associations of ideas of one or another kind. This view is popular among physicists and has in recent years been remodeled by one of them, Sabine; among psychologists it is a lost cause. Stumpf's fusion is represented by as many inflexion points as Helmholtz's relationship. The tonal fusion of Stumpf, however, is not the result of habit, but is a fundamental property of tone sensation. The reviewer has always supported the same view that

the musically most interesting attribute is a curve with many inflexion points, and that it is an attribute of sensation, that is, something fundamental, not reducible. Révész supports the same view. On the other hand, Stumpf's theory of fusion is like Helmholtz's in assuming that "fusion" in successive tones, in melody, is not fundamental, but a mere habit of perception. Révész regards it in both simultaneity and succession as fundamental, rightly, as the reviewer has always been convinced. He reached this conclusion without realizing, at the time, that it had been reached and published at about the same time by Köhler and many years before by the present reviewer. In the present book Révész states: "Meyer's arguments . . . are correct . . . but not sufficient for such an important theory, and that is probably the reason why psychologists have not accepted them." The truth is rather this. There are very few psychologists who are extensively and intensively interested in the psychology of tone and music. And those not thus interested simply paid no attention to the theory, whether important or unimportant, correct or incorrect. Now we see that the only two psychologists who, experimentally and theoretically, have in recent years studied the fundamental problems of musical perception, have reached the same conclusion reached by the reviewer. I have no ill feelings toward them on account of reaching this conclusion independently of me, and of each other. This is so much the better, because it proves that we are right. And, may be, other psychologists will now pay a little more attention to the conclusion than before it had been reached independently by three.

But, unfortunately, there is the terminological difficulty. In my paper on the attributes of sensation[1] I spoke of the attributes of pitch and quality, pitch being the musically most important attribute, represented by a curve of many inflexion points, quality being the musically less important attribute. I referred to judgments about similarity in pitch as judgments about degrees of tone relationship. Helmholtz would have used the same term. Stumpf would use the term degrees of fusion. Similarity in quality I called "similarity" in the narrower sense. Helmholtz and Stumpf would use the same term. Köhler, without knowing my terms, called "Höhe" what I called pitch, and "Vokalität" what I called quality. This is not bad except that Köhler, after learning of my previous efforts in the matter, continued to think that his vocality and my quality meant two entirely different experiences, when we

[1] Psychol. Rev., 9.

were actually speaking of essentially the same experience,—just because he had happened to give it a different name.

But now comes Révész and, unwittingly, calls "Höhe" what I had called quality, and "Qualität" what I had called pitch. The result is that whenever we are speaking of identical experiences we use opposite terms, and identical terms whenever we are speaking of opposite experiences.

I believe that the best way out of this dilemma is to adopt the terms tonality and vocality for the two attributes in question. In music tonality would then be the more important one; in speech vocality would be the more important attribute. I shall henceforth use this terminology. Tonality = Révész's "Qualität," vocality = Révész's "Höhe."

The most important contents of this book (but largely published already in magazine articles by the same author) seem to be the following. First, experiments on a subject (Liebermann) who has a peculiar psychological defect, which permits him to demonstrate more clearly than this has ever before been possible the necessity of distinguishing as absolutely fundamental tonal attributes tonality and vocality. While another defect, the lack or weakness of tonality together with a fair degree of vocality is not infrequent among so-called unmusical persons, Liebermann's defect is rare. He possesses a difference of tonality in the two ears, while the vocality in the two ears is the same.

Second, Révész seems to establish beyond doubt what has been hinted at by the reviewer years ago, that the distinction between tonality and vocality is essential for the understanding of the so-called memory of absolute pitch. Révész clears this question up considerably by demonstrating that there are probably two kinds of such absolute memories, one in the one attribute, the other in the other attribute, and that a person may have either the one, or the other, or both, not to speak of a poor memory in both, which is, of course, the logical reverse of a good one.

Third, Révész demonstrates that musical intervals, their perception and judgment, are also of this double nature. A musical interval is a definite interval either in the sense of representing a definite distance or span in vocality, or in the sense of representing a definite relation of tonality, or, sometimes, in both senses at the same time.

The reviewer agrees with Révész that the foundations upon which a theory of music can be built must be such as stated here

(excepting the confusing terminology, for which, however, the author should not be unduly blamed). But the actual building up of a theory of music upon such foundations has barely been attempted by Révész. This attempt at a theory of music is confined to the last sixteen pages of the book under the two headings "Segmenttheorie" and "Harmonie und Melodie," or rather, to a few among these sixteen pages. This treatment of the problems of music, while interesting to the specialist, is too sketchy for a detailed criticism in a review.

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NOTES AND NEWS

PROFESSOR R. M. OGDEN, of the University of Tennessee, has accepted the professorship of psychology at the University of Kansas.

PROFESSOR T. H. HAINES, of the Ohio State University, has been appointed director of the psychological bureau for the study of juvenile delinquents now being established by the State Board of Administration of Ohio.

A SPECIAL department of the New York University School of Pedagogy has been organized for the training of teachers of backward and defective children. Professor James E. Lough has been appointed director of the department.

THE GENERAL European war has apparently caused a suspension of most of the foreign scientific publications on the continent. No German or French psychological publication has been received with date of publication subsequent to August first. Announcements have been made in *Nature* that the English universities will be opened as usual. No information has been received regarding the continental universities, but it is believed that all have temporarily suspended. A number of American psychologists who were abroad at the outbreak of the war have been reported to have sailed, or to have arrived safely in this country. It is supposed that Professor F. M. Urban (University of Pennsylvania) is with the Austro-Hungarian army.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE PSYCHOLOGY OF SEX

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During the four years since my last review of the literature of the psychology of sex (PSYCHOL. BULL., October, 1910) the number of experimental investigations in the field has increased to such an extent that whereas it was difficult at that time to find anything to review, it is now impossible to review all I could find. The number of books and essays devoted to general discussions of the subject has also increased and their quality has improved very markedly. The emphasis placed on sex by the Freudian school and the interest in sex education, to say nothing of the whole feminist and woman's suffrage movement, have swelled the dimensions of the literature aside from experimental contributions to such an extent that no brief review could pretend to deal with it. Confronted by such a dilemma I have chosen the course of attempting a summary in the field of experimental psychology as complete as time and library facilities would allow, and a very brief mention of what seem to me the most important contributions to the other phases of the subject.[1]

I. EXPERIMENTAL AND STATISTICAL STUDIES

There have been two extended series of tests applied for the purpose of measuring sex differences, one by Burt and Moore (19),

[1] I am indebted to Mr. Charles A. Reed, librarian of the University of Cincinnati, for special library privileges and for assistance in borrowing books and periodicals from libraries at a distance, without which it would have been impossible to prepare this review in Cincinnati.

in England, summarized by Jones (46), and one by Cohn and Dieffenbacher (22) in Germany. A third one by Pyle (69) in the United States, less comprehensive in scope, but representing a larger number of individuals, has sex as one basis of formulation. Other experimental papers either deal with only a few phases of the sex problem, or are formulated primarily from some other point of view. I will make the summary by topics, referring to the parts of the special investigations under the various headings.

(*a*) *Heredity.*—The present status of the theory of sex inheritance is very clearly and concisely summed up by Morgan (59). So far as a layman can see, there is little if anything in the theory which applies to the psychological problem. The ancient idea that the female is essentially an undeveloped male seems to be finally disproved by the fact that it requires more determiners—usually one more chromosome, or a larger sex chromosome—to produce a female than a male. When the additional sex chromosome was first discovered the assumption was that it determined maleness, doubtless because of the idea that the male was a more highly developed type. If there were any sense at all in such a formulation—which there probably is not—it would now have to be reversed. It seems certain that sex is determined at the moment of fertilization, and its determination is quite independent of environmental factors. Morgan believes that both the primary and the secondary characters of sex follow the laws of Mendelian inheritance, though not all biologists agree with him (Meijere, 55).

Secondary sexual characters are in some instances—chiefly in insects—determined independently of the sex glands. In the higher animals they are to a great extent dependent on the action of the sex glands, so much so that successful transplantation of the sex glands in the guinea pig carries with it a development of the secondary sexual characters of the opposite sex, even to the extent of producing secretion of milk in the milk glands of the male. The mechanism by which this is brought about is that of hormones given off to the body fluids by the sex glands.

The part played by sexual selection in evolution Morgan considers very small. There is little evidence that it takes place at all in animals. Even when consciously practised it is incapable of originating modifications of species, or producing steady change in any direction. It merely serves to develop in pure strain traits which have become mixed. Modifications of species always arise as mutations, for the appearance of which no explanation can at

present be offered. Mutations when they arise may be inherited as sex-linked traits of the type of color-blindness, which are found predominating in one sex, though in certain combinations they may be inherited by the other.

Both Morgan and Tandler and Gross (77), point out that it is impossible to find any single secondary character which belongs exclusively to either sex throughout the animal kingdom. For instance, superior size and brilliant plumage in some species belong to the female, while even the instinct for incubating eggs is assigned in some species to the male. Tandler and Gross interpret all secondary sexual characters as modifications of characters belonging to the species as such. They believe that the reason the sexes resemble one another after castration is merely that under those circumstances both sexes tend to revert to the original species type, an assumption which makes it unnecessary to assume the presence in each sex of the determiners of the other sex.

The theory of heredity, then, seems incapable of throwing light on the question as to what systems of the body carry sex-linked factors. Conceivably any of them, including the nervous system, might. It merely describes the machinery by means of which any mutation which arises may be inherited as a sex-linked trait.

(*b*) *Physical Development.*—Under this head I shall report a few papers which are of interest from a psychological point of view. Beik (9), instead of measuring children in absolute amounts, as most previous observers have done, measured a series of 6½-year old children in terms of the proportion to adult standards for each sex. On this basis, he found girls more advanced than boys in height, weight, dentition, brain weight, and probably in the development of the skeleton. Measured in absolute terms boys are ahead in most of these respects. Hertz, in the report of the Danish Anthropological Society (26) gives a series of measurements kept for the last 27 years which show that during that time girls have gained considerably in height and weight, while boys have been at a standstill. Burgerstein (17) in reporting European statistics, states that girls show a much greater susceptibility to disease than boys.

(*c*) *Motor Ability.*—Beik (9) found that at 6½ years, girls, measured in terms of proportion to adult attainment, were ahead of boys in motor control. In simple reaction time and in rate of tapping, boys and men—as in previous tests—have shown them-

selves superior (Burt and Moore 19). In card dealing, Burt and Moore found the boys quicker, while Calfee (20) found girls quicker. In card sorting and in alphabet sorting, girls were found decidedly superior by Calfee and by Burt and Moore. Culler (25) also found women faster on first trials of card sorting, though his group was small (17 of each sex) and he was not primarily interested in that point. In mirror drawing Calfee found the girls—college freshmen —faster than the boys throughout six successive trials. This agrees with previous work. Burt and Moore found the boys superior, but they do not consider their own test very reliable because of a change of method.

Mead (54) gives a small but reliable set of statistics supporting the popular opinion that girls learn to walk and talk earlier than boys. Starch (72) measured the handwriting of the entire school system of Madison, Wisconsin, and found the girls superior to the boys in speed, legibility, and form. The sex difference was greatest in form. Burt and Moore found the same difference with regard to speed. Cohn and Dieffenbacher (22) found that girls read faster than boys, a result also obtained by Burt and Moore in reading and in counting for speed.

Ballard (7) found a relation between left-handedness and stammering, both of which are more prevalent among males. He tries to show that while the greater frequency of left-handedness is characteristic of the male sex, the greater frequency of stammering among boys is an artificial condition brought about by attempting to force left-handed individuals to write with the right hand. Statistics show that stammering is far more frequent among the left-handed who have been forced to write with the right hand than among those who were allowed to write with the left hand. He offers no explanation of how the result is brought about.

The tentative generalizations which may be drawn from this series of facts are (1) that girls develop faster than boys from infancy; (2) that boys are superior to girls in rapidity of movement under conditions in which the direction of attention remains fixed, as in reaction time and tapping; and (3) that girls are superior to boys in rapidity of motion in types of activity in which the direction of attention is constantly shifting—activities which involve rapid adaptations—such as card sorting, mirror drawing, reading and writing.

(*d*) *Sensation and Perception.*—(1) *Skin and Muscle Sense.* Bobertag (11) found that boys of 8, 9, and 10 years are more accu-

rate in the Binet-Simon test for discrimination of weights than girls. Burt and Moore (19) confirm this result for both children and adults. They also found the space threshold of females, child and adult, very much finer than that of males. These sex differences are in accord with previous investigations. (2) *Hearing.* Hentschel (38), who tested 250 children of each sex in Germany, found that boys discriminate pitch better than girls both when a musical interval is employed, and when much smaller differences of vibration rate are made the basis of comparison. The boys are from 2 to 7 per cent. ahead in the several series. Burt and Moore, like previous investigators, found females a little better in pitch discrimination than males. (3) *Vision.* Burt and Moore found females superior in fineness of color discrimination. Monroe (58) in giving the Binet-Simon tests to 300 boys and 300 girls, of from three to six years, found that the girls excel the boys in color perception and in color naming. Burt and Moore found the boys superior in judging visual space. These results also agree with previous work. (4) *Perception.* The group of tests which belong most distinctly under this head are tests of the cancellation type, which involve both perception and motor reaction. In these tests females of all ages are uniformly better than males (Haggerty and Kempf (36), Woodworth and Wells (86), Pyle (68, 69)).

The possible generalizations in this field are (1) females have a finer spatial threshold on the skin, better color vision, and more rapid motor responses to changing perceptions than males; and (2) males are superior to females in the discrimination of weights and visual areas. The results with regard to pitch discrimination are contradictory.

(*e*) *Memory.*—There have been two sorts of experiments which may be included under this head, the rote memory experiments and those in "Aussage" or report. Under the first head there have been tests by Aall (1) using objects, by Burt and Moore (19) material not stated, by Myers (64) using words and letters in testing incidental memory, by Vertes (79) using words, by Cohn and Dieffenbacher (22) using digits, by Pyle (69) using words, and by Winch (85) using consonants. All of these workers found females superior except Cohn and Dieffenbacher, and Pyle, who found no difference of sex. These results are in accord with most previous investigations.

The experiments in the psychology of report have been carried on chiefly in Germany, Holland and Norway, and are published in

German. The term *Bericht* refers to the spontaneous account given by the subject of the picture, story, or series of events presented to him, while *Verhör* refers to the results of an examination which he subsequently undergoes on the subject matter. These words I shall translate *report* and *examination*. The trustworthiness (*Treue*) is estimated by finding the proportion of correct statements to the total number of statements made, both correct and false. Spontaneity is measured by finding the proportion of correct statements in the report to the total number of correct statements in both report and examination. Some of the questions used in the examination are distinctly suggestive, which gives an opportunity to measure suggestibility. Finally it is possible to classify the kind of items reported by each sex, for qualitative differences of memory.

With regard to the extent of memory displayed by the sexes in these experiments, the results are somewhat contradictory. In view of the small number of individuals represented in many of the series (from 15, or even less of each sex, to 30) contradictions are not surprising. Aall reports two tests, one with adults (2) and one with school children (1). In both cases he followed the plan of asking for a second reproduction of the story without warning. In some groups a mental attitude of expecting an immediate reproduction had been induced, while in others the expectation was that the reproduction would be deferred. In all variations of the experiment he found the extent of immediate memory greater in the female. With adults the same difference held for the second reproduction, but the school boys were better in the second reproduction than the girls. Aall is inclined to lay great stress on the latter result. The same type of test was tried by Lem (49) with school children with exactly the reverse result. His boys displayed a greater extent of memory in the immediate reproduction than the girls, while in subsequent ones, asked for without warning, the girls caught up with and at last a bit surpassed the boys. Breukink (15) and Schramm (71) both compared groups of university students. Breukink used pictures and Schramm a story. Breukink found the extent of memory a bit greater in men, while Schramm found it greater in women. Cohn and Dieffenbacher (22), and Pyle (69), whose test of logical memory belongs here, both found school girls superior to boys at all ages. With regard to trustworthiness, Breukink, Schramm, and if I understand him correctly, Aall, found women superior, Lem found boys superior, and Cohn and Dieffenbacher found no difference of sex. The latter authors report that girls have a decidedly greater degree of spontaneity.

Aall lays great stress on the qualitative differences in the reports as distinctive of sex. These analyses have been carried to too great length to be reported here. The chief point of agreement among them is that females report visual elements and particularly colors more frequently than men. Several of them also find that males report space relations more accurately than females, a fact corroborated by Myers (64) in his study of incidental memory.

Memory of dreams can be considered a special case of the psychology of report. In an Italian kindergarten in which the children take a nap every day, they were questioned immediately on waking with regard to what they had dreamed. Doglia and Banchieri (27) made records for 100 children at three years of age. The girls remembered more dreams and remembered them more fully than the boys. Two years later Banchieri (8) reexamined a large portion of the same group, and found that the same sex difference persisted.

To sum up then, females are superior to males in memory at all ages. The difference is clear and very uniform with regard to rote memory. In experiments in report sometimes one sex and sometimes the other has shown itself quantitatively superior, but on the whole the advantage is with the females.

(*f*) *The Effect of Drill.*—Closely allied to memory are the investigations on the effect of drill. Brown (16) and F. M. Phillips (67) both tested elementary school children with respect to the efficacy of drill work in arithmetic. Brown found no difference in this respect between the sexes, while Phillips found that the boys gained more than the girls. Wells has two papers which touch on the subject, but in both instances the sex groups are too small to be significant. In one (83) he found a progressive improvement of endurance with practice which was greater in women than in men. In the other (82) he found no difference in the gains made by practising addition and number checking. Yoakum and Calfee (88) report that their freshmen boys gained more in practising mirror drawing than the girls, though they did not catch up with them. Culler (25) observed that the men of his comparable group (only 7 of each sex) gained with practice in card sorting enough faster than the women to surpass them, particularly after an interference due to a rearrangement of the system of sorting. These investigations have been very different in type, and most of them represent small groups, so that generalizations are not safe, but there have been more of them which report a faster rate of improve-

ment with drill in boys than in girls. It is interesting to notice that these tests have been carried out with processes in which females are at the start faster.

(*g*) *Association.*—Huber (45) carried out, with soldiers in training, the same series of free associations that Reinhold had previously tried with the girls of an advanced school. Though he states that differences of sex exist, the specific differences which he finds, such as greater uniformity in the associations of the girls, and more predicate, adjective and definition reactions on the part of the soldiers, he explains as due not to sex, but to the amount of education in the two groups Free association tests consisting in recording the number of words which could be written in a given length of time are reported by Burt and Moore (19) as showing boys faster, and by Pyle (69) and Lobsien (51) as showing girls faster. The latter found the difference marked from 9 to 11 years, but insignificant in older children. Since girls write faster than boys, such a test cannot throw much light on the rapidity of the thought process. Free associations in which the reaction time for each word has been measured, have been very uniformly found faster in men than in women. Haggerty and Kempf (36) and Wells (81) confirmed this result. Controlled association of the type represented by fundamentals in arithmetic (addition, etc.) is usually faster in females. Burt and Moore found boys faster, but Courtis (24) with his enormous series of New York school children, Phillips with a smaller number of school children, and Haggerty and Kempf with university students found girls and women faster. In controlled association of the opposite type girls are also apt to be superior (Burt and Moore, Pyle, Bonser, (15)), though in this case correctness of idea is a larger factor in estimating results than time of association. Haggerty and Kempf, considering speed alone, found men faster. The Ebbinghaus completion test has been used as a measure of sex difference by Cohn and Dieffenbacher (22), Burt and Moore, and Bonser. Burt and Moore, who call the test "completion of argument" because of the nature of the text used, found no sex difference, while the other two found boys superior. In a substitution test, Pyle found the girls faster at all ages, while in the number of associations suggested by an ink blot (called a test in imagination) boys were superior.

The generalization which is suggested by these results is that males are faster in free associations, while females are faster in practised systems of associations.

Both Wells and Haggerty and Kempf discuss the reasons for the more rapid free associations of men. Both papers take the view that the lengthened time of the women is due to a greater tendency to interference and suppression of ideas. This means, as Wells points out, that the associations of women are really controlled associations—controlled by the self for various reasons—to a greater extent than those of men. He thinks it possible that this result may be due merely to the fact that men have tested women, and that a woman testing men might obtain reverse results. Haggerty and Kempf are inclined to think that this tendency to be "on guard" against embarrassment is characteristic of the female sex. Apparently the Freudian school would find this interpretation in harmony with their theory of hysteria, which they explain exclusively on the basis of the suppression and substitution of sex impulses and ideas, and which is so much more prevalent among women.

With regard to types of reproduction within the associative process, Wells (81) and Lobsien (51) give results. The only decided difference of sex observed by Wells was the greater frequency of predicate associations in women, and of coordinate associations in men, a difference which had been previously noted. Among children Lobsien found the vast majority of associations belonging to the type in which no connection was evident. He calls them "springende" reproductions. The next largest class was the coordinates, while verbal and predicate associations were very few. The sex differences were small. Taking the entire group from 7 to 15 years, he found a few more "springende" associations for girls, and a few more of each of the other three types for boys. He also, then finds coordinate associations a bit more frequent for boys, though he fails to find predicate associations more frequent for girls. However differences of method make a comparison of results of doubtful value.

(*h*) *Attention.*—Cohn and Dieffenbacher (22) measured attention in terms of the distraction involved in simultaneous reading and writing, in which the girls suffered less from distraction than the boys. Burt and Moore (19) used two tests, one a test of the scope of attention called the spot pattern test, a tachistoscopic test in which a pattern composed of spots is reproduced, and one called irregular dotting which consists in tapping as rapidly as possible when each tap must hit one of an irregular series of dots. In both tests they found the boys superior, though in the second one the

girls were better if the time interval was short. Heymans (39) lays stress on the narrower range of consciousness of the female, which he thinks can be deduced from her greater emotionality, and which is corroborated by the greater prevalence of hysteria in women. These two tests of the scope of attention give contradictory results.

(*i*) *Judgment and Reasoning.*—Breukink (15) tested judgments of time and space in men and women, and found men more accurate with regard to time, but no sex difference with regard to space. In judging space from memory, Myers (64) found males more accurate. Cohn and Dieffenbacher (22) thought the boys showed better judgment in their series of tests in several respects. They judged better the additional time required to learn the long series of digits than did the girls, though they came out with no better result in the end. He found that the boys had more questioned judgments in their tests of report, and that they were more trustworthy than the girls on the most essential points of the picture, though not in the report as a whole. In the logical arrangement of themes of the two sexes they found no difference. Burt and Moore (19) found boys better than girls in solving mechanical puzzles, but observed no difference in the sexes in respect to reasoning power tested by a group of tests consisting of the completion of an argument, the completion of analogies, constructing sentences, opposites, and the correction of syllogisms. Bonser (14) who made a particularly careful and many-sided investigation of a large group of children in the fourth, fifth, and sixth grades, found the boys a little ahead in the median for the series, seven tests in all. In details there were more marked differences. The boys were ahead in reasoning out problems, in selecting correct reasons for statements, and a bit so in a completion test. The girls were ahead in opposites, in selecting correct definitions, and particularly in the interpretation of literature. With regard to age, he found the boys ahead up to twelve years, and the girls ahead above twelve years.

The other tests which I have been able to find deal with reasoning as displayed in the solution of problems in arithmetic. F. M. Phillips (67) using the Stone tests, and Courtis (24) using his own tests found the boys better than the girls in tests of correct reasoning. Fox and Thorndike (31) report that in their group of high school pupils, girls surpassed boys in arithmetical ability, but they believe that the girls in that community were a more selected set than the boys.

On the whole, then, males have stood better than females in tests of judgment and reasoning.

(*j*) *General Intelligence.*—Under this head there have been (1) several investigations of school marks in the United States and Europe, and statistics with regard to the number of advanced and retarded children in school systems, (2) Binet-Simon tests, (3) groups of selected tests, and (4) some single tests which can be more conveniently classified here than elsewhere.

(1) The instability of school marks as a measure of ability has been strikingly brought out by Starch and Elliot, who sent an examination paper to 180 head mathematics teachers to be marked, and received grades all the way from 25 to 90! However, taken in the mass they doubtless have some significance. Baldwin (5) studied school marks in the fourth and fifths grades of a city school. He found that the girls maintained a higher standard of scholarship than the boys. In accord with this was the fact that there were more repeaters among the boys and more girls who skipped grades. Miles (57) made a study of the marks in both elementary school and high school for a group of 106 children for whom he had continuous records. The girls were consistently ahead in every grade, and in every subject except arithmetic, where there was no sex difference. Klinkenberg (47) studied school marks in a school system in Holland which was partly coeducational and partly segregated. Boys were ahead in mathematics, physical sciences, history, and geography, subjects, he remarks, in which an analytic process of thought is uppermost. Girls were ahead in literary studies and languages. He states that girls do not stand examinations as well as boys, but do better in class work than one would expect from their examinations. Girls were further behind boys in geometry than in algebra, which is due, he says, to their well-known disinclination to constructive thought. Cohn (see Bobertag, 13), in the "Dritter deutscher Kongress für Jugendbildung und Jugendkunde" gave a report on school marks in a coeducational school in Baden. Taken as a whole, he found no sex difference, but in grouping the subjects he also found boys better in science and mathematics, and girls in the language group. Forsyth (30) reports that the mean college grade of women in the University of Illinois is a little higher than that of the men. Heymans (39) collected statistics on this point from the universities of Holland, and found that the women rank higher than the men. The fact is so well established in this country that it has given rise to the

witticism that university professors who used to object to admitting women to their classes on the ground that it would lower the standards of scholarship, now object because the women do so much better class work that the men become discouraged and refuse to compete in the game.

The number of advanced and retarded children in large school systems in the United States have been tabulated by Bevard (10) in Washington, D. C., by Hill (41) in New Orleans, by B. A. Phillips (66) in Philadelphia, and by Lurton (52) for fifty-five towns in Minnesota. In every instance there were more retarded boys than girls, and more accelerated girls than boys.

(2) The Binet-Simon tests have been made the basis of sex comparison in the United States by Goddard (35), A. C. Strong (75), and Monroe (58), and in Europe by Bobertag (11) and Wiersma (84). Monroe dealt only with children from three to six years of age. He tested 300 of each sex, and found no sex difference on the whole, though there were small differences in the various years. Goddard's results represent the largest number of children tested by the Binet-Simon scale under one director, 2,000 children. His table shows no clear difference of sex. Reduced to percents on the basis of the proportion of each sex who are two years or more retarded, or two years or more advanced—a procedure which he did not himself carry out—it appears that there is no sex difference in retardation (boys 18.4 per cent., girls 18.6 per cent.), but the girls have a slightly greater proportion of accelerated individuals (boys 3.7 per cent., girls 4.8 per cent.). Strong in tests of 225 white children found on the same basis a similar state of affairs, though the differences were larger—retarded, boys 9.6 per cent., girls 10.7 per cent.; accelerated, boys 3.2 per cent., girls 6.9 per cent. The European results rest on much smaller numbers. Wiersma, who tested 68 boys and 73 girls, found the girls ahead on the whole, while the boys had larger groups both of retarded and of accelerated individuals. Bobertag alone found boys superior to girls. His results are stated in terms of years and fractions of years for each sex at each age. The boys were superior at each age by amounts varying from 0.06 to 0.20 of a year. Bobertag is quite too scientific to regard this result as conclusive, since it rests on about fifteen of each sex at each age, but he remarks that if it is substantiated it would be in accord with other experimental findings. That it does not agree with the general trend of Binet-Simon tests so far is evident. It is quite possible, however, that results in the co-

educational school systems of Holland and the United States may prove to be different from those in the segregated schools of Germany.

(3) Cohn and Dieffenbacher (22), Burt and Moore (19), and Pyle (69) carried out series of tests on comparable groups of the two sexes. The subjects of Cohn and Dieffenbacher varied in age from 7 to 19 years. They were selected as representatives of the better and the poorer sections of their school classes. There were about 100 of them in all. Burt and Moore tested about 140 children of 12½ to 13½ years, and about 100 university students. These two series agree in finding no sex differences as a whole. Specific differences which they report have been mentioned under the appropriate headings. Pyle, testing school children in this country, found the girls superior, but his tests were not as varied in type as the other series.

(4) Two investigations, those of Libby and his coworkers (50) and that of Franken (32), were made by means of questions on general information. Franken, though he had a considerable number of subjects, had only small comparable sex groups. The younger girls were superior to the boys, but there were no differences among the older children. Libby and his associates tested grade children from the fourth to the eighth grade, and first year high school students. They report boys superior in all age groups. The girls were more cautious in their replies, and not so likely to guess if they did not know. Ash (4) tried giving school children the choice of two kinds of tasks, one of which required original observations, and the other compilations from books. He found no sex difference on the whole, but the boys were most numerous in the group who selected all their tasks from one type, while the girls were more likely to divide the choice. With regard to mental fatigue, which should, I suppose, be regarded as an element in general intelligence, Offner (65) reports that no sex difference has been observed.

On the whole, then girls have stood better than boys in measures of general intelligence. So far as I know, no one has drawn the conclusion that girls have greater native ability than boys. One is tempted to indulge in idle speculation as to whether this admirable restraint from hasty generalization would have been equally marked had the sex findings been reversed! The usual explanation of the result offered is that girls are more docile and industrious than boys. The greater industry of girls has been turned to account by Lipmann

in a novel argument for the inherent superiority of the boys. In his summary of the evidence on variability (see Bobertag, 13) he states that there are a larger number of series of measures in which the boys proved to be the more variable sex in the sense that there were more boys in the extreme quartiles of the range of values, and more girls in the two middle quartiles. He argues that the greater industry of the girls would be capable of raising them from the lowest quartile to a higher one, but would not suffice to overcome their lesser native ability to the extent of raising them from a lower to the highest quartile. To limit the effects of industry so much as to make it inoperative through a whole quarter of the range of a measure seems a bit extreme.

The writers who explain the results just quoted on the ground of the greater industry of girls are also those who emphasize their greater emotionality and rapid changes of mood. They seem to find no contradiction in the fact that the sex which is most dominated by emotions and moods is also the one which has the greatest capacity for plugging away at a task whether it is interesting or not. Another explanation quite as reasonable as that of the greater industry of girls might be sought in the fact that girls develop somewhat faster than boys. In the case of university students it may be, as Thorndike points out, that the sexes are selected on a different basis.

(*k*) *Affective Processes, Tastes and Ideals.*—The only direct experimental investigation of affective processes is that of Burt and Moore (19) in which they measured the psychogalvanic reflex in adults under stimulation of various sorts, and found the deflection in response to emotional disturbances greater in women than in men. It would be interesting to find out whether the same difference obtains when a woman instead of a man does the testing of the two groups. Under those conditions the plethysmograph and respirator—which to be sure are not very safe measures—gave opposite results in my own tests. Burt and Moore believe that an analysis of the content of association reactions revealed a difference of sex in emotionality at an early age, and that the difference increases with years.

Heymans (39) attacked the question of the relative emotionality of the sexes by the questionnaire method. A large number of intelligent people in Holland filled out the blanks, and a tabulation of results showed that a larger number of women than men were classed as emotional. Moreover the traits that were assigned

predominantly to women were also those assigned to emotional men. (For a discussion of the scientific value of this method see Thorndike, 78.)

There have been a few bits of experimental evidence bearing on other phases of affective life than degree of affectability. E. K. Strong (76) found that women have more and greater dislikes than men and are better able to classify them. H. L. Hollingworth (42) suggests the generalization, which he says needs further confirmation, that men resemble one another more clearly in their preferences, while women are more alike in their aversions. Kuper (48) confirmed for children Strong's statement that women have more dislikes than men. Her method was to ask 200 children, evenly divided as to sex and varying in age from 6½ to 16½ years, to arrange three series of pictures in the order of preference. All three series represented the same nine subjects. It is interesting to notice how nearly alike the order was for the two sexes. For girls it was religion, patriotism, children, pathos, animals, sentiment, landscape, heroism, and action. The only change in the order for boys was that the positions of children and of heroism and action together were reversed, bringing children last and heroism and action third and fourth in the boys' lists.

Ballard (6) classified preferences in the themes of free drawings made by London school children. The themes of boys in order of preference were ships, miscellaneous drawings, plant life, houses, human beings, vehicles, animals, weapons, and landscapes, while for girls the order was plant life, houses, miscellaneous drawings, human beings, animals, ships, vehicles, weapons, and landscapes. Here again the order is very similar. The chief difference is that boys show a much greater liking for ships and girls for plant life. Stockton (74) tried to measure preference by means of the choice of one of a pair of words. He found far more resemblance than difference. Both boys and girls choose time words a bit more frequently than space words, words for food rather than words for dress, and adjectives rather than verbs. For words of activity boys showed a small preference, while girls choose words of passivity a little more frequently. He found that preference based on the idea of the word increased with age, and more markedly so in the case of boys than in that of girls, but neither sex based the choice on meaning to as great an extent as upon mere position.

There have been three investigations which consisted in asking each of a large number of children to state what person, whether

acquaintance, historical character, or character of fiction he would most like to resemble. Brandall, reported by Gilbertson (34) worked with Swedish children, Hill (40) with American children, and Hoesch-Ernst (see Bobertag, 13) also with American children. They all agree that girls choose personal acquaintances oftener than boys, and that boys choose more public and historical characters. Brandall and Hill found that girls choose ideals from the opposite sex many times as often as boys. In the Swedish study boys choose characters from fiction more frequently than girls, while in this country the reverse was true. Brandall recorded also the reasons assigned by the children for their choices. He found that girls name moral, intellectual and artistic qualities more frequently than boys, while boys name material advantages, honor, and social position more frequently.

Anderson (3) gives the result of a questionnaire on the kind and amount of reading done by school children. She found no difference of sex with regard to amount, though girls read more books and boys more magazine articles. The girls used libraries more than boys. The preferences for kinds of literature were for boys, (1) stories of adventure, (2) detective stories, (3) and (4) war and love stories; for girls (1) love stories, (2) stories of adventure, (3) detective stories, and (4) travel and biography. Anderson also found that girls displayed a greater range in their reading, received more advice about it, and talked more about what they read than boys. The boys were more independent and original in choice.

Scheifler (70) has a paper on the tastes of boys and girls in games, based on a questionnaire given to 5,000 children. He divided plays into four classes, imitation plays (dolls, soldier, etc.), plays of bodily movement and contest (ball, tag, etc.), plays of intellectual activity and contest (building, checkers, chess, etc.), and occupation plays (sewing, reading, collecting, etc.). His general result is that girls give a greater preference to imitation plays, and boys to plays of bodily movement and contest, while there is no sex difference in the other two groups of plays. However when he picked out a set of plays which he designates as constructive—such as drawing, building and chess—the boys predominate. Scheifler is much relieved to note that coeducation shows no tendency to make the plays of boys and girls alike. If it did he thinks it would be a sufficient reason for doing away with coeducation. "Freuen wir uns vielmehr der schönen Eigenart der Geschlechter

und pflegen wir sie! Unser Volk braucht immer noch beides: Männer die da wägen und wagen, Frauen die im kleinsten Kreise unendlich Grosses wirken."

Melville (56) asked each member of the four high school classes to write down all the slang phrases he knew. He then selected 100 papers, evenly divided between the sexes, from each class. The boys were ahead of the girls in the number of expressions by amounts increasing from 18.7 per cent. to 40.0 per cent. in the four classes.

(*l*) *Creative Ability in Art and Letters.*—There have been several studies of children's drawings published. Cohn and Dieffenbacher (22) and Wagner (80) both followed the method of asking large groups of children to draw, under experimental conditions, illustrations for Hans Sach's poem "Schlaraffenland." They both classified the drawings as Kerschensteiner had done, on the basis of representations of space, from the entire spacelessness of primitive drawings through linear and group arrangements to well-developed perspective. They agree that the primitive spacelessness is more characteristic of girls' drawings than of boys', and that girls take more pains than boys with decorative details. Cohn and Dieffenbacher found that girls treated a greater number of themes than boys, while Wagner found the reverse. Wagner noticed more elaboration of details in the drawings of the boys, and found them superior in inventiveness, in the representations of humor, and of motion. On the whole Wagner considers the boys very superior. The girls in his group excelled only in details which had to do with feminine interests. Cohn and Dieffenbacher noticed that the drawings of the boys were larger than those of the girls, and more characterized by heavy lines and strong colors, whereas the girls preferred delicate lines and soft colors. This difference in color preference had been previously noted in Kirkpatrick's monograph on "Studies in Development and Learning."

Muth (63) asked children from the first to the seventh years in school to decorate the outline of a plate and of a shield. She agrees with the two reports just quoted that girls prefer fine lines and a smaller more delicate type of drawing. She found that the sense of rhythm is earlier developed in girls and is stronger than in boys. The girls showed a better sense of proportion between the filled and the blank spaces of the surfaces. From the point of view of mere decorative effect, then, girls were superior, though she found the boys excelling in the expression of humor and in the originality of their drawings.

The generalization suggested by these pieces of work is that boys excel in perspective drawing and girls in decorative drawing.

Within the years with which I am dealing, I have found but one attempt to measure the relative merits of literary productions in the sexes. Cohn and Dieffenbacher (22) asked their group of children to write a theme on experiences at the local railroad station. They found the themes of the girls superior in most of the measures which they applied. Their themes were longer, both in words and in statements, their sentences were longer, they used more figures of speech, and a greater number of unusual expressions. Their themes were richer in content, and better in literary style. Analyzed for content they found that the boys mentioned more objects, more definite numbers and spaces than the girls. The girls' themes were richer in feeling, and more subjective. The sexes differed in the kind of feeling expressed. With girls sentimental and comic moods predominated, and with the boys the loyal and ethical sentiments. Though it does not belong in my period, it seems worth while to mention the fact that Giese (33) arrives at generalizations opposed to most of those just quoted! His monograph is an extended study of the free literary productions of boys and girls from the ages of five to twenty. The material he collected from all sorts of sources, chiefly from the public press. He criticizes Cohn and Dieffenbacher for passing judgment on a question of personal opinion like literary style, but does not seem to feel that his own work is open to the same criticism with reference to his selection of material, and his judgments of originality and value. He finds that boys write more poetry than girls, and do it much better, that their compositions are longer, more philosophic, and of higher artistic quality. The monograph contains very detailed comparisons of a large number of factors, and is half devoted to a collection of literary productions representative of the various ages.

(*m*) *Suggestibility.*—Two of the papers on the psychology of report (Aussage) contain measures of suggestibility. Breukink (15) in his group of adults found the women more suggestible than the men. They answered more of the suggestive questions both wrongly and correctly than the men did. Cohn and Dieffenbacher (22) in their group of school children found no sex difference in suggestibility, measured in the same way.

(*n*) *Variability.*—Several of the experimental series to which we have referred have been formulated in terms of variability, but most of the groups have been too small to be significant unless there

was wide agreement, which there has not been. The results dealing with the largest number of individuals, those of Goddard (35) on Binet-Simon tests and of Courtis (24) on tests in arithmetic fail to show any sex difference in variability. There have been two papers which sum up experimental evidence on the subject, one by L. S. Hollingworth (44) and one by Lipmann (see Bobertag, 13). Hollingworth sums up her review by saying, "If the evidence can be said to point in one direction rather than another, a greater female variability seems actually to be indicated in experiments so far made on the higher mental processes." Unfortunately I have not seen Lipmann's original paper, but only the abstract of it in the report of the congress at which it was delivered. He says that he worked over all the available statistics on variability in the sexes, and found that in 53 per cent. of the series of measures males were more variable, in 37 per cent. females were more variable, and in 10 per cent. there was no difference. Thorndike (78) selected a set of measures of various traits which he thinks most reliable as a basis for estimating variability, and concludes that they indicate somewhat greater variability of the male. He is convinced that greater variability of the male must be the explanation of the great preponderance of male geniuses. The amount of the sex difference in genius is most vividly brought out by comparing Cattell's former study of eminent men with that of Castle (21) on eminent women, and is of course not brought into question by sketches of the contributions to science made by women, such as those by Mozans (60), interesting as they may be.

Hollingworth questions the genuineness both of the greater number of male geniuses and of the greater number of male deficients, facts which have usually been thought to be proofs of male variability. She points out (43) that most of the evidence for the greater number of male deficients rests on statistics from institutions for the feeble-minded, which she and others consider unreliable because it is easier for feeble-minded women to maintain themselves outside of institutions than for feeble-minded men, since the former may earn their way either as household drudges or as prostitutes. As evidence of the truth of this assumption she reports a series of 1,000 consecutive cases passing through the New York clearing house for mental defectives, in which she found the females much more numerous than the males in the older group, showing that they had been able to maintain themselves longer in society than the corresponding males. The Binet-Simon tests confirmed this

by showing that of those individuals who tested at a given mental age, the women were older than the men. She concludes that if social pressure bore equally on the sexes, there would be as many females as males in institutions for the feeble-minded. The statistics from a social survey of the number of the feeble-minded outside of institutions, which gives more males than females, Hollingworth considers unreliable, though Thorndike apparently accepts them. With regard to genius (44) she makes the very pertinent suggestion that no one who has discussed the question has given sufficient weight to the fact that most women have devoted the greater portion of their time to occupations connected with bearing and rearing children, and in maintaining a home—occupations in which eminence is impossible though genius is not. No one can tell, she says, how much genius of a high order may have gone into these tasks where recognition in terms of fame is out of the question. She concludes that there is little ground for explaining the lesser scientific and artistic achievements of women on the ground of greater male variability. Finot (28, 29) makes much the same point in stating that in proportion to the number of women devoting themselves to scientific and artistic pursuits, the number of persons of eminence has compared favorably with males.

II. General Discussions

The general discussions of the psychology of sex, whether by psychologists or by sociologists show such a wide diversity of points of view that one feels that the truest thing to be said at present is that scientific evidence plays very little part in producing convictions. As Coolidge puts it: "In our present stage, the conclusions as to the permanence or significance of any feminine peculiarity at which any observer will arrive are in accordance usually with his anti- or pro-feminine bias." Hartley expresses the same idea. Among psychologists Burt and Moore (19), Stern (73), Heymans (39), Wreschner (87), and Thorndike (78) have expressed opinions with regard to the facts of the psychology of sex, based on the experimental evidence. The generalization at which Burt and Moore arrive is that sex differences are most marked in the simpler functions of sensation and motion and decrease as one rises to the higher levels of mental activity, until in the most complicated functions no difference is to be observed. Stern arrives at exactly the opposite generalization! The simpler and more easily measured functions show no significant differ-

ence of sex, he says, while we may be certain that as we penetrate further with experimental methods into the more complex mental functions, the significant differences will appear. Heymans, basing his opinion largely on the returns from the questionnaires which he and Wiersma sent out, though he considers experimental results also, derives a differential psychology of sex from two fundamental factors, first the greater emotionality of women, and second their greater activity, in the sense of readiness to act. The differences in intellectual capacity he explains in terms of interest and attention, which are ultimately determined by emotionality. Heymans's book is exceedingly readable, but not altogether convincing. His principle fails to work at a very vital point. The fact that women are in many respects poorer observers than men, he explains on the ground that their emotionality limits their interests, so that they observe well only that which has emotional value for them. When it comes to accounting for the better rank of women in academic work, he finds that while men put effort chiefly on that which interests them, women are industrious and conscientious in all tasks, whether they find them interesting or not. This contradiction he attempts to resolve on the ground that women are more readily spurred to action than men. Wreschner's book is in the nature of a popular lecture summarizing experimental studies of sex. He gives no references, and no indication of the strength of the evidence underlying his generalizations. The source of his material is easily recognized by any one familiar with the field. As a matter of fact some of his statements rest on evidence so contradictory or so meagre that they are worth no more than a personal opinion. In his conclusions he agrees with Heymans in assigning to women a stronger emotional nature, and a smaller participation in abstract intellectual processes, but takes the opposite point of view with regard to activity, which he regards as distinctly greater in men. Thorndike (78) regards the differences between the sexes of the type revealed by experimental psychology as too small, in view of the large variations within each sex, to be considered significant except with regard to the greater variability of the male. So far as central tendencies in various abilities are concerned, he assumes no difference of sex. He is inclined to agree with the others that women are more emotional than men, and thinks it probable that the chief difference of sex aside from variability is to be found in the fighting instinct of the male and the nursing instinct of the female, instincts which affect lines of conduct.

One element in the success of men in scientific, artistic or social fields is their love of getting ahead of the other fellow, while women have less of a desire to win, and a more pronounced humanitarian tendency.

All of this group of men, in spite of their wide differences of opinion as to the nature of the psychological characteristics of sex, are convinced that they are inherent and are not to be explained by environmental influences during the life of the individual. Burt and Moore base their conviction on the fact that the sex differences which they found in English children and adults were similar in kind and amount to those of my series of American university students. Differences which remain constant at different ages and in different countries must, they think, be inherent in sex itself. They do not seem to have considered whether or not there are factors in the social environment of sex which remain constant in all modern civilized countries. Stern believes that sex differences have been found in processes which are not influenced by social environment, such as spontaneous drawings. Wreschner holds that some of the traits most characteristic of women, notably emotionality, are of a nature to be repressed rather than fostered by the social environment of women. Heymans points out with much justice that much of the argumentation with regard to what effect the social milieu would have on given traits is very inconclusive. It is no difficult matter to get up fairly plausible arguments to prove either that social conditions tend to foster emotionality in women (Finot) or that they tend to repress it (Wreschner). Heymans thinks it quite as reasonable to suppose that differences in traits determined the differences in environment as vice-versa. Finally Wreschner inquires somewhat peevishly how in the world we are to know what is inherited and what socially acquired, and calls upon all good citizens to help along the course of evolution, whose direction he is confident he perceives, by cherishing our present valuable distinctions of sex instead of subversively trying to overthrow them. However none of these men, except perhaps Stern, believes that the nature or amount of the psychological difference of sex is a sufficient ground for separate systems of education for the two.

There are a few points in the literature of experimental psychology which point to the importance of social influences. The sex difference in size, whose hereditary origin has seldom been questioned, is decreasing with the change in the educational regime of

girls. The Danish Anthropological Society (26) has found that within the last generation girls have made large gains in height and weight, while boys have not changed. It is interesting to notice, too, that in Germany, where the tradition of the mental inferiority of women is still strong, and the girls' schools are even yet inferior (Münsterberg, 62) experimental results are more likely than in other countries to show differences of sex, and to find them in the direction of male superiority. In the tests conducted by Cohn and Dieffenbacher in one of the few coeducational schools of high school rank in Germany, they found the girls superior not only to the segregated girls, but to the boys in the same school. They were a small group, and German psychologists explain their high rank on the ground that they were to a greater extent than the boys selected on a basis of ability. It is also significant that differences between the cultured and the uncultured in experimental results are usually far larger than those between the sexes (Breukink, 15).

When one turns to the books written more largely from the historical and sociological point of view, the trend of opinion is that mental differences of sex are of social origin. There are four scholarly and exceedingly interesting books of this type, Coolidge (23), Hartley (37), Finot (28, 29), and Müller-Lyer (61), coming respectively from the United States, England, France, and Germany. The last three all contain historical sketches of the position of women from primitive times to modern. Hartley and Finot also discuss the question of sex in animals, and its bearing on human problems. Coolidge's book is particularly interesting to American readers because it is written with immediate reference to the social position of women in the United States during the last few generations. They all lay stress on the view that social conditions account for most of the traits ordinarily considered feminine, and particularly for the limited accomplishment of women in art and science. Coolidge gives a vivid sketch of the way traditional domesticity limited and determined the intellectual life of women. The same point is effectively brought out from the German standpoint by Maurenbrecher (53).

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THE HEREDITY OF MENTAL ABILITIES

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The recent work upon the heredity of mental traits is strongly influenced by the findings of the biologists, and especially the Mendelian formula. The newer point of view and the data collected by numerous field workers have given a new aim and character to this branch of research.

Several important investigations in the transmission of *feeble-mindedness* have appeared. Goddard's (9) work, *The Kallikak Family*, has received widespread attention. He traced two lines of descent from a soldier of the Revolutionary army. One line began with a feebleminded girl whose illegitimate son was the forbear of 480 individuals, the other line with a normal woman, his legitimate wife, and numbers 496 persons in direct descent. In the former line 143 were feebleminded, 46 normal, and the others unknown, or doubtful cases; in the latter line all were normal persons. In the defective line there were 41 matings, in which both parents were feebleminded. They had 222 feebleminded children and only 2 who were considered normal. Goddard believes his results "show the possibility that the Mendelian formula applies to human

heredity." Miss Danielson (4) traced the defective strains of a community, where feeblemindedness was rife, back to two families; and her study of these two family-trees led her to believe that feeblemindedness cannot be considered a "unit character," for two "recessives" did not yield 100 per cent. recessives, but only 77.3 per cent. Feeblemindedness is rather due to the "absence of a set of traits." Easterbrook's (8) study of the defectives of an isolated community indicates that "heredity plays a part in indolence, alcoholism, licentiousness and shyness." Davenport has collected a number of genealogies, biographies and studies of the insane and criminal classes (5) which have many hints for the field worker, and his systematic arrangement of traits to be studied (6) should prove very serviceable.

The transmission of congenital *insanity* is obviously more difficult to trace than feeblemindedness. Mott's (15) analysis of 18 families, in which both parents suffered from insanity, or nervous disease, or were suicides, shows that 39 per cent. of the offspring were affected; while in 90 families, where but one parent was afflicted, only 9.6 per cent. of the offspring were affected. His examination (16) of 508 pairs of parent and offspring shows a signal tendency to the occurrence of most of the insanity in the offspring of insane parents at a much earlier age than in the parent. This, he holds, is nature's way of ending a degenerate stock. He does not believe that the Mendelian proportions can be shown in the inheritance of the neuropathic tendency. Rosanoff (17) on the other hand, in a study of the inheritance of the neuropathic constitution,—using that term to designate a vast class of nervous and mental conditions,—found a close correspondence between the Mendelian formula and his actual results. Where the Mendelian expectation indicated 359 neuropathic offspring 351 were found, and where 578 normals were expected 586 were found. Manic-depressive insanity appears to be recessive to the normal condition, but dominant over epilepsy. Bateson (1) ascribes to dominant descent, along Mendelian lines, such nervous diseases as angioneurotic œdema, tremor hereditarius, Huntington's chorea, ptosis and probably several forms of spastic paralysis and myoatrophy. He finds less abundant evidence of recessive conditions in man, but he thinks that paralysis agitans is one and, possibly, feeblemindedness another. He also notes that some traits are limited wholly, or partially, by sex; thus, color blindness and a form of nystagmus are more apt to follow the male line than the

female. Similarity in the form of insanity affecting parent and offspring is nearly twice as frequent as dissimilarity, according to Corson (3). In manic-depressive cases it was observed that a strictly maniacal, or melancholic, state in an ancestor was more frequently associated with a similar state in a descendant—mania with mania, and melancholia with melancholia.

The transmission of *minor defects* has been observed by numerous investigators from time to time. Lundborg's (13) work is interesting in its endeavor to apply Mendel's law to the inheritance of deafmutism, which he believes to be a recessive and monohybrid. Of course, as he admits, it is difficult to determine when a case is congenital, or acquired, and there is room for differences of opinion in selecting cases for tabulation.

The inheritance of *normal abilities* is a more elusive study than that of the transmission of defects. Its material is less sharply marked and more susceptible to misunderstanding. Nevertheless we find Hurst (10) bravely applying the Mendelian Law to the musical temperament and finding that it behaves as a recessive character! Children who hum and whistle tunes are apparently *recessives*, while those who, "when not silent drone monotonously or are merely noisy," are *dominants*. Thorndike (19) maintains that both intelligence and morality are transmissible. In proof of the inheritance of such mental ability as the school demands he cites a study of 168 families having each two children. Of these families 138 contain two children who are both forward, or both backward, while only 30 families have two children with one "retarded" and one "accelerated." MacDonald's (14) comparison of the standing of school children, whose parents are in the laboring or non-laboring classes, native Americans, foreign-born or colored, seems to show striking differences. For example, the standing of the children of the laboring class is rather lower than that of the non-laboring people (teachers, officials, and tradespeople). Obviously, other factors than heredity enter into these comparisons. Josefovici (11) has gathered some interesting material illustrating the transmission of impulses, instincts and sensory traits. He calls attention, for example, to the families living in Paris for several generations, who originally came from the north, or the south, of France and who retain their indifference, or their susceptibility, to the cold of the city.

When the normal traits are sufficiently conspicuous and unusual the tracing of their transmission is more confident. Woods (22)

proves that the forty-six celebrities in the Hall of Fame are related to other exceptional people in many more instances than is the average person related to eminent persons. He declares "they are from five hundred to a thousand times as much related to distinguished people as the ordinary mortal is." His work upon the Influence of Monarchs (23) restates his earlier contention for heredity in royalty and points out a correlation between the high character and ability of reigning sovereigns and the prosperity of their age.

The problems of heredity as they affect the *race and society* have given rise to a literature, which is both scientific and popular. Periodicals are published in Germany, England and the United States dealing with the questions of inheritance from all imaginable, and some unimaginable, angles. The conviction is certainly growing which Burt (2) expresses: "So far as our meagre evidence goes the same principles that govern physical inheritance appear to govern mental inheritance too, . . . mental inheritance, then not only moulds the character of individuals, it rules the destiny of nations." That such a destiny is, in part, in the hands of men Whetham (21) maintains from evidence gathered from biology, sociology and psychology. How man can coöperate with nature in improving the race is the great problem. There is no unanimity, as yet, concerning who the unfit are and how they shall be artificially eliminated. As Mott (16) asserts, the same family stock sends out branches bearing both genius and insanity. Shelton (18) thinks it is both wrong and foolish to place any prohibition, or restriction, upon the propagation of an imagined defective class, in the present state of our information: for "great geniuses have at times been mad." A number of men have done great work with ill health and even disease; among them such as Nietzsche, Cowper, Keats, Brontes, Chatterton and John Davidson. Here is "the kind of failure and degeneracy the world needs." Walter (20) in the concluding chapters of his book, *Genetics*, also urges the necessity of caution.

These cautions are timely, in view of the hasty and inadequate legislation (7) which the eugenic propaganda inspire. There can be no question, however, that practical and effective measures for the isolation, or sterilization, of the congenitally defective will be adopted in the future. Society will not leave the matter to the defective, trusting, as Lavergne (12) asserts, that the neuropathic strain finds marriage uncongenial. At present, the real problems are in the hands of the scientist, not the statesman.

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RACIAL DIFFERENCES

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The perplexing questions arising out of the Negro problem in the South have given rise to some interesting, though not always convincing, discussions of the psychological differences between negroes and whites. Discussions which are not fairly anchored in experimental data are apt to be of little value and indeed often rest on erroneous presuppositions. Of such character is a paper by Bardin (2), who, ignoring such authorities as Boas, Haddon, Rivers and others, begins with the postulate that the negro and white races differ in physiological and mental organization to the same extent as they do in certain obvious anatomical features. He thence argues that differences in culture are fundamental and ineradicable. Of somewhat similar character is the paper by Jordan (3), who however professes to speak from personal acquaintance with the negro population in various parts of the South. His experience is that the more nearly white are the mixed bloods, as judged from skin color, the more do they approach the whites in mental and social alertness.

Experimental tests were made by Baldwin (1) on 37 white and 30 colored delinquent girls, ranging in age from 13 to 21 years, inmates of a Pennsylvania reformatory. Learning capacity was tested by a substitution test, with the average result that the negro girls did only 62.4 per cent. as much work as the whites in a given time, and made 245.3 per cent. more errors. The negro girls were "much slower to warm up to the occasion," and the first to drop back and lose interest. They were difficult to arouse and could not be forced or stimulated except, temporarily, through flattery. Their work was more irregular than that of the white girls, and dependent apparently on moods. While working at the tests they seemed only partially occupied with the task in hand, for at the same time they were making random movements, mumbling, grumbling, humming, and saying original and funny things. The fact that the tests failed to enlist the interest of the negroes to the same degree as the whites makes it difficult to judge of the real capacity for learning of the two groups.

The Binet-Simon tests were applied by Miss Strong (6) to 120 negro and 250 white children in the schools of Columbia, S. C. Unfortunately for our purpose, racial differences were purely an incidental consideration with the author and are not worked out adequately; but the following results are suggestive: 60.8 per cent. of the colored, as compared with 25.2 per cent. of the white children, rated below age in mental development; at age there were 30 per cent. of negro and 42.9 per cent. of white children; and above age 9.2 per cent. of negro and 26 per cent. of white children. The tables show another interesting point on which the author makes no comment. At the ages of six, seven and eight just about twice as many negro children as white rate below age, whereas for the ages of ten, eleven and twelve the superiority of the whites over the negroes is but slight. This suggests that the rate of maturing may be more rapid with the negro children, so as to make them older, mentally, at the age of twelve than white children of the same age.

Mayo (4) contributes a valuable study of the learning capacity of whites and negroes living under similar social and economic conditions and subjected to identical tuition and media of instruction, by comparing the school marks received by negro and white pupils of the New York City High Schools. The 150 negroes available for study were compared with an equal number of white pupils, selected at random from the same classes attended by the negroes. The median mark of the white pupils in all subjects taken together was 66; of the colored pupils, 62; and 29 per cent. of the colored reach the median mark for the whites. The average deviation is 7 for the white pupils and 6.5 for the colored. The per cent. of colored pupils reaching the median mark for whites in each group of school subjects is as follows: in modern languages, 33; in mathematics, 32; in history, 31; in science, 29; in Greek and Latin, 27; in English, 24; in the commercial branches, 22. These results tend to dispel the common conception of the negro as relatively good in English and especially inferior in subjects requiring abstract thought, such as science and mathematics. The poor showing of the negroes in English cannot be explained by home environment, since the white pupils who are here compared with the negroes come, many of them, from the homes of recent immigrants, in which little English is spoken. On the whole, the negroes seem to be distinctly below the whites, though the overlap is sufficient to make it easily possible to teach the two races in the same classes.

The common opinion that primitive peoples have existed in all stages of mental development, reaching down to a condition slightly above that of the ape, is challenged by Spiller (5), who cites authorities to show that even the native Australians display a surprising degree of intellectual power. From the testimony of missionaries and teachers who have lived among primitive peoples, he reaches the unwarranted conclusion that all the peoples of the earth are virtually equal to Europeans in mental and moral capacity. As a matter of fact, personal experience with a primitive people in their customary surroundings affords a very unsafe basis for estimating their mentality. A test of the power of meeting unfamiliar situations is necessary.

A very suggestive scheme for the study of any social group is offered by Thomas (7), who reports that he has applied it to the study of the Negro and of some European peasants. He assumes that the main factor responsible for the differences in mental and social attainment found among different peoples is expressible in terms of interest, stimulation, imitation, opportunity, occupational differentiation due to traditional or geographical limitations, and mental attitude in general. With Boas and others he believes that the general organization of mind is much the same in all races of mankind, and that the relative intelligence and advancement of a social group are dependent on the objects to which they give attention.

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SPECIAL REVIEWS

Elemente der Völkerpsychologie: Grundlinien einer psychologischen Entwicklung der Menschheit. WILHELM WUNDT. Leipzig: Kröner, 1912. Pp. xii + 523.

In the early years of his psychological activities, Wundt crossed swords with Steinthal and Lazarus over the conception of a folk-soul. Now, almost fifty years later, he has to defend his own conception of Völkerpsychologie against the assaults of Delbrück and Hermann Paul. He believes in a folk-soul, but in one devoid of all metaphysical attributes. As the actions and interactions of psychic processes in the individual mind constitute the content of the individual soul, in so far as it is of interest to psychology, so the psychic processes and products which are due to the interplay of many minds constitute the content of a social soul (see *Völkerpsychologie*, Vol. I, pp. 9–15). Wundt is opposed to the theory that socio-psychological changes start with an accidental variation in an individual mind which is reproduced by imitation and thus becomes part of the culture of the group. Both the origin and the fixation of such psychic changes, according to him, are socially conditioned. Here, perhaps, lies the weakness of his theory.

Folk psychology is in no sense to be regarded as an applied psychology. Its studies should rather furnish new material to be utilized by psychology. The main subdivisions of the field are given by Language, Art, Religion, Myth, and Custom. In the five volumes of his *Völkerpsychologie*, Wundt segregated these subdivisions, following, as it were, a longitudinal sectioning of the cultural process; in his *Elemente*, he attempts a series of cross-sections, his analysis being directed to cultural eras. Of such eras he distinguishes three: the Era of Primitive Man, the Totemic Era, and the Era of Heroes and Gods—besides the incipient Era of Humanity.

As true representatives of primitive man Wundt accepts the pygmies discovered by Scheinfurt among the African Monbutta, the negritos, and a few other existing groups. Primitive man lives in his shanty, hut or cave, with him the dog, which through community of interests in protection from enemies and success in the chase, becomes his constant companion. He hunts when prompted by the pangs of hunger, but there is as yet no organized chase. It is

woman, the plant gatherer, who first learns to save and provide for the future. The digging stick, with a point charred in the fire, is the only working utensil. The weapons are the bow and arrow (later the boomerang). Primitive man knows the use of poisons, and thus makes his wooden-pointed arrow a deadly weapon. Fire he produces by rubbing together two sticks, or by boring in wood. The exclusive use of the bow and arrow, weapons that cannot be effectively used in combat, indicates that primitive man, on the whole, lived in peace with his neighbors. His art is based on memory, the recollections of his daily impressions, which give rise to naturalistic drawings on the walls of his cave. Barter is carried on secretly, the parties preferring not to meet one another face to face. Marriage is monogamous, and the families are herded together in small local communities. Practically no remnants of a truly primitive language are left, but an analysis of some relatively primitive Sudanese dialects reveals a remarkable resemblance, in form of expression and order of words, to the natural language of the deaf. The thought of primitive man is characterized by concrete concepts with but slight indications of abstraction. Magical beliefs pervade his mental life. The phenomena of death and disease are far more important factors in his religious life than are the heavenly bodies and their movements. He is not inquisitive; only the strange and unusual evokes his emotional and intellectual reaction. His dominant art is dancing, his only musical instruments two wooden sticks rhythmically beaten together, the drum, the rattle. Decorative art consists of simple geometrical designs. While the intellectual horizon of the savage is limited, his mental powers, in their own sphere of activity, seem not markedly inferior to those of civilized man. In his natural state, primitive man is open and honest, does not lie or steal. There being no incentives to transgression in these directions, his ethical status may be characterized as one of "negative morality" (pp. 12–115).

The Totemic Era is the epoch of tribal and kinship organization. Chiefs arise, and the primitive peace yields to a state of continuous warfare of tribe with tribe. Exogamy, which belongs to this Era, takes the form of a dual exogamous division of the tribe, primarily occasioned by the natural increase of population. The dual division is followed by further bifurcations resulting in four and eight classes. Horror of incest is not a cause but a consequence of exogamy. Both polyandry and polygyny occur, the former preceding and laying the foundation for the latter, while

group marriage results from a combination of the two. Monogamy is, however, the foundation of all these later forms of marriage. This Era is characterized by a close association of man and animal, the latter belonging to a realm somewhat superior to man, and often appearing as an ancestor. The totem animal, at the close of a long evolutionary career, becomes the domesticated animal of later periods. Totemic taboo is the earliest form of taboo. Totemism in its further transformations leads to manism (ancestor worship) and fetichism. Totemic cults are based on direct emotional reactions, and must be rather regarded as an important source than as an expression of totemic beliefs. The characteristic arts of the period are tattooing and the decoration of pottery, the designs being based predominantly upon the totemic animal. The typical myth of this Era is the half human, half animal story which is believed to be true (pp. 116–278).

The Era of Heroes and Gods is characterized from its very inception by vast migrations and mixtures of peoples. It is the age of domestication. To it belong the horse, the ox, the cow, the wheel, the wagon and the plow. Work becomes individualized, and division of labor is prominent. Private property develops. War consists of combats of individual champions accompanied by indefinite fights of the masses. The weapon of this period is the sword. The state consolidates, colonization begins. While in the Totemic Era the subdivisions of the tribe followed the dual principle, now the state is divided according to the number twelve, and later according to the number ten and its multiples. The characteristic family is the extended monogamous family, embracing three generations with a patriarch at its head. Social classes spring from conquests of one people by another; when the two cultures are very different, castes arise, when the contrast is less marked, social classes, differentiated in terms of property and power. The city and the state arise and grow together. Accumulated customary rules become consolidated into a fixed body of laws. God is the product of this era. Pure monotheism, however, must be regarded as a product of philosophical speculation, all natural religions recognizing many gods besides the one god. The cardinal distinction of a god from a demon or spirit consists in the definite personality of the former when compared with the vague and fleeting characteristics of the latter. The typical myth of this period is the hero-myth, which bears clear traces of its multiple derivation from the stories and myths of the preceding era. Art

is now characterized by the domination of grand concepts as embodied in architecture, together with the elaboration of detail in the realms of sculpture and painting. The drama arises as a highly complex product of literary and mythological sources belonging to the preceding period (pp. 279–464).

The incipient Era of Humanity is treated by Wundt in very general terms. May it suffice here to indicate the main subdivisions of the section: (1) Der Begriff der Humanität; (2) Die Weltreiche; (3) Die Weltkultur; (4) Die Weltgeschichte.

Wundt's conception of the three Eras is in no sense a contribution to the interpretation of history. It will be noted that their dominant characteristics are selected from different domains of culture: the first being on the whole characterized by its material achievements, the second by its social system, the third by its religion. The selection is obviously arbitrary and one-sided. Wundt himself seems to regard the eras rather as a frame for loosely embracing the mass of material than as a substantial contribution; and we should perhaps do better justice to his effort by disregarding them altogether.

Wundt's treatment of the culture of primitive man is, on the whole, admirable. We must endorse his insistence on original monogamy and his rejection of the hypothesis of promiscuity. His interpretation of group marriage is ingenious and, while speculative, certainly suggestive. The designation of the earliest period of human culture as the Age of Wood deserves serious consideration. His treatment of totemism, on the other hand, contains serious errors of fact and judgment. The formation of clans by successive bifurcations of a tribe is a process that cannot be substantiated by facts, and the entire "Princip der Zweiteilung" is distinctly "aus der Luft gegriffen." The alleged striking resemblance of the social systems of Australia and the Iroquois is largely imaginary; and the three forms of exogamy ascribed to the Australian system (pp. 145–147) are based on some amazing misconception. The assertion that the belief in animal ancestors *must* have preceded that in human ancestors (p. 229) is not supported by ethnological evidence and opinion. The characteristics of a mythical story, distinctive of Wundt's Totemic Era, may be identified one by one among the Eskimo whose culture could by no amount of ingenuity be squeezed into a totemic frame.

But Wundt's work is replete with fact and theory, and a full analysis would carry us far beyond the limits of this review. His

great contribution, moreover, does not lie in the masterly condensed exposition of a vast body of material, nor in the conceptual scheme which determined the formal structure of the work. Wundt's *Elemente* may be regarded as the first theoretical work of large scope in which the results of modern ethnological research have been systematically utilized. Thus, we find a deeply rooted appreciation of the importance of diffusion of culture and the mixture of peoples (p. 48), and a constant insistence on the multiplicity of psychic sources of cultural phenomena, and on the principle of the psychic transformation of cultural values. He dwells repeatedly on the circumstance that the ultimate sources of social change must be elemental and unconscious, as exemplified by the transition from the primitive to the totemic social organization (p. 151), by the formulation of law (pp. 325, 346), and by the semi-accidental character of inventions (pp. 24, 291). One of the leading thoughts of the entire book is the importance of emotion as a source of cultural phenomena. Wundt, perhaps the first among the historians of culture, has set an example for psychologists and anthropologists by drawing psychological and epistemological conclusions from an analysis of primitive languages (pp. 11–13, 15). Particularly significant, finally, in view of Wundt's prominence as an evolutionist, is his realization of the tremendous complexity of the historical process and the unique character of each historical happening (p. 346).

Thus, whatever may be said in criticism, the *Elemente der Völkerpsychologie* remains a contribution of consummate knowledge and wisdom, and its analysis of cultural processes stands, in its main conclusions, in close agreement with the findings of the modern Science of Man.

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The North American Indian of the Plains. Clark Wissler. *Popular Science Monthly*, 1913, 83, 436–444.

In this paper Dr. Wissler briefly characterizes the trend of recent anthropological thinking, illustrating his points by the concrete example of the Plains culture area. Anthropology, as the science of culture, has become sharply separated from biology, and has been obliged to turn from theories of evolution generalizing the course of development to interpretations based on historical analysis. After sketching the main features of Plains culture, the

author turns to the problem, whether the great degree of uniformity throughout the area is due to independent invention or to historical contact. His conclusion is that Plains culture "was the joint product of many tribes, some working out one trait, others again different traits, which by tribal contact and interaction were gradually diffused over the area. In other words, the culture as a complex was worked out by the Plains Indians themselves, but probably not by any one group and probably not without very material aid from tribes in other culture areas."

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Kinship and Social Organisation. W. H. R. RIVERS. London: Constable, 1914. Pp. vii + 96.

This essay deals with one of the most abstruse and technical of ethnological subjects,—terms of relationship. Nevertheless, it is of considerable interest to psychologists, for the point discussed by Dr. Rivers is whether the relationship terminology employed by various peoples can be explained on psychological grounds. This had been the contention of Kroeber, who emphatically rejects a sociological interpretation of kinship terms, which he views as purely psychologico-linguistic products. Against this position Rivers advances the thesis that "not only has the general character of systems of relationship been strictly determined by social conditions, but every detail of these systems has also been so determined" (p. 93f.). This view he is able to demonstrate in several instances, but his generalization is certainly too broad.

ROBERT H. LOWIE

The Belief in Immortality; and the Worship of the Dead. Vol. I: *The Belief among the Aborigines of Australia, the Torres Straits Islands, New Guinea and Melanesia.* J. G. FRAZER. New York: Macmillan, 1913. Pp. xxi + 495.

In the present work Dr. Frazer avowedly confines himself to "a collection of facts illustrative of the belief in immortality and of all the momentous consequences which have flowed from that belief." He does not, needless to say, wholly eschew comparison, but the method here followed of abstracting, at considerable length, the testimony of authorities for each of the areas considered tends to preclude too frequent clashing with the rigorously historical methods of recent years. In regard to historical method, he is

decidedly conservative; but as regards psychological interpretation he is nothing less than Bourbon. He insists on the "rational basis of savage life"; he rejects absolutely the doctrine that savages act first and afterwards invent reasons for their conduct; and he cannot imagine how "any race of men who invariably acted first and thought afterwards" could survive in the struggle for existence; finally, he is convinced that the believers in the essential irrationality of savage conduct uniformly lack personal experience with primitive cultures (pp. 264–266). It is difficult to remain patient at this tissue of misconceptions. Dr. Frazer confuses two problems that are distinct. We may readily admit that primitive mentality does not differ essentially from ours, and that accordingly primitive men, like ourselves, are not incapable of logical reasoning. But it is a far cry from the psychological unity of mankind to the dogma of a rational basis for savage life. The alternative that we, too, may act first and reason about our actions afterward, seems not to have occurred to the author. The secondary character of what purports to be the basis of savage conduct has been repeatedly demonstrated—perhaps most clearly with regard to ceremonial behavior. Again and again, the same series of ceremonial activities, occurring in neighboring tribes, and in some instances borrowed from a single source, is found coupled with *different* theoretical interpretations of these activities. Of these only one can conceivably be the basis of the conduct, the others *must* be secondary; and there is no reason for assigning an exceptional significance to the one theory that is not, by logical necessity, proved secondary; more probably it too, like its compeers, serves to explain a pre-existing practice. The "rational basis" thus turns out to be a rationalistic afterthought.

The purely descriptive task which Dr. Frazer has set himself is well executed. He has collected all the available information with exemplary industry, utilizing not only the standard works, but a host of recondite articles buried in periodicals and communications of missionary societies; and his beautiful English continues to arouse admiration and envy. ROBERT H. LOWIE

The "Psychological Interpretation of Language." A. M. HOCART. *Brit. J. of Psychol.*, 5, 267–279.

This distinctly clever paper will interest the ethnologist mainly for its concrete illustrations of principles rather generally recognized in his circles. In a psychological journal, however, the principles

themselves require formulation, for if misconceptions prevail to a lamentable extent among educated laymen on any subject of primitive life and mentality, it is assuredly that of primitive language. Basing his discussion entirely on the Fijian field with which he has familiarized himself, Mr. Hocart points out that the supposed richness of concrete terminology and concomitant absence of abstract words is not amenable to a simple psychological interpretation, such as the inferior ability of the savage to see identity in difference. The development of a language is due to no rationalistic, logic-chopping analysis of the universe, but is conditioned by practical considerations in the life of the people using it. This can be illustrated no less clearly by the English than by the Fijian tongue. A Fijian is specific along lines that interest him, such as planting, handicrafts, war, while he is exasperatingly abstract in fields where English is more precise. Language must be correlated with the culture in the midst of which it developed or of which it forms a part. And, moreover, as our own language becomes intelligible only as an *historical* product, so in the speech of savage tribes the importance of historical conditions must be constantly kept in mind.

Robert H. Lowie

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NOTES AND NEWS

THE present number of the BULLETIN, dealing with race and individual psychology, has been prepared under the editorial direction of Professor R. S. Woodworth, of Columbia University.

DR. KARL HEILBRONNER, professor of psychiatry in the University of Utrecht, known to psychologists especially for his contributions on aphasia, died on September 8.

DR. WALTER S. HUNTER, of the University of Texas, has been promoted to the grade of adjunct professor.

J. CROSBY CHAPMAN, B.A. (Cambridge), D.Sc. (London), Ph.D. (Columbia), has been appointed assistant professor of experimental education in Western Reserve University.

DR. A. H. SUTHERLAND, of the University of Illinois, has been appointed instructor in psychology in Yale University.

DR. CLARA HARRISON TOWN has announced the opening of an office in Chicago, where she is prepared to examine and treat mentally atypical persons.

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE RECENT LITERATURE OF MENTAL TYPES

BY WARNER BROWN
University of California

Phenomenal calculators have generally been regarded as members of a special mental class, but the analysis by Lahy (11) of the gifts and attainments of Mlle. Uranie Diamandi, sister to the Diamandi studied by Binet, leads to the conclusion that while the attainments of this calculator are considerable her natural gifts are not remarkable. Even in immediate memory for digits her ability is not abnormal. Her success is attributable to practice and to family influences together with an exalted faith in her own ability. The analysis of some of the working methods of phenomenal calculators by Ameline (1) shows that they are essentially primitive and involve no extraordinary processes. So far as extraordinary memory for numbers is concerned the work of Müller (12, 13) with Rückle likewise makes it seem probable that there is no typical difference between these rare performers and ordinary persons.

According to the objective psychology of Bechterew (2) the "mental class" of criminals is also a fiction.

The study by Seashore (16) of the mental make-up of the singer is typical of what seems to be a strong tendency away from the theory of mental types, with the attempt to define mental classes, and toward a more purely descriptive study of individuals through comparisons with established norms. On the other hand the doctrine of special types flourishes in the hands of certain popular writers whose work would not need mention here except for the wide publicity which it has received and the warm reception with

which it has met. According to these writers (3, 5) mental types may be judged and individuals given a mental classification on the basis of the appearance of their handwriting or the color of the hair and the "convexity" of the face.

Writers who are themselves of another (but sometimes not more psychological) mental type also make a serious business of the establishment of mental classes. For example Müller-Freienfels (14) proposes three categories each consisting of a pair of opposite types as a basis of classification which will hold alike for artists and thinkers. These categories are: *Speziellseher-Typenseher*, *Statiker-Dynamiker*, *subjective-objective*. In the mind of Kurella (10) the gifts of the artist and thinker are to be clearly distinguished from those of technical workers and men of affairs, and his whole discussion of mental heredity is based upon this distinction. Jung (9) traces a common thread running through several attempts at a dual classification of types—the *tender minded* and *tough minded* of James, Ostwald's *classicists* and *romanticists*, Worringer's distinction between *Einfühlungsdrang* and *Abstraktionsdrang*, the distinction by Schiller of *naïf* and *sentimental* and Nietzsche's *Appolonian* and *Dionysian*. The basis of all these distinctions is found by Jung in the tendency of some minds to direct their interests inward upon themselves (*intraversion*), while others turn outward (*extraversion*). It will be our future task to evolve a psychology which shall not be partial, as Freud's or Adler's is, to one or the other of these types.

Myers and Valentine (15, 18), in the course of an elaborate analysis of the attitudes which different individuals assume in æsthetic appreciation, note four distinct types: *Intrasubjective*, depending upon the feelings, feelings of self activity, etc. *Objective*, involving a comparison with the ideal, analysis of the objective characteristics of the color, tones, etc. Ascription of *character*, personifying, etc. *Associations* of various types. It is recognized that pure cases of any of these types are rare, but in the reviewer's opinion these types have at any rate the advantage of being based on experimental work, while much of the writing in this field is distressingly theoretical. The paper by Werner (20) can be held responsible for the last remark.

Thorndike (17) in the Cattell Festschrift discusses the present status of the study of gifted individuals of the scientific type.

A summary of investigations (with a bibliography of 29 titles) of the typical peculiarities of children in learning, memory, atten-

tion, ideation, suggestion and reasoning, is given by Howard (7). Jones (8) shows by a series of tests that there are enormous differences in ability between children in the same classes in school.

Married people are distinguishable as a class from unmarried people, particularly by their greater activity and their superiority in all intellectual endowments, according to Heymans and Wiersma (6). They use the results obtained on this point from their well-known questionary and argue from them for the effectiveness of natural selection in the mating of human beings at the present time.

The Heymans-Wiersma questions, together with the topics or questions proposed by Hoch-Amsden, Cattell, and Davenport, have been made the basis by Wells (19) of a set of questions along the lines of the unpublished Hoch-Amsden "Guide" so as to give what is by far the best available scheme for obtaining classified information through questions concerning an individual. It is held that "personality denotes an *ensemble* of characters." This set of questions will prove of great service to those who wish to discover what the actual characters are which enter into such an *ensemble* in any particular instance. A very similar aim is responsible for the proposal by Fuchs (4) that the characteristics of an individual be noted under the strain of reaction to concrete situations such as an earthquake or an insult. He would classify the reactions under four heads: Reflex or instinctive (including memory), apperceptive processes (thought, judgment, etc.), affective states, somato-physiological processes; and also from their social, non-social, or anti-social aspect.

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RIGHT AND LEFT HANDEDNESS

BY STEVENSON SMITH
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Experimental work in this subject during the last two years has not been very extensive. Stevens and Ducasse (8) investigated for various positions in the field of vision the distances between the fixation point and a movable point in indirect vision, that were estimated equal to a standard distance from the fixation point, in the opposite radius. They found that, with a few exceptions, these distances are overestimated in the right half of the field of vision both by the right and left eyes. They conclude that objects in the right half of the field of vision, by thus appearing larger, "attract the visual attention, which in turn leads to grasping movements of the right hand. The hand thus favored by earliest experience acquires a special skill which causes it to be used in all manual acts requiring the greatest precision."

A patient, aged 42, always right-handed, who developed simultaneously *left* hemiplegia and complete motor aphasia is reported by Mendel (4). The lesion was an embolism in the fossa Sylvii of the right hemisphere. The patient was under observation for six

months, during which time a complete neurological examination was made and the history secured. Death ensuing, the autopsy was made and seems decisive.

Several similar cases are cited from literature, but the evidence of the lesion's being confined to the right side of the brain in right-handed aphasics is not always as good as that in the new case reported here.

Ramaley (7) reports a study of the inheritance of left-handedness, comparing his result with the Mendelian expectation. Only two generations are recorded, consisting of 610 parents and 1,130 children. When both parents are right-handed of families containing some left-handed children the proportion of left-handedness among the children is 45.67 per cent. The discrepancy between this and the Mendelian expectation (25 per cent.) is explained by supposing that many of the parents reported as right-handed are really left-handed. When both parents are left-handed (2 families, 7 children) one right-handed child and six left-handed children result. In order to make plausable the explanation that the left-handedness of one of these parents may have been acquired, the author suggests that "possibly some heterozygous (simplex) persons may easily learn to use the left hand."

The abstract of Meyer's paper (5), which was read before the American Psychological Association, asserts the primary left-handedness of infants. The following fact, to which Meyer's (6) attention was called by Professor G. V. N. Dearborn, is cited without references. The muscle fibers in the sartorius have been counted and found to be fewer in the right than in the left in the new born, and more numerous in the right than in the left in the adult.

Kipiani's paper (3) contains an extensive critical review of the previous work in the subjects of right-handedness, left-handedness and ambidexterity. The pedagogical implications are considered as well as the pathological etiology. Some original experiments in training for ambidexterity are reported and these show, especially in "mirror" writing, the development of great facility in the less favored hand. The article is of chief value as an abstract of literature. Ioteyko's (2) interest is pedagogical. She defends the greater use of the left hand by left-handed children on the ground that the same facility can never be developed in the right. Many reasons are given, however, for the training of both hands by symmetrical exercises. Brewster (1) has written an article containing no original matter but presenting many facts which might be of popular interest.

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VOLUNTARY PHENOMENA—EXPERIMENTAL

BY R. S. WOODWORTH

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Pupils of Ach have been engaged in the further working out of the experiment reported in his "Willensakt," with the particular object of obtaining quantitative objective demonstrations of the several factors which he found from his introspective observations to be important as helps or hindrances to the successful execution of a volition. Ach's method, it will be recalled, was first to form strong associations between pairs of nonsense syllables, and then to present the first members of such pairs with instructions to respond by syllables rhyming with those presented or by syllables having some other prescribed relation to the stimulus syllables. The prescribed (and intended) reaction would thus be different from that which had become strongly associated with the stimulus, and in overcoming the tendency to the habitual reaction the will would be strongly excited. In some of the present studies (4, 5) the method has been developed by the use of two-syllabled nonsense words, such as *golaf*, formed according to certain rules and specifications, in place of the syllables used by Ach. With these longer compounds a variety of operations could be prescribed, such as interchanging the two vowels, interchanging the first and last consonants, substituting for the middle consonant the consonant immediately following it in the alphabet, etc. The subject could then be trained in one form of reaction, and then shifted to another form to produce interference. Another improvement in method consists in replacing the "new syllables," which Ach employed for

purposes of control, by "neutral syllables," made thoroughly familiar by previous study in constantly varied combinations, so as to avoid any particular associations. The neutral syllables would thus not differ from the previously associated syllables in point of familiarity, but only in the absence of definite associations. (It should be remarked, however, that, under the conditions in which these neutral syllables were made familiar, they became distasteful to the subjects, and thus may well have acquired a disturbing quality quite as bad as the unfamiliarity which it was desired to avoid (Glässner, Rux). This could have been avoided by familiarizing the neutral syllables by aid of recognition experiments instead of by requiring them to be learned in combinations which were constantly changed.)

These papers are perhaps more important in point of method than in results. It is objectively demonstrated that an intended operation is impeded by contrary associations previously formed (reproductive inhibition—Glässner, Rux), and by the perseveration of contrary operations just previously exercised (perseverative inhibition—Wiedenberg). The reality of a reproductive facilitation of intended operations is similarly shown (Glässner). Ach's "law" that a specific task is easier of execution than a more generalized task receives confirmation, and "Jost's law" of the superior effect of distributed learning is shown by Wiedenberg to apply also to the perseverating tendency of an exercised form of reaction.

Rose (3), working in Störring's laboratory, reëxamines with improved technique the latter's statement that unpleasant sensations have a positive dynamogenic effect. He replaced the hand dynamometer by a finger dynamograph or spring ergograph, and measured both the force of contraction and the latency or reaction time, both in neutral conditions and under the influence of strongly unpleasant stimuli. These consisted of strong vinegar, strong salt solution, and a mixture of these two. The outcome of a large number of trials was to the effect that these stimuli increased the force of voluntary contraction in 65 per cent. of the cases, and hastened the onset of the contraction (decreased the reaction time) in 73 per cent. Störring's statement was thus shown to hold good, though with exceptions. The author also examined the effect of the familiar sensory and motor attitudes of reaction time experiments upon the force of maximal voluntary contraction, and found that stronger contractions were obtained with a motor than with a sensory attitude, the "natural" attitude giving intermediate results.

An interesting observation is that of Abramowski (1), who finds that many persons are able to inhibit the "psychogalvanic reaction" at will. The stimuli employed were sudden light or darkness, noises, touching the head or shoulders, mental multiplication, and words for free association. The inhibition was seldom complete, and varied with the character of the stimulus and with the individual. The experiments so far reported are not numerous enough, however, to do more than make clear the general fact of voluntary inhibition. The inhibition seemed to the subjects themselves to be accomplished, in some cases by attending to something other than the stimulus, and in other cases by concentrating an intellectual attention upon the stimulus; but the author rejects these interpretations, and holds that the voluntary influence is probably exerted directly upon the cœnesthesia which lies at the basis of the emotions.

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The papers of Glässner, Rux and Wiedenberg also appear in incomplete form as inaugural dissertations, and these alone have been accessible to the reviewer.

DYNAMIC PSYCHOLOGY

BY F. L. WELLS

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The reply of the foremost champion of introspectionism to Professor Watson's position appears in Professor Titchener's recent remarks before the American Philosophical Society (5). He points out that Professor Watson's views are but a rising again of what has before been crushed to earth in psychology. Behaviorism is logically "irrelevant" to psychology, since someone must still scrutinize what the behaviorist has ignored. "Science is concerned with empirical facts; and for the individual man of

science to 'insist' that certain facts of observation may be cancelled without loss to the science to whose subject-matter they belong is to incur, at the very least, the charge of a certain rashness of behavior." He questions the factual validity of Watson's generalization regarding the "fifty-odd years," and calls attention to the contributions to applied psychology from introspective sources. In regard to Watson's laryngeal and sex-organ criteria, "the 'required' peripheral changes are required—by the thoughts and emotions of an introspective psychology! . . . The confusion here is plain, and the critical point need not be further labored." The strongest point in the paper is the insistence that behaviorism shall not run with the hare of science and hunt with the hounds of technology. If it adheres to the most rigid standards laid down by Watson it will miss so much of the immediately practical that it can make no consistent claims on that score. The knowledge of the human mind that can be devoted to practical ends, which Titchener would formulate as a technology, must be drawn from both introspection and behaviorism.

The contest between these two modes of thought will probably go on, under one name or another, just so long as humanity feels the necessity of rationalizing its mental activities. But it does not give the ultimate causes of why one set of reasons appeals to the Titcheners and another set to the Watsons, which are, at least technologically, the most interesting of all.

A systematic account of recent studies in the physiological chemistry of the emotions is published by Cannon (3). He begins with a very necessary anatomical description of the autonomic nervous system. One may quote practically without change a number of sentences from his paper. Fear, rage and pain are accompanied by an increased discharge of adrenalin into the blood, and by a freeing of stored glycogen from the liver for circulation through the body as dextrose. Because the adrenalinæmia and the hyperglycæmia following painful or strong emotional experiences are reflex in character, and because reflexes as a rule are useful responses, we may reasonably inquire whether under these circumstances the increase of adrenalin and sugar in the blood is useful. The conclusion seems justified that the increase of blood-sugar attendant on the major emotions and pain, is of direct benefit to the organism in the strenuous muscular efforts involved in flight or conflict or the struggle to be free. The conclusion is warranted that adrenalin, when freely liberated in the blood, not only aids

in bringing out sugar from the liver's store of glycogen, but also has a remarkable influence in quickly restoring to fatigued muscles, which have lost their original irritability, the same readiness of response which they had when fresh. The absolutely essential organs, as well as the skeletal muscles, are, in times of excitement, when the adrenal glands discharge, abundantly supplied with blood taken from organs of less importance at critical moments. There is a considerable account of the antagonisms between the different divisions of the autonomic system. "Just as in times of war between states the arts and industries which have brought wealth and contentment must suffer serious neglect or be wholly set aside both by the attacker and the attacked, and all supplies and energies developed in the period of peace must be devoted to the coming conflict; so, likewise the functions which in quiet times support the bodily reserves are, in times of stress, instantly checked or abolished, and these reserves lavishly drawn upon to increase power in the attack and in the defense or flight."

"If various strong emotions can thus be expressed in the diffuse activities of a single division of the autonomic—the division which accelerates the heart, inhibits the movements of the stomach and intestines, contracts the blood-vessels, erects the hairs, liberates sugar, and discharges adrenalin—it would appear that the bodily conditions which have been assumed, by some psychologists, to distinguish emotions from one another must be sought for elsewhere than in the viscera. . . . For this reason I am inclined to urge that the visceral changes merely contribute to an emotional complex more or less indefinite, but still pertinent, feelings of disturbance, in organs of which we are not usually conscious. . . . Evidence from uniformity of visceral response and evidence from exclusion of the viscera are therefore harmonious in pointing towards central rather than peripheral changes as the source of differences in emotional states."

Benussi (1) reports a series of experiments in which the subject sat before a number of observers, and was given a card whose contents he must describe according to a standard procedure. The regular card was to be described correctly; but if it bore a red star in the corner, the description was to be falsified in every particular. The observers were to judge whether the description was correct or false. At the same time the breathing of the subject was recorded, and the records examined to determine if the breathing before and after the false descriptions differed in any characteristic

way from that before and after the correct descriptions. The essential relationship is the quotient of the inspiration time divided by the expiration time. Though there are individual differences, the reliability of the judgments of the observers as to the correctness or falsification of the descriptions is too small for significance. There appeared a somewhat greater tendency to take a correct for a falsified description than the reverse. The pneumograph records on the other hand show the phenomenon that the quotients *inspiration : expiration* before a correct description are greater than those after it; in the case of a falsified description they are less than those after it. That is, expiration is relatively more rapid after a falsified description. This is practically exceptionless. The capacity of the individual subjects for undetected falsification of their descriptions is also represented in their breathing curves. If, however, the observers knew that an incorrect description was being given and the subject knew that they knew it, the characteristic symptoms of falsification did not appear, but the breath curve was the same as for normal descriptions. The symptoms of falsification were not altered by voluntary effort to distort them. There appears here a possibility of determining lies in pedagogical and criminalistic fields. The observations are formulated as "*Die Atmungssymptome der Lüge.*"

"*Alles was man sagt, ist ein bischen wahr*": and it would be interesting to know if the method could be elaborated to give not only the fact of the lie, but an idea of its magnitude. An even greater possibility of usefulness would attach to it if one could thus determine, besides the lies one tells to others, also those that are told to oneself.

The almost uncanny tone of the psychoanalytic results with the association experiments is sustained in the study by Lang (4) of the comparative association types of dementia præcox cases and of their families. There were 47 subjects belonging to 11 families, in all but one of which the præcox cases were men; also two normal families of eight persons in all. The stimulus words were the regular 100-word series of Jung, whose system of classification was also followed in the quantitative treatment of the results. This was analogous to that in the study of Fürst, to which frequent reference is made. The case histories are given in detail, where the shut-in-personality plays a prominent part. Some show the precipitation of the psychosis when life demands from the patient a separation of the *Uebertragung* from its previous object, which

he is unable to make. "We are inclined to believe that a far-reaching correspondence in the (association) reaction type of two persons betokens a strong approximation of the one to the other, or what means the same thing, a strong and long-standing *Uebertragung*. It is also believed that a pronounced predicate type of association is symptomatic of inadequately sublimated libido, a finding that the reviewer's experiments would probably confirm. There are some data that seem also to confirm the idea of *Umkehrung der psychosexuellen Einstellung* put forward by Pfenninger, and previously noted in these columns. The variability of the association type is smaller in the dementia præcox families than in the normal, indicating that the latter are less susceptible than the former to the influences or the extra-familial *milieu*. The main result is that the dementia præcox case shows the closest approximation of association type to that member of the family about whom his delusions center. The dementia præcox case also has the smallest mean variation (*mittlere Abweichung*) from all other members of the family.

Bleuler has a rather condensed article on sexual resistances or negativism (**2**). The sexual instinct is especially distinguished from all others in that disproportionately great resistances are set against it,

> "Die Schwierigkeit ist immer klein
> Man muss nur nicht verhindert sein."

These resistances are shown for example in the artificial selections of totemism, and in the regulations of civilized society, which are so much opposed to the positive trend that in spite of all dangers they are continually transgressed. The quite instinctive identification of sexual intercourse and death brings it into conflict with the instinct of self-preservation. The valuation of chastity is partly an expression of this sexual negativism, which also brings about the conception of sexual intercourse as sin, that is, it can be dangerous for both individual and race. "Boundaries between the permissible and the impermissible are unknown to nature. Therefore, all enjoyment is not only something worth striving for, but also something harmful, in the moral sense a sin . . . and as it (sexuality) plays elsewhere the greatest rôle, so must it also be the most important factor in sin."

"This corresponds with observation. The sexual symbol, the snake, is at once the symbol of sin. Sexual asceticism is the most respected, and the most consequentially desired."

Man has an exceptional capacity for self-satisfaction in sexuality, and as this most directly endangers the continuity of the race, the most powerful resistances are built up against it, as is shown in the tendencies to concealment though the nature of the actions is not understood, as in the masturbation of young children. Again, pathological cases show very clearly that onanism is the sin *par excellence*. So many self-accusatory ideas are traceable to autoerotic complexes that they are unquestionably the greatest source of all pathological self-accusation.

By the mechanisms of autistic thinking, the resistances which inhibit onanism must also be spread out over the entire sexual instinct. The conclusion lies near that the essential factor in sexual resistances is the carrying over of the negative affect from onanism to sexual reactions in general.

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REACTION TIME

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Lyon and Eno's (5) interesting experiments show that if two electric or tactual stimuli of like intensity are applied at points eight inches apart—wrist and elbow—the stimulus at the wrist must be given one fortieth of a second before the stimulus at the elbow in order that the two sensations shall appear simultaneous to an observer. This would indicate a speed of the nervous impulse of ten meters per second which accords neither with the results of reaction time measurements nor with other experiments on the rate of the nervous impulse. Ten possible sources of error or explanations are discussed and dismissed with a conclusion that

since "when the two stimuli are so timed that the corresponding sensations occur simultaneously the correlative sensations *do not* occur simultaneously, it would seem to follow that in the case of sensation, at any rate, the cortical and psychic processes are not *synchronous*."

Kramers (4) gives detailed introspections for purposes of a descriptive analysis of recognition reactions to four-place numbers previously memorized. The groups of experiments consisted of simple reactions to known stimuli, simple reactions to unknown stimuli, and choice reactions to known stimuli with the thumb, to unknown with the middle finger, and to doubtful stimuli with the index finger, and the same series without reaction movements. In addition to the introspections and the time values, pneumographic and sphygmographic records were obtained in all cases.

G. R. Wells (10) studied the effect of five durations of auditory stimuli and five durations of illumination and darkness. The results "do not follow a rule analogous to Weber's law, as the results which Froeberg obtained apparently did. Nor is there any evidence of increase of reaction time with decrease of stimulus duration." In fact "the longer the duration of the stimulus the longer does the reaction time tend to be." The duration of an auditory stimulus within the limits of the durations used does not materially affect the reaction time. The reactions to visual stimuli showed no regular variations with the durations used nor with different individuals.

Salow (9), in a paper prepared by Dr. Klemm from Salow's tables and notes, reports experiments on sensory and motor reactions to visual stimuli with the right and left hands and with both hands simultaneously with pauses of 20, 15, and 10 seconds between the individual reactions. The left hand reacts more quickly than the right, especially in sensory reactions, both in reactions by one hand alone or by both hands simultaneously. The reactions by both hands are slightly longer than those by one hand. Other preliminary results on the influence of various conditions are also given.

Piéron (6) reviews in great detail the literature on the relation of stimulus intensity to reaction time and reports the results of experiments, most of which have previously appeared in the *Comptes Rendus*, with a considerable range of intensities of pressure, temperature, taste, sound and light from the threshold up. The results confirm Wundt's law that the time of reaction decreases

with the increase in intensity. The general formula expressing most nearly the curve of decrease is of the type

$$y = \frac{a}{x^{\alpha} + \frac{x\beta}{b}} + k,$$

where a represents the shortest time limit and k the difference between the shortest times and the longest times at the threshold. From this formula are derived specific formulæ for each of the senses.

Potter, Tuttle and Washburn (8) determined the average reaction times required to make judgments 'indifferent,' 'pleasant' and 'unpleasant,' 'very pleasant' and 'very unpleasant,' colored papers being the stimuli and the times measured with a stop watch. Ninety reactions were recorded for each of 55 observers. The average reaction times to judgments of extreme pleasantness and extreme unpleasantness were the same, 1.2 seconds or 1.3 seconds, to judgments of pleasantness about .3 or .4 of a second longer, and to judgments of indifference .3 or .4 of a second still longer.

Henmon and F. L. Wells (3) give evidence of marked individual differences in reaction time persisting after long continued practice. The simple reactions of one subject are after practice 20σ shorter than for the other, while his complex reactions are uniformly about 40σ longer. Individual differences are not reducible to direction of attention nor to practice as is not infrequently maintained.

Henmon (2) in the Cattell Festschrift, gives a general review of reaction time research with special reference to Professor Cattell's contributions in this field.

Piéron (7) discusses the relative values of the Hipp, d'Arsonval, and Ewald chronoscopes and suggests an improvement in the last named by using two independent circuits, one for the tuning fork and the other for the chronoscope, to reduce the strength of current required. This may best be done with a Guillet fork, or more inexpensively with a Bull fork, or even with a vibrating spring. The union of the Hipp chronoscope with the Bull apparatus would realize the ideal chronoscope.

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FATIGUE, WORK, AND INHIBITION

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The Effect of Physical and Psychological Factors on Fatigue.—Lee (**24** and **25**) points out that it is not, as so long held, the chemical properties of air, such as the presence of CO_2, or the lack of oxygen, that are important in the consideration of pure air but rather the physical properties such as heat and humidity. Humidity is classed here with heat as it too affects the true temperature of the body through its influence on the rate of perspiration. When the bodily temperature is raised there is an early oncoming of fatigue. This is caused by the addition to the normal fatigue toxins of other toxic products of abnormal metabolism. Cannon and Rice (**4**) find that adrenal secretion produces (1) an increase in blood flow, thereby lowering fatigue through (*a*) washing away fatigue products and (*b*) supplying nourishment, and (2) a facilitation of the passage of impulse from the nerve into the muscle. These effects are, however, too slight to account for the feats of strength which are performed in times of great excitement. Gruber (**11**) calls attention to the fact that increased blood pressure only increases noticeably the work done when the blood pressure is below 90 to 100 mm. of mercury. Small doses of adrenalin, he finds, cause a fall of arterial pressure, not a rise. When the fall is not below the above critical pressure of 90 to 100 mm. a betterment

in the height of contraction results; when below this zone the result is the opposite.

Effects of Fatigue on Physiological Processes.—Macdonald (27) and Glazebrook and Dye (8) are studying the heat production associated with muscular work and present a formula showing the relation between heat produced and the weight of the subject. Gruber (12) finds that fatigue increases the normal threshold stimulus—the amount depending upon the duration of work and the particular individual but not seemingly upon the amount of work done. Bose (3) working upon a plant reports a latent time of response of 0.1 sec. which is increased if the resting interval (20 to 25 min. between each excitation) is shortened. If it is shortened too much, the motile excitability is temporarily abolished. Langier and Richet (23) find professional work causes an increase in reaction time when the work period exceeds $5\frac{1}{2}$ hrs.,—the procedure was, however, not at all thorough. Amar (1) reports indications of fatigue as shown by (1) the pneumograph and (2) the pulmonary gaseous exchange.

Nature of Fatigue.—Ioteyko (20), while discussing pain and fatigue as psychical defenses to the organism, shows that Weber's law does not hold respecting them. In fact, according to her, sensations of fatigue increase geometrically while the stimulus is increased arithmetically. Fatigue has a noticeable effect upon the extent to which certain illusions of reversible perspective are seen, according to Flügel (6). From his study of these cases he decides that the fatigue is local and "highly specific in nature."

Physical Phases of Work.—A vegetarian diet seems to delay the onset of fatigue while meat diet increases the onset, according to Labbé (22), who also adds that the amount of food needed for efficient athletic work is not great. Roth (36) reports on a study of the weight of football men before and after practice, while Cook and Pembrey (5) report some results of study of "second-wind."

The Work Curve.—Maccagno (26) reports that such factors as voluntary effort, admonitions by experimenter, rest-pauses, etc., affected the amount of work done (adding) by two 10-year old girls, but they did not affect the type of curve—one having a descending and the other a flat curve. Hill, Rejall and Thorndike (18) report that they find no plateaus in two practice curves from typewriting nor any negative accelerations, and that evidently the old learning has a very great permanence even after $4\frac{1}{2}$ years. When 45 min. is divided up into $22\frac{1}{2}$, 15, 6, or 2 min. intervals and

used as drill periods in arithmetic in school the shortest interval is found to be considerably superior to the others when measured in the amount of permanent improvement. But as Kirby (21) has pointed out, this superiority may be due to the fact that the pupils have had greater opportunity to practice themselves outside of school.

Mental Fatigue.—Thorndike (39) has again emphasized the difference between the mechanical and biological theories of fatigue. In his *Educational Psychology* (40) we have an elaborate presentation of his views on mental fatigue which cannot be considered here for ack of space.

Fatigue in School.—Heck's monograph (17) has previously appeared in three installments (14, 15, and 16). The author concludes from a study of arithmetical tests upon 2,200 school children in school that if fatigue is present the amount is not enough to warrant any adaptation of school procedure to it. Martyn (29) found no consistent depreciation in various mental tests after school as compared with the early morning hours. In still another study (30) in which arithmetic tests were used the above was confirmed, but there was noted in addition some indication that fatigue caused a later appearance of the effect of *Anregung*. Saffioti (37) reports that children from 5 to 9 years of age show the first signs of fatigue after writing ten minutes and that fatigue is markedly evident in twenty minutes. He presents a description of these evidences.

Fatigue in Industry.—At the 15th International Congress on Hygiene and Demography held in Washington in 1912 a great deal of interesting material was presented as to the effect of fatigue in industry. Only a few of the papers may be referred to here because of lack of space. Goldmark's plea for a scientific study of fatigue in industry ought not to be overlooked by psychologists (9). Franz (7) finds that "fatigue is evidenced by inaccuracies in movement, as well as by the lengthening of the time of movement and by a decreased performance of mechanical work," that "with increased speed, error arises, but the error increase is much greater than that of speed"; and that "changing the rate of movement increases the proportionate errors, making them greater than those when the speed is a constant, and decreasing the speed increases the proportionate errors, although not proportionately as much as when there is an increase of speed." Reid (33) and Robertson (34) find unmistakable evidence that there is a greater infant mortality

when mothers are engaged away from home than otherwise. But when the family is wretchedly poor, poverty is a more deleterious influence than when the mother is engaged in work away from home.

Rotch (35) and McMillan (28) call attention to the ill effects from monotonous industrial work upon children in that it overdevelops certain functions (often straining them) without developing others, which would be developed in normal play, while at the same time it has a markedly benumbing mental effect. Morton (31) again calls attention to the bad effects on women from long-continued standing and from severe muscular work. The pitiful noonday lunch which the woman laborer can afford is also condemned. The psychological effects from noise especially on the inner ear are considered at some length by Blake (2). The indirect result of hard labor, White (41) claims, is shown in the marked increase of hysteria and neurasthenia. Williams (42) gives some account of the various occupational neuroses. Other factors considered by the Congress are: eyestrain, occupational diseases, caisson disease, smoke, pneumonia, heat and humidity (see Lee's articles above).

Inhibition.—Pawlow (32) reports a study of cases of the following sort. A tone of 1,000 vibrations will cause saliva to run in a dog. Upon adaptation the saliva ceases to appear. Then when a neutral stimulus (*i. e.*, having no effect on the salivary reflex itself), as an electric light flash, is given at the same time the saliva appears again. Shepard and Fogelsonger (38) find that if *a* and *b* have both been associated with *c* independently, when both *a* and *b* are shown together the reaction time in calling up *c* is very much longer than when *a* or *b* are shown separately. They feel that this type of inhibition cannot be brought under the ideas of drainage—that association cannot be explained as a mere path of lowered resistance—that association must involve other processes than those which prevent any other stimulus from using the same neurones at the same time, even when both stimuli would arouse currents which would naturally discharge over the same pathway. Having found that in a group of subjects the women were better in such tests as cancellation, color and form naming, directions, etc., while the men were better in the opposites, verb-object, agent-action, etc., tests, Haggerty and Kempf (13) conclude that the women's slowness in the second group is due to the suppression of many of the first responses that come to mind. The authors tentatively advance this greater tendency of women to be "on guard" against embarrassment as a phase of sex-differences.

Grassberger (10) presents some of the social implications of fatigue, as in daily life, art, poetry, etc. Hutchins's (19) paper is merely a review of the work of Goldmark's 'Fatigue and Efficiency' and Taylor's 'Scientific Management.'

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PSYCHOLOGICAL EFFECTS OF DRUGS

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No report on the effects of drugs was published for the year 1912, on account of the dearth of experiments which would be of interest to the psychologist. The present report includes the years 1912 and 1913.

The studies of alcohol occupy the most prominent place in the two years' work. Frankfurter (3) has studied the influence of alcohol, tea and coffee, on the speed and accuracy of work in typewriting. He failed to observe the elementary requirements of technique in drug experimentation, as all experiments were conducted upon himself as observer, and no control doses were employed. His results, however, accord with those of other workers. Alcohol (20 c.c.) decreases speed and increases the errors. The latter are said to be the result of false reactions. The chief difficulty is in the matter of visual-motor coördination. Tea (15 minutes brew of 20 gr. Ceylon) removes fatigue induced by preceding work, and also decreases the number of mistakes. Caffein (0.5 gr.) increases the amount of work done in a given time and decreases the number of errors.

Karlson (4) reviews 19 pieces of experimental work on the effects of alcohol on mental and muscular activity. He concludes that more experimentation is needed, on account of conflicting results. The review indicates to him that alcohol impairs every faculty more or less, the higher the faculty and the larger the dose, the greater is the effect. The impairment is one of quality rather than of quantity of work. The effect is cumulative and somewhat delayed. Great individual differences have been noted. Boos (1) discusses alcohol as a depressant rather than a stimulant. Although there is a brief stimulating effect upon some activities, it is so soon followed by a depression that stimulant is a misnomer. In many cases where stimulation seems to result it is really due to the depression of other related functions. Alcohol should be used therapeutically only where a narcotic is indicated and not as a stimulant.

Lillie (6) reviews the conditions and probable mechanism of anæsthetic and narcotic action. Stimulation requires variations of permeability on the irritable tissues. Anæsthetic effects seem to

be produced by modification of the semi-permeable membranes. This modification is of such a sort that the resistance of these structures to changes of permeability is increased. Loevenhart (7) points out that by using drugs which inhibit the oxygen-carrying power of the blood without interfering with the elimination of carbon dioxide, it is found that decrease of oxidation *per se* is responsible for the initial stimulation observed in asphyxia. Increased oxidation, secured by the use of certain derivatives of iodbenzoic acid, results in suspension of respiration, together with other evidences of depression of the central nervous system. Anæsthesia is a case of secondary depression resulting from decreased oxidation as opposed to depression from increased oxidation, which is probably the condition occurring in sleep.

Bush (2) investigated the effects of tobacco smoking on mental efficiency. Fifteen men were tested with a series of ten mental tests, "the method employed being similar to those used by Professor Thorndike and others." He found that tobacco smoking produces an average decrease in mental efficiency of 10.5 per cent. The greatest losses occurred in the fields of imagery, perception and association, that of the first being 22 per cent. Further, the effect was found to be due not to nicotine but to pyridine. The former was not found in the smoke of any tobacco except slight traces in cigarette smoke. The effect decreases with habituation. It is consoling to note that "the least effect was produced by the cheapest kind of tobacco."

Meier (8) investigated the effect of continued doses of bromides and chlorides upon the mental processes of epileptics. She criticizes previous tests as being too brief. Two epileptics who did not receive either drug were used as controls. Simple psychological tests, such as color naming, numeral naming, addition, learning nonsense syllables, etc., were used on account of the condition of the subjects. Six subjects were tested. Bromides caused a general decrease in efficiency and a quick onset of fatigue. There was a constant drowsiness and reduced accuracy of perception. The reaction time was decreased but the quality of the reactions was poorer. The effect on the memory varied; perseveration was common and a kind of aphasia appeared in some cases. Power of attention was considerably reduced.

Knauer and Maloney (5) describe the mental effects of the drug mescalin. Experiments were arranged for the purpose of getting some direct insight into the hallucinations of the insane. The drug

was administered to a number of physicians, who gave detailed introspective accounts of their experiences. The reports show that immediately preceding experiences have some influence on the nature of the hallucinations. Visual after-images, however, may be experienced independently of the visual hallucinations. The attention is narrowed but not to such an extent as in the hypnotic state. Sexual experiences were found to be a very unimportant factor in the content of the hallucinations. A full account of the experimental results is promised at a later date.

Poffenberger (9, 10) studied the effects of medicinal doses (1/20 to 1/30 gr.) of strychnine on two observers for a period of thirty days and on seven observers for a period of two days. The main purpose was to compare the effects of strychnine and caffein. For this reason, the tests and the technique followed closely the plan of Hollingworth's work on caffein. A multiplication test was added. The recognized sources of error in drug tests were carefully taken into account. No consistent physical symptoms were noted. The curves of work show neither an increase of efficiency nor a subsequent period of depression, although relapse after stimulation is usually given as one of the common characteristics of strychnine action. Poffenberger inclines to the view that, since strychnine acts predominantly on the lower centers of the nervous system, the mental processes should not be expected to show change. The only effect on muscular work would be a delay of the onset of fatigue. If this be finally shown to be the case, the action of strychnine must be considered markedly different from that of caffein.

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FIVE YEARS OF PROGRESS IN COMPARATIVE MUSICAL SCIENCE[1]

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The young science of exotic music is advancing at an accelerated pace. Nearly twenty-five years have elapsed since Benjamin Ives Gilman published the first phonographic study of primitive music; but within the last five years of this period, since the preparation in 1909 of Dr. Gilman's review and summary of the results achieved through the use of the phonographic method, the number of available contributions has doubled.

The leader in this forward movement is the talented director of the phonographic archives of the Psychological Institute of the University of Berlin, Erich M. von Hornbostel. To his scholarship and his industry during the past five years we are indebted for two clear and careful methodological studies in coöperation with Abraham (**37, 44**), and for incisive formulations of problems and results (**49, 65, 73, 77**), as well as for the actual transcription and analysis of melodies from many lands. His researches extend in geographical range over eastern and central Africa (**45, 51, 76, 79**), Madagascar and Indonesia (**40**), Bismarck Archipeligo and the Salomon Islands (**50, 68**), Western Mexico (**70**) and Central Asia (**57**). The types of musical performance here exhibited range widely also over the different paths of musical evolution. To discover among such varied areas and types a few fundamental principles of musical experience, and at the same time to give a systematic account of the manner in which these principles have operated to engender among the races of men wide diversities of musical achievement, is a task which calls for penetrating insight as well as for patient accumulation of data.

In the task of transcribing, studying, and making available some of the phonographic data now to be found on the 6,000 cylinders of

[1] Read before the section for Ethnology at the Congress of the International Musical Society, Paris, June, 1914.

the Berlin archives, von Hornbostel has had among his collaborators Fischer and Wertheimer. Fischer has published an analysis of Patagonian phonograms (35), and a much more extensive study of Chinese records, vocal and instrumental (63). Wertheimer (46) has made a study of four phonograms from the Veddas of Ceylon, a short but extremely interesting contribution because it reveals in the music of these aborigines a type of song in some respects more primitive than anything previously known. Myers, of Cambridge University, has published a somewhat larger collection of Vedda songs (61), and also valuable researches on the songs of the Malu tribe of Papuans who are found in Murray Island, Torres Straits (66), and on the music of the natives of Sarawak, in Borneo (75). Myers's comparison and contrast of the music of these three peoples furnishes one of the best descriptions yet given of the early stages of the evolution of song (74). From the Vienna phonographic archives, Felber has issued a volume on the cermonial recitations and songs whose intonation has come down through some three thousand years of Hindu practice from the period of the Vedas (67).

One of the finest studies issued during the recent period we are considering was made in Copenhagen by Thuren on phonograms gathered by Thalbitzer among the Eskimo of East Greenland (56, 59). All of the notes were patiently determined tonometrically. Every printed melody is preceded by a scale which exhibits exactly the intervals used, and which, by means of the conventional symbols prescribed by Abraham and von Hornbostel (44), tells at a glance many details about the characteristics of the song. In this respect Thuren follows von Hornbostel's suggestions even more closely than von Hornbostel himself has been doing.

This raises a very practical problem of method. To measure the pitch of every note is an inordinately slow and laborious task. Is it worth while? When one considers the wide range of inaccuracy of any singer, be he Cherokee medicine man or trained European vocalist, one wonders what value there can possibly be in measuring primitive performances with a fine scale, and in such great detail.

It is, I am willing to concede, a waste of time to measure with our present laborious tonometrical methods every note of every melody. But I want to seize this opportunity to urge the adoption of another ideal, that of publishing in full with every phonographic research a set of representative measurements. These measurements should be made in such a manner that they will exhibit the

range and the nature of *variability* of performance, as well as the typical performance. For example, Fischer (35, p. 942) gives us a table of measurements of two notes as they were sung by a Patagonian in nine different measures of a song. Each note has a variability exceeding a half tone. Wertheimer (46, p. 301) gives a sample set of measurements to show the maximal *accuracy* of Vedda intonation, but none to show the maximal *inaccuracy*. Here as elsewhere in the field of mental measurement it is important to know (1) the average, or central tendency, (2) the average of the deviations from this central tendency, and (3) the extremes of variability. Such information as this can be made available for purposes of comparative study if each investigator will publish, not necessarily all the measurements of all the notes used in all the songs, but all the measurements of the notes in a few selected songs. Particularly desirable are tabular comparisons of the intonations of the same motif when it is repeated several times in the course of a song, or in the same melody sung on different occasions by the same singer, and also by different singers. Such comparisons help in sifting out what is felt to be essential and what adventitious. Moreover, the index of variability may prove to be a valuable measure of one phase of racial musical development.

Let me hasten to add that the value of these data for comparative purposes will be greatly enhanced when we know more than we do now—which is surprisingly little—regarding the customary inaccuracy of intonation among trained and untrained singers of European music.[1]

The late Frederick J. Burton devoted many patient years to the study of the songs of the Ojibway Indians; but we hesitate to include his volume entitled *American Primitive Music* (43) in our list of contributions to comparative musical science, because the standpoint from which he made his observations was frankly and explicitly not the scientific standpoint, but rather that of the musical composer in search of material. He used the phonographic method, but not to assist him in faithfully transcribing the sounds the Indians actually sang. He thought instead always to report what the singer meant to sing. In this application of what we may characterize as the interpretative or artistic method, as contrasted

[1] An important paper of W. C. Miles, "Accuracy of the Voice in Simple Pitch Singing," has appeared since this paragraph was written. Miles's research shows how valuable Seashore's tonoscope is, as a means of attacking these problems. His own contributions are mainly in the direction of standardizing tests and establishing norms. See *Psychol. Monog.*, 1914, 16, No. 69, 13–66.

with the scientific, Burton brought to his task the invalidating presupposition that the Indians really intended to sing intervals and sequences that conform to the musical ideals of our own European diatonic and harmonic standards. However useful his phonographic transcriptions may be as sources of thematic material for unresourceful composers, they certainly cannot be used by the scientific student of primitive music.

More objective, and hence more useful as scientific data, are the extensive records of songs of this same tribe, gathered, transscribed and analyzed in the two volumes by Densmore (52, 71). Sapir has transcribed for the University of Pennsylvania Museum and made available for study a selection of Creek and Yuchi songs gathered by Speck (60).

The problem of origins is a fascinating theme, as treated by Stumpf in his little volume on the Beginnings of Music (64). After pointing out essential inadequacies in the theories of Darwin, Spencer and Bücher, the author seizes the opportunity to present a convincing case for his theory that music had its first beginnings in the signal-call. What is the first differentia of speech and song? The voice in song assumes successively different levels of determinate pitch, while in speech the pitch is more indeterminate and continuously shifting. But when one calls loudly to a distant comrade, the voice tends to maintain one pitch, or to utilize in succession two or three distinct pitches. What is the primary desideratum in the way of musical capacity, without which no considerable development is possible? The ability to distinguish and utilize *consonant* intervals. The consonances of the octave, fifth, fourth and so on, were first forced into attention when groups of men and women became accustomed to unite their voices in prolonged signal calls. Such is the kernel of the theory which Stumpf develops with skill, and buttresses with analogies discovered between certain very primitive songs and the calls of the Alpine yodlers. Then from these hypothetical beginnings in the midst of an impenetrable antiquity, he traces the course of musical development along the more easily discernable paths of later evolution. One chapter is devoted to primitive musical instruments and their influence, and another to primitive polyphony, rhythm, and speech song.

In the second half of his volume, Stumpf conducts the reader on a rapid circular tour through the whole realm of comparative musical science. He exhibits typical selections from the songs

that many hands have gleaned, points out the characteristic features of each, and indicates their significance for our conception of the development of music. A large fraction of the researches mentioned in the appended list have been levied upon for illustrative material, and in addition, several phonographic transcriptions made in the Berlin Institute are here published for the first time. Anyone wishing to digest the literature of comparative musical science may well take this volume as a first course after the *hors d'œuvre* of Gilman's review in *Science* (41), to be followed in turn by the solid research of Ellis "On the Musical Scales of Various Nations" (3), which ever since its epoch-making appearance in 1885, has supplied substantial pabulum for students with an appetite for exactness in musical investigation.

Gilman in this summary enumerated seven characteristics clearly revealed in exotic music: (1) Rhythmic complication; (2) Anharmonic structure; (3) Heterophony; (4) The isotonic scale; (5) The melody type; (6) Neo-tonality; (7) Pure song.

In the light of the newer and fuller information now available, what further can be said regarding these divergencies from European norms?

(1) Complexities of rhythm beyond the capacity of ordinary European musicians to duplicate or indeed to hear appreciatively, continue to come to notice. But in addition to these skillful products, are found many instances in which the rhythmical complexities are traceable not to a highly developed sense of rhythm but to a lack of it.

(2) The statement still holds that "as far as is known, true harmony does not exist outside of European music. . . . No peoples but the European have ever based an art of tone upon the disturbance and readjustment of consonant combinations of notes." But one of the gratifying achievements of recent researches, particularly those of von Hornbostel, has been the disclosure of various beginnings out of which harmony has grown.

There may be mentioned first of all the antiphonal singing of some of the Bantū cannibals of East Africa, in which the solo voice is found at the close of the stanza to overlap for a time the melody begun by the answering voices of the chorus. (A most unusual variant on this overlapping comes to light in the songs of the Ruanda, in which a systematic telescoping of the rhythmical figure results from the premature entrance of the antiphonal melody.) Secondly are found abundant instances of bordun, of vocal organ-

point, with the sustained tone sometimes above instead of below the melody; and not rare examples of ostinato, in which two or more of these sustained tones regularly alternate. Next should be cited the cases of organum, of singing a melody in parallel fifths or fourths, and much more rarely, in parallel thirds, sixths or even seconds. (The achievements of the Salomon Islanders in this respect are not without duplicate in contemporary Europe. The peasants of Dalmatia delight to sing in parallel seconds.) Yet another root of harmony is discovered in the widespread practice of heterophony, the simultaneous rendering of the same melody by different voices or instruments each in its own manner, with its own embellishments and variants. And finally, exotic music reveals traces of polyphony in the narrow sense, the simultaneous performance of different melodies which only now and then come into unison or consonance.

(3) Heterophony has been found in very simple and primitive music. It is by no means confined to the highly complex and elaborate orchestral performances of such oriental peoples as the Chinese.

(4) The isotonic scale. The prevalence in Java and Siam has long been recognized of music which uses not at all the diatonic, consonant intervals, but whose scale is constructed on the principle of tonal distance, by dividing the octave into equal steps. These forms of pentatonic and heptatonic scales are exotic but not primitive. Indeed they represent a very high degree of sophisticated development. The studies of primitive music, however, have also revealed the working of this principle of tone-distance sometimes side by side with the principle of consonance. In the songs of the Veddas, tone-distance is the only determiner of the size of the small melodic steps they use. In Sarawak, where a few of the larger consonant intervals are employed, the smaller intervals are apparently formed through dividing these larger intervals into equal parts. The tuning of the pan-pipes brought by Koch-Grünberg from Northwest Brazil apparently rests upon a similar combination of guiding principles. Tone-distance, so little in evidence in our own musical consciousness, seems to be widespread where the principle of consonance is not completely entrenched.

(5) Nothing new has been brought to light regarding the little understood Hindu raga or melody type.

(6) Neo-tonality. Fresh instances have been accumulated where (*a*) the first and highest tone in the melody is the keynote

and the final tone; (*b*) where the lowest pitch to which the melody gravitates functions as end tone, and (*c*) where the chief tone apparently coincides with neither the first nor the last tone of the melody. A fresh lesson in caution in this connection comes from von Hornbostel's observation that songs of the Kirghiz hordes of Central Asia, although they are made up of diatonic intervals, cannot be classed as either major or minor; for in different repetitions of the same melody, they interchange the crucial major and minor thirds indifferently.

(7) Of pure song, that is, of melodies unfettered by the restrictions of scale, the Eskimo melodies of Thuren may be cited as new instances; and indeed, from one point of view, most of the material gathered from tribes that have no musical instruments will be seen to be of this sort. The primitive musician does not have in mind a limited group of pitches within which all of his melodies must take their course. The interval is not the mental unit with which he works. His unit is the motif. As a song advances, a given motif may be transferred to new levels of pitch, but it retains its form, its integrity, its unity. This transposability of the motif is one of the more significant facts which the recent researches have brought into prominence; for it has varied bearings, not merely on these music-theoretic points regarding the priority of song over scale, but also on psychological problems regarding the nature of form, of *Gestaltsqualität*.

The psychologist will be interested in the growing knowledge of primitive music, chiefly because of the accumulating light it throws on certain mooted questions in audition, for example, the nature of consonance. Two tones whose vibration ratios are relatively simple are consonant. Is this characteristic, which makes them blend or fuse in consciousness, due simply to the presence or absence of such secondary phenomena as beats, which arise only when two musical sounds whose vibration ratios are not simple, are produced simultaneously? Or are the characteristics which make clangs consonant or dissonant, primary characters which can be perceived in successive tones of a melody under circumstances which preclude the possibility of beats and other secondary criteria?

I doubt if anyone who is familiar with the literature of primitive music will care to maintain the former alternative. The use of the octave, the fifth and the fourth is too well-nigh universal, even among most primitive peoples who have no musical instruments, and whose songs are purely melodic. Sabine (38), indeed, at-

tempted in 1908 a rehabilitation of the original Helmholtz theory that dissonance is due to the presence of beats and consonance to their absence. Sabine's main contention, however, is not for the beat-theory of consonance, but for a theory of the physical environmental conditions under which the phenomena of consonance led to the evolution of our musical scale. His researches within the field in which he has achieved eminence—the acoustic properties of halls and of building materials—forced strongly upon his attention the fact that when a melody is sung within the walls of an edifice the successive sounds overlap for a brief period, the length of which varies with the dimensions of the room and with the sound-absorbing properties of the materials of which the walls are made. Hence his hypothesis of the origin of a musical scale whose melodic intervals have simple vibration ratios: the perception of consonant or dissonant relationships between successive notes of a song became increasingly possible as songs were sung in buildings, large dwellings, halls and temples.

Sabine has done a service in calling attention to the share which this environmental factor may have had in facilitating the progress of musical evolution in Europe. But to view it not as a minor accessory factor but as the primary factor, one must turn his eyes away from the accumulated evidence of musical ethnography. Practically the only definite ethnographic statement Sabine makes is the following: "Almost no traveller has reported a musical scale, even of the most primitive sort, among any of the previously unvisited tribes of Africa" (p. 847), a statement peculiarly inapt, inasmuch as it is among the savage tribes of German East Africa and the Congo that there have been found the most obvious instances anywhere discovered as yet, of the early stages of the development of harmony. If there is one point in which the native Africans are not inferior to primitive peoples of other lands, it is precisely in this matter of a consciousness of relationships of consonance and dissonance, and the appreciation of their use in polyphonic singing.[1]

[1] Sabine chose also to ignore the acoustical researches of Stumpf and other psychologists, which some students of audition supposed had long ago made Helmholtz's beat-theory of consonance untenable. As samples of the considerations Stumpf has advanced, let me here cite but two. If two dissonant tones of light intensity are conducted, one to the left ear and the other to the right ear, in such a manner that it is impossible for them to produce beats, the resulting clang does not lose its dissonant character. Moreover, if two musical sounds which form a consonant clang are made rough through the production of imitation beats, the beating clang does not become

Our attention throughout this survey of recent contributions to comparative musical science has gone mainly to those aspects which are of interest to the psychologist, to the acoustician and to the student of musical theory. This accumulating literature is of even greater interest to the ethnologist; for it will eventually give him an acquaintance with primitive culture as it expresses itself in song, comparable in adequacy with his present excellent knowledge of primitive graphic and plastic art.

In the matter of tracing cultural contacts and ethnic relationships by means of musical criteria, little has been done as yet; but what has been attempted, strikingly claims attention. I refer particularly to the evidences of contact which von Hornbostel (62) has found between regions as remote as the Salomon Islands and northwestern Brazil; and again, between Burma and Africa. At least one reviewer (72) of this ethnographic research has been impressed, not merely by the evidence itself, but by the penetrating analysis of general principles which guided von Hornbostel in the formulation of criteria for evaluating evidences of cultural contact.

Ethnologist, psychologist, *Musik-theoretiker*, each may share in the ripening harvest of comparative musical science. Others, too, may profit if they glean this field. No unsuperficial survey of the music of other lands and races can fail to increase one's catholicity of judgment, and to shatter one's provincial conviction that the only true God-given music must be cast in our own diatonic modern-European mould. No serious pondering of the rich accumulations of exotic music can fail to give a truer and more vivid insight into the little understood music of our own spiritual ancestors, particularly the mediæval musicians and the Greeks.

dissonant, but retains its consonant character. Beats are not essential to dissonance, nor the absence of beats to consonance; and the amount of the roughness produced by the beats of the partials of a dissonant clang is by no means always proportional to the degree of dissonance of the clang.

A Selected Bibliography of Comparative Musical Science to 1914

In the choice of titles, it has been the aim to give a complete list of first-hand studies of exotic music made with the aid of the phonograph; to include a selection from among the more reliable of the collections of materials made without the aid of phonographic control; to add related researches on pitch measurements of primitive musical instruments; and finally to mention the articles in which from time to time the results of these various investigations have been gathered together, their theoretical problems attacked, or their significance indicated for students of musical science, ethnology and psychology. No mention has been made of the phonographic studies of folk-music, a closely related field of rich promise.

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SPECIAL REVIEWS

Il Methodo degli Equivalenti. Contributo allo studio dei processi di confronto. A. GEMELLI. Florence, 1914. Pp. 344.

This book is undoubtedly one of the most important experimental researches in the psychophysics of touch which has appeared for some time. Dr. Gemelli has measured the equivalence-ratio for several parts of the body in pairs, under varying conditions which are faithfully reported. The equivalence-ratio is the ratio between two distances defined by the points of æsthesiometers which when applied to two parts of the body appear to be equal. Further Dr. Gemelli has based on the introspections of himself and of his subjects a careful analysis of the mental processes involved in making the comparison between two such distances. In respect of this experimental work and this analysis the book is an excellent addition to the literature of the subject, and one which should be added to every psychological library. It is to be regretted however that Dr. Gemelli has not confined himself to a clear statement of the results of his work in these respects, instead of indulging in philosophical discussions on the possibility of mental measurement, the nature of the so-called method of equivalence, and the like, which obscure the real value of his work.

The style of the book calls for some remark. The lucidity of the Italian is most refreshing in contrast to the numerous quotations in ponderous German. But the pleasure of reading is marred by the extraordinary and reprehensible frequency of misprints. It is not right that a work with the *cachet* of the laboratories of Bonn and Turin should have been allowed to appear in this condition. Nor are the mistakes all mere sources of amusement; some are such as possibly to lead to error. The description of Tables 7 to 26 which is given on page 84 is in two points inconsistent with the tables inasmuch as (1) the last column of those tables is incorrectly stated to contain mean values of equivalence-ratios and the mean variation thereof and (2) the final mean variation given at the foot of each table is in the description said to refer to the variable distances whereas in the tables themselves it apparently refers to the final value of the ratio, and this view is confirmed by Table 28. In Table 7 the final value 1.82 for the

ratio is surely a miscalculation or a misprint, and reappears in Table 28. The diagram in page 79 seems to contain some error. It succeeds in obscuring a perfectly simple process, for in the diagram as described on page 80 neither series is descending. These are only some of the errors easily found by a casual reader.

The method of experimenting followed by Dr. Gemelli is that known as the form G 1 of the Method of Equivalence. Consider the two parts of the body to be compared. A constant distance N was applied to one of them, and a variable distance V to the other. Later N was applied to the second and V to the first. The distances were not applied simultaneously but consecutively, separated by a pause. In some series N preceded V, in others it followed. Clearly the order of succession of the variable stimuli V might have been either irregular or consecutively ascending or descending. For reasons which do not appear to us convincing the latter form was chosen. In the first place this procedure makes the influence of suggestion and anticipation very difficult to ignore. Experiments performed with irregularly varying stimuli are much more reliable. Of course for Dr. Gemelli's purpose, the introspective analysis of the mental processes involved, one plan is as interesting as the other.

In the second place the way in which these ascents and descents were handled implies a mathematical process of calculation to which the present reviewer has elsewhere applied the same Limiting Process, and it is not the least of the services which Professor Urban has rendered to psychophysics that he has fully shown the mathematical connection between this process and others. Dr. Gemelli however does not seem to recognize the limitations of this plan, or at any rate he does not refer in any way to them in his book. Indeed his Chapter 4, on the mathematical treatment of the results, is most unsatisfactory, in particular with regard to what is said about the Gauss-integral. Possibly the author was well advised not to use this integral. But it is not true as he asserts that its use would have been wrong. The argument on which Dr. Gemelli incorrectly bases his rejection of the Gauss-integral simply asserts that if we know that a certain stimulus produces the same proportion of answers *two* on two regions, we still cannot say that the sensitiveness of these regions is the same, by which Dr. Gemelli here apparently means that they have the same threshold. But it is difficult to know how we can come to have this piece of knowledge without knowing something about other stimuli on each region, and then we can calculate L_1 and L_2, S_1 and S_2.

There are two ways in which we can imagine a Gauss-integral being used in these researches. (1) The S and L of each region might be given as a short way of defining the proportion of answers *two* to be expected at each stimulus. The ratio of two distances which gave the same proportion would of course not be the same throughout the scale unless L was inversely proportional to S. A knowledge of these ratios would be most interesting for comparison with the equivalence-ratios as defined by Dr. Gemelli which are something quite different. (2) The Gauss-integral might have been used in finding the points of subjective equality to each standard. In neither case is Dr. Gemelli's argument significant. There is no *a priori* objection whatever to any psychometrical function, and experience shows that the Gauss-integral is so far the best tried. The plan of calculation which the author finally adopts is commendably simple, and probably serves his purpose quite well. It would have been much improved by the use of the standard deviation instead of the mean variation. Our present criticism is directed not against the plan adopted but against the often incorrect discussion of the possible plans which were not adopted.

The chief experimental fact proved by this research is the dependence of the equivalence-ratio on the absolute value of the stimuli which are judged equal. The equivalence-ratio is greatest for small stimuli near the threshold of the less sensitive of two organs compared, decreases with the increasing stimulus to a minimum, and then increases again to the largest stimuli which could be employed. An exactly similar curve is obtained in the research on lifted weights which is briefly described in an appendix. The result differs from that of Camerer in giving larger values for the ratios, and from those of Camerer, Washburn and others in discovering the minimum which these experimenters did not reach. If this minimum is confirmed it is to be hoped that Gemelli's name will be given to the law.

It is here that the lack of statistical precision in giving the results is most felt. Not that there is much doubt of the significance of the result, for the unanimous agreement in this point of table after table shows that it is not likely to be due to chance sampling. But it is in searching for a reason for this equivalence law of Gemelli that one feels the need of more accurate statistical information.

For the far reaching effect which this research will have on the question of mental measurement, if it be confirmed by other experi-

menters, must be noted. We do not consider that Dr. Gemelli makes this at all clear. Take as a concrete example the comparison between the arm and chest of subject 1. The spatial threshold of this subject for the arm is 4.05 cm., for the chest 4.65 cm. Yet we can conclude from Dr. Gemelli's other numbers that a distance so about 3.8 cm. on the arm, which is usually felt as one point, if judged to be longer than about 5 cm. on the chest, which is usually felt as two points. If this be really so it is very interesting and important and would make mental measurement by threshold units a thesis very difficult to support. It would show that the psychological conditions of a threshold experiment (in which a sensation is compared with a memory of *twoness*) are so different from the conditions of a comparison or equivalence experiment (in which a sensation is compared as to its length-significance with the corresponding quality of a recent other sensation) that no consistent relationship exists between the results obtained in the two experiments.

In all this it must be kept in mind that we are discussing averages, average thresholds and average points of subjective equality. The average threshold is the point where the probability of an answer *two* is 0.5. What we should have liked to know and what Dr. Gemelli does not give is the probability of an answer *two* at each of the distances used (see page 436 of this review). Then quantitative accuracy could have been given to such statements as that made above that certain distances had *not usually* the quality *twoness*. This information would have enabled us to surmise to what extent the probability of *twoness* in a distance changes as it is considered in isolation or in comparison, and also would have permitted an accurate discussion of the error which seems to us to be inherent in the G 1 form chosen by the author.

This G 1 method was permissible for Fechner, who did not know that the equivalence-ratio varied with the distances used, but is not for Dr. Gemelli: for what it does is to measure in two different parts of the scale and then compound these two measures of different things into one ratio.

Of course even the G 2 method, although an immense improvement, does not entirely remove the difficulty. But the difference would not be great and probably further refinements are inadvisable.

One more point deserves mention before we leave the statistical side of the research. The results given by the plan of using ascents and descents have been conclusively shown by Professor Urban

to depend for mathematical reasons on the size of the steps used. Now in this research half centimeters were always used. That is, the steps bore a changing proportion to the standard, were comparatively small for large standards and vice versa.

We turn next to some of the side issues of the book, which are so numerous that we must select only a few for mention. The eighth chapter of the second part, on the influence of attention on the equivalence-ratio, is interesting. The author refers to two previous researches, by Binet[1] and Michotte[2] respectively, which contradict one another, inasmuch as Binet concludes there is no evidence of any modification in the threshold due to the influence of attention, while Michotte on the other hand found that in a state of unattention the threshold became about one sixth larger.

Gemelli makes a careful analysis of the meaning of the ambiguous word inattention, and distinguishes between inattention which is intense attention to something else, and that which consists in a distribution of diluted attention over a wide field containing many objects one of which is the object under discussion. The regions employed were the forehead and forearm, and he found that the equivalence-ratio was decidedly increased by thus diffusing the attention. The author is concerned throughout only with the actual value of the equivalence-ratio, not with the respective accuracy with which it can be measured in the different states of attention, although as far as can be gathered from the unsatisfactory measures of scatter which he gives there does not appear to have been much difference in this respect. The present reviewer's own experience in this matter has been that the threshold becomes more variable when great attention is given, rather than that any change in its absolute value occurs.[3]

The remaining experiments in the chapter are concerned with the equivalence-ratios between certain regions of the hand. The results are consistent with the former. The issue is here however confused by the references to Michotte's theory of "les signes regionaux" which is not very relevant to the present question; and which is stated in a somewhat incoherent fashion by Dr. Gemelli, who says on page 181: "tutti i punti situati all' interno di una regione hanno un medesimo segno," which does not seem to be the same as what appears to the present reviewer to be a more accurate

[1] Recherches sur la sensibilité tactile, *Année psychol.*, 1900.

[2] *Les signes regionaux*, Louvain, 1905, p. 64.

[3] See *British J. of Psychol.*, 1912, 5, pp. 238 and 241.

statement on page 189, that in any one region "la soglia spaziale e espressa dalla medesima cifra."

Apart from the consistency of the experimental results illustrating Gemelli's law, the other chief point of interest in this research is the combination of experimental and introspective methods. To this introspective analysis, carried out in the spirit of the school of Külpe, is devoted the third part of the book. The process of comparison is divided into six stages, namely, (1) preparation, (2) appreciation of the first stimulus, (3) pause, (4) appreciation of the second stimulus, (5) formation of the judgment, (6) expression of the judgment. To each of these a chapter is devoted, and of especial interest is the discussion of what goes on during the pause, to which great importance is attached. The function of the pause is twofold; it permits the subject to reflect on the first stimulus, and to project his attention towards the second stimulus. Since he knows that the variable always changes by a half-centimeter, the subject often begins to form his judgment and occasionally even pronounces it before he has experienced the second stimulus. In certain cases the subject has a projection of the first stimulus on to the second region. This happens in various ways: one subject imagines the parts of the body brought into juxtaposition, another imagines the first æsthesiometer applied to the new region, others transport the distance itself in other guises. All this has a bearing on chapter 7 of the second part in which the influence of the visual imagination is discussed. It appears to us a mistake to separate the introspective work so completely from the rest of the book. In the case of the chapter on visual imagination referred to, some introspective evidence is certainly necessary to support the author's hypothesis that the differences in judging tactile distances on the arm for different positions of the latter are due to perspective foreshortening of the visual image formed.

Finally, the influence which Dr. Gemelli (rightly we think) attributes to the *Aufgabe* must be briefly referred to. This appears to us to be excellently illustrated by the difficulty raised in an earlier paragraph of this review: for when the direction to the subject is the detection of *twoness* in a tactile sensation the results obtained are inconsistent with those reached when the comparison (as to length) with another tactile sensation forms the *Aufgabe*.

GODFREY H. THOMSON

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Ancient Rome and Modern America: A Comparative Study of Morals and Manners. GUGLIEMO FERRERO. N. Y.: Putnams, 1914. Pp. 352.

America is taken in this book less for itself than as a symbol of the modern industrial age, the age of steam and electricity, of rapid production and consumption, when the bounds that were formerly set to human activity, enjoyment and thought are swept aside, and no limits are longer admitted, when the ideal of unlimited "progress" is the controlling force. The author, in visits to South and North America, was much puzzled by this ideal of progress, which at first seemed to him simply a struggle for unlimited wealth. Finding, however, that the increased wealth did not yield greater personal enjoyment, while still the people pursued their ideal of progress, he finally concluded that progress meant, at bottom, accomplishment, the conquering of new lands, the subjection of nature by the agencies of science and machinery. In short, the ideal of the present and coming age is quantitative, whereas the ancients, extremely limited in material resources as they were, accepted their limitations, and adopted an ideal of qualitative perfection. Only by thus accepting limits and striving for quality can a civilization rise to the dignity of high artistic production; and the cause of the low state of the arts in modern civilization is thus laid bare. The quantitative ideal has so strong and increasing a hold of Europe and America that there is no prospect of conditions favorable to art—and with art should be classed religion and all higher spiritual disciplines. No doubt, many individuals, having amassed wealth that they can not utilize in mere quantity of consumption, do and will seek for objects of qualitative perfection —as, for example, they seek to acquire famous paintings and other antiques. But this demand is not great and continuous enough, and does not pervade civilization to a sufficient degree, to call forth new art. Hence it appears probable that the ineradicable human impulses towards beauty and all forms of qualitative perfection, not meeting with satisfaction, will more and more lead to disillusionment. The future seems to hold in store, for Europe and America alike, a continued increase in wealth and mastery over nature, along with a gradual loss of the higher satisfactions of life and a consequent growth of pessimism. This then is the conclusion that is forced upon the author by contrasting ancient and modern civilizations. There are also certain parallels between the decline of the ancient civilization and the tendencies of our own

times, especially an excess of urbanization, and a decrease in the fertility of the human species.

The book makes interesting reading; whether solid or not is a question that can not be argued in brief compass.

R. S. WOODWORTH

COLUMBIA UNIVERSITY

The Instinct of Workmanship. THORSTEIN VEBLEN. N. Y.: Macmillan, 1914. Pp. 355.

This work will be of interest to those concerned with the relation of the individual to industry, culture and social institutions. The author begins with a defense of the traditional use of the term "instinct" as a convenient designation of certain large groups of specific reaction tendencies related to each other from the point of view of their teleology. The instincts, as thus described, assign the ends of life and determine the direction of rational endeavor and expedient. The parental bent, idle curiosity, and the sense of workmanship, among these proclivities, are of special importance in determining the development of technical, cultural, industrial and institutional structures. The manifold inter-relations and "contaminations" of these tendencies are presented, their characteristics and behavior described, and their useful and retarding influences elaborated. "The instinct of workmanship brought the life of mankind from the brute to the human plane, and in all later growth of culture it has never ceased to pervade the works of man." Instinctive propensities not directly related to this sense may nevertheless be seen to count materially in shaping the technological equipment of ideas and may even deflect the sense of workmanship from the pursuit of material efficiency. The latter propensity, in turn, reacts on strivings of a different sort and determines in various and often in hindering ways "the texture of the technological system." Thus the instinct of workmanship, through the sentimental propensity to attribute workmanlike qualities to material and implements, impedes the progress of the mechanic arts through the medium of anthropomorphic magic.

The major portion of the book deals with social rather than with individual themes,—the savage state of industrial arts, the technology of the predatory culture, ownership and the competitive system, the era of handicraft, machine industry, etc. But the whole discussion is intended to hinge on the leading proposition that for the individual human being "efficient use of the means at hand and

adequate management of the resources available for the purposes of life is itself an end of endeavor, and accomplishment of this kind is a source of gratification." In fact, habitual attention to technique is often seen to put the original motive in the background and the implements of labor become in themselves the end of endeavor. As is common in sociological exposition, there is throughout the book a tendency to mistake convenient historical description for adequate psychological explanation, and to confuse the conceptualized forms of behavior with its causal mechanisms.

H. L. HOLLINGWORTH

COLUMBIA UNIVERSITY

Outline of a Study of the Self. R. M. YERKES and D. W. LARUE. (Rev. ed.) Cambridge, Mass.: Harvard Univ. Press, 1914. Pp. 24.

The authors have revised the edition printed in 1913 (reviewed in the BULLETIN in January, 1914), but the changes are unimportant, consisting chiefly in the omission of a few redundancies and the addition of a few references. The *Outline* should stimulate and aid the systematic study by many a psychological reader and student of his own individual psychology.

M. W. CALKINS

WELLESLEY COLLEGE

BOOKS RECEIVED

CALKINS, M. W. *A First Book in Psychology.* (4th rev. ed.) New York: Macmillan, 1914. Pp. xxi + 428.

BINET, A. & SIMON, T. *Mentally Defective Children.* (Tr. by W. B. Drummond.) New York: Longmans, Green, 1914. Pp. xi + 180. $1.

ROBINSON, L. *Marching Men, or Facing Problems of Childhood, Pulpit, and Pew.* Boston: Sherman, French, 1914. Pp. 243. $1.25.

HOLLINGWORTH, H. L. *Outlines for Experimental Psychology.* New York: Seiler, 1914. Pp. 109. $1.

HOLLINGWORTH, H. L. *Outlines for Applied and Abnormal Psychology.* New York: Seiler, 1914. Pp. 20. 25 cents.

SHEPARD, J. F. *The Circulation and Sleep. Experimental Investigations Accompanied by an Atlas.* (63 plates.) (Univ. of Mich. Studies, Scientific Series, Vol. 1.) New York: Macmillan, 1914. Pp. ix + 83.

MÜNSTERBERG, H. *Psychology and Social Sanity.* New York: Doubleday, Page, 1914. Pp. ix + 320. $1.25.

NOTES AND NEWS

DR. E. P. FROST, of Yale University, has been appointed professor of psychology at the University of Tennessee.

DR. GARDINER C. BASSET, of the Carnegie Laboratory of Evolution at Cold Spring Harbor, has been appointed professor of educational psychology at the University of Pittsburgh.

THE daily newspapers have announced the death of August Weismann, the distinguished zoologist of Freiburg, at the age of 81.

ANNOUNCEMENT is made of the inauguration of a Post-Graduate School of Neurology in connection with the Philadelphia General Hospital. Courses will be given similar to those of the foreign neurological clinics and laboratories.

THE Southern Society for Philosophy and Psychology will hold its annual meeting in Philadelphia during convocation week.

THE twenty-third annual meeting of the American Psychological Association, under the presidency of Professor R. S. Woodworth, will be held December 29 to 31, at the University of Pennsylvania, in affiliation with the American Association for the Advancement of Science and with the Southern Society for Philosophy and Psychology. Arrangements are pending for joint sessions with sections L and H of the A. A. A. S. and with the Southern Society.

A MEETING of the New York Branch of the American Psychological Association, in conjunction with the Section of Anthropology and Psychology of the New York Academy of Sciences, will be held November 23. The following papers are announced: W. P. Smith, Some Aspects of Emotional Reactions; G. C. Myers, Motor-Emotional Expression of an Infant; H. L. Hollingworth, The Logic of Intermediate Steps; R. H. Paynter, Experiment vs. Court Decision; C. H. Bean, Demonstration of Psychological Apparatus.

PROFESSOR G. M. WHIPPLE has resigned his position as assistant professor of educational psychology in Cornell University and has accepted the appointment of associate professor of education at the University of Illinois.

THE following items have been taken from the press:

AT the George Peabody College for Teachers a building for the Jesup Psychological Laboratory, to cost about $75,000, is in process of construction.

DEAN A. WORCESTER has been appointed associate professor of psychology at the University of New Mexico.

DR. THOMAS A. LEWIS has been appointed professor of psychology and education at Denison University.

DR. TRUMAN L. KELLEY has been appointed instructor in the philosophy of education at the University of Texas and will have charge of a psychological clinic which is to be established by that institution.

EDITORIAL ANNOUNCEMENT

The plan for a new *Journal of Experimental Psychology*, outlined in the February BULLETIN, has met with a most favorable reception. The Editors of the Review Publications have accordingly determined to proceed with the enterprise. It was intended to start the new *Journal* in February, 1915, but the present abnormal situation in the scientific world abroad makes it advisable to postpone the first issue till more normal conditions prevail. The exact date will be announced later.

To relieve the crowded condition of the PSYCHOLOGICAL REVIEW part of the PSYCHOLOGICAL BULLETIN will be devoted temporarily to original contributions. The diminished foreign output in psychology, will shorten the general reviews in the BULLETIN for some time and renders this transfer both practicable and desirable. All original contributions should be sent as heretofore to the Editor of the PSYCHOLOGICAL REVIEW. The Board will assign as many articles to the BULLETIN as space permits, subject to the authors' approval.

HOWARD C. WARREN
JAMES R. ANGELL
JOHN B. WATSON
SHEPHERD I. FRANZ

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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE TASK AND THE METHOD OF SOCIAL PSYCHOLOGY

BY JAMES H. LEUBA

Bryn Mawr College

The relation of individual consciousness to so-called "social consciousness," and the nature of the "social mind" continue to give rise to discussions. Of the very recent ones that of Boodin (1) is the more extensive. The author wishes to show that the interaction of minds makes a new reality, "that there is a genuine social unity, distinct from what we call the unity of individual experience."

In the consideration of this problem, one must "start not with the postulate of isolated minds, but with the postulate of inter-subjective continuity as an elementary fact." The ordinary concept of the communication of mind with mind through space and the nervous system, means, according to him, merely material, not psychological continuity. There can be in this sort of relation no direct acquaintance of mind with mind; other minds are merely inferred. But the fact is that there is another kind of relation between minds. "We respond to the voluntary reactions within the total situation as immediately as to the physical." We do not start with one's self and other selves, these are instrumental abstractions; we start with integral situations. The social situation is never a mere addition of certain entities with their separate characters; a creative synthesis takes place.

In the second part of the paper, arguments of two sorts are advanced for the existence of social minds. (1) Social minds are

real because they possess characteristics analogous to those of particular minds. The social fusion seems as much a new unity as the fusion of the individual tones in a clang. Both depend upon the quality, the intensity, and the number of the components. A French fusion is different from an Anglo-Saxon fusion; a lady's tea party from a man's smoker. The whole is held together by a dominant common interest. Since a social situation is thus analyzable, we can predict to a certain extent social fusions, as we can predict tonal fusions.

The fusion is not primarily one of ideas and of sensations, it is primarily a voluntaristic fusion, a creative unification of conative tendencies. It is uniquely selective in the particular situation, and so can be treated as a subject. It has its own identity of traits from moment to moment and from age to age. "Whatever can be said of so-called individual minds in the way of characteristics, can be said of social minds." The author concludes that "whatever reality can be accorded to the abstract particular mind can be accorded to the social mind."

(2) Social minds must be real because of the practical relations they invite. We deal differently with a man accordingly as we consider him as a member of a Church or of a political party. Furthermore these minds must be real, since they can be judged as moral beings, *i. e.*, they are subject to praise and blame.

"The spirit of the nation or the institution is not a mere fiction. It is the living creative process in which individual minds are bathed and without which they are abstractions."

Maciver's paper (2) is a criticism of a conception similar to the one defended in the preceding paper. The attack is directed against utterances of Wm. McDougall in which the existence of overindividual or collective minds is recognized and in which a "mind" is defined as "an organized system of mental and purposive forces." This seems to Maciver quite inadequate. "Mind," in the ordinary, accepted sense of the word, includes not only an organized system of mental or purposive forces, but also a "system" that thinks, feels and wills. There is obviously no such collective mind; neither is there a collective mind that thinks the whole structure of the collectivity of which it is presumably the subject. The fact that individuals react differently in different groups is not an argument for the existence of collective minds, it shows merely, according to this author, that every mind is influenced by every kind of environment. There are, of course, purposes com-

mon to many minds, but a thing common to many minds does not constitute a super-individual entity. The bonds of society are in the members of society, in individual minds, thinking that which is common; they are not outside them.

It is evident that Boodin, in his advocacy of the reality of collective mind as thinking, feeling and willing mind, cannot deny that every particular collective consciousness appears in a person. The acceptance of this statement would probably bring harmony between him and Maciver. Why not speak of many minds in one and the same person? In my opinion "minds" are all social. There is no individual mind in the sense of an organized system of conscious, purposive forces in which is taken into account only the thinker. Some of these "minds" reappear in many persons who form then a social unity.

In a second part of his paper, Maciver attempts to differentiate social psychology from sociology. Here he disagrees with Karl Pearson who in *The Grammar of Science* affirms that the two are wholly identical, and even with Ward who in *Pure Sociology* declares that they are in part identical. Our author claims that although they usually deal with the same facts, these sciences are altogether different. They are totally different because psychology is interested not in objects as such, but in objects in their relation to the subjects, the minds that know, feel or will them. Sociology, on the contrary, is interested solely in the objects of social origin. The psychologist is, for instance, interested in the common characters of minds as they appear in the nation, in the several classes of a community, in minds as affected by occupation, etc. While the sociologist is interested in the social systems or unities in which the types are co-ordinated, *i. e.*, in the social outcome of the psychological likenesses and differences, the objects themselves.

When the author passes to the differentiation of individual psychology from social psychology, one is surprised to find him unable to make any distinction. All psychology, he writes, is modified by the social *milieu*, therefore it is all in some degree social. He evidently forgets psycho-physics and psycho-physiology. The law of Weber and the laws of light and color perception, for example, are independent of social interaction.

One of the merits of Weber (4) is not only to have seen in a general way that in the explanation of social institutions one must take into account the contribution of the individual, considered

as independent creative centre, but to have indicated that contribution in several concrete instances. He shows in particular how the technical inventions of the early period of civilization and their transmission are independent of collective belief, they are the products of individual activity (p. 156, see also 161, 209). Regarding the formation of language, he attempts also to separate the individual from the social factor (pp. 195–199, 209–211). These and other parts of Weber's book[1] bear directly upon the controversy raised by Durkheim in *Les Règles de la Méthode Sociologique*.

Roberty (3) shows how the leading representatives of contemporary sociology have accepted, in totality or in part, the essential theses of neo-positivism, namely the theses of the French Positivists who from about 1880 modified in several respects the principles of A. Comte. The sociologists whose principles are shown to be in agreement with those of neo-positivism are Durkheim and Lévy Bruhl in France, Baldwin in the United States, Wm. Ostwald and Simmel in Germany, and A. Ardigo in Italy.

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RECENT SOCIAL PSYCHOLOGY IN BRITAIN

BY WM. McDOUGALL

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During the past year two important books dealing with or bearing closely upon social psychology have been published by British authors. Mr. A. F. Shand's *Foundations of Character*[2] is a well-written work of more than 500 pages, devoted to the elucidation of the innate tendencies to feeling and action which become organized to form the characters of individuals and of societies. Mr. Shand's psychology is both structural and functional; for he

[1] A fuller review of *Le Rhythme du Progrès* will be found among the Special Reviews, p. 473.

[2] London: Macmillan, 1914. Pp. 532.

has avoided the fashionable error of regarding structural and functional tendencies in psychology as alternative to, incompatible with, or opposed to, each other; as also the parallel error of setting introspection and the study of behavior, subjective and objective observation, over against one another as entirely exclusive rather than as complementary and mutually helpful methods of study. A striking feature of the book is the great extent to which the author has made use of literature, and especially of poetry, as a rich mine of evidence bearing on the constitution of human nature. Mr. Shand recognizes innate tendencies of three main classes, namely, (*a*) instincts, conceived as conative dispositions, each of which involves a tendency to some one kind of bodily movement only; (*b*) appetites and emotions, each of which is, or springs from, a complex system consisting of some one dominant disposition presiding over and controlling an array of instincts; (*c*) innate sentiments, systems of dispositions still more complex; for each such system is conceived as consisting in a group of limited emotional systems, each comprising in turn its array of instincts subordinated to an emotional disposition.

It will be seen that Shand thus regards the innate basis of character as a very extensive complex organization; in this respect going far beyond most modern writers; and it will be felt by many that he has gone too far in his revulsion from the *tabula rasa* conception of the infant mind. It is clear that the onus of proof lies with him, and that, in avoiding some of the problems of individual development by postulating natively given much that is commonly regarded as acquired through individual experience, he simplifies the problems of ontogeny at the cost of complicating very seriously those of phylogenesis. But even those who cannot follow Mr. Shand in this part of his work will recognize that his book, rich as it is in subtle reflections and ingenious argument, will do much to stimulate observation and discussion in this important field.

Mr. Graham Wallas is widely known as the author of *Human Nature in Politics* and, in this country, as one of the founders of the Fabian Society (of philosophical socialists) and as one of the most active and experienced of those unpaid administrators to whom British institutions owe so much that is characteristic and admirable. His new volume, *The Great Society*,[3] aims at deepening our understanding of that universal organization of humanity which, in spite of the European war, the eye of faith may still discern as a

[3] London: Macmillan, 1914.

system that underlies and comprehends all existing nations, as each national organization underlies and comprehends a multitude of lower social groups. In his *Human Nature in Politics* Mr. Wallas appeared as a ruthless exponent of the part played in political life by suggestion and by emotional impulse and contagion. In the present work he has changed his ground and figures as an opponent of the tendency to rate very low the influence of reason in politics; as he himself puts it—"the earlier book was . . . an argument against nineteenth century intellectualism," while this book is "an argument against certain forms of twentieth century anti-intellectualism."

This is a startling conversion. It might seem that Mr. Wallas has been shocked by the success of his own teaching. But the inner history of this change of attitude would seem to be roughly as follows—and here, since Mr. Wallas repeatedly criticizes my *Introduction to Social Psychology* as representing twentieth-century anti-intellectualism, reference may be made to it. That book was published at almost the same date as *Human Nature in Politics;* its main thesis was that our intellect works only in the service of and under the driving power of our conative dispositions, devising means for the attainment of the ends towards which these are directed. It denied to the intellectual apparatus all independent power of governing action and indeed all power of independent operation—independent, that is, of the conative dispositions. Now, although Mr. Wallas had been led by his large experience of practical politics to perceive that impulse and suggestion play a great part in human, and especially in political, life, this doctrine was more than he could stomach; it was too radical for him. And the essence of his defence of intellectualism in the new work is to maintain that the intellect is an active tendency, a psychophysical disposition, which can and does work in independence of all others; that thought is an independent impulse in the same sense as fear or anger is. "Mr. McDougall does not hold, as I hold, that we are born with a tendency, under appropriate conditions, to think, which is as original and independent as our tendency, under appropriate conditions, to run away" (p. 43).

Mr. Wallas in short defends the old and, I believe, fallacious doctrine that the rational and the irrational faculties are separate and distinct from one another in their operations. He has rejected the nineteenth century error of regarding man as a purely rational animal, "the economic man"; he has looked beneath the frock coat

and the silk hat of the civilized man and has seen that the "animal propensities," the lower forms of mental activity, are still alive and active within him; nevertheless he merely goes back to Plato and sets the rational and the irrational over against each other as independent and opposed faculties which might well be localized in bodily organs as distinct as the brain and the heart. The "argument against intellectualism" is, then, merely a retrograde step, due, like Mr. Bergson's separation of instinct from intelligence, to failure to grasp the essential nature of the relation between conation and cognition. But this argument is really only a small part of the book, which contains much that is valuable and stimulating, especially in the way of practical suggestions (contained in the last three chapters on the organization of thought, of will, and of happiness, respectively) for the improvement of the mental operations of the "Great Society." It may be hoped also that the book will perform a great service over and above its direct contribution to science. For in this country it is no small matter that an author of high reputation as a man of affairs should confidently proclaim the practical importance of psychological understanding. For the general attitude towards psychology of historians, and of all interested in the study of human society continues to be one of utter scepticism, if not of positive dislike and antagonism.

This is well illustrated by a recent work which may fairly be claimed as an important contribution to Social Psychology, though its author would be horrified by the suggestion, namely *The History of English Patriotism*, by E. W. Stratford. This book of some 1,200 pages traces in a very interesting and attractive manner the growth of British patriotism from the earliest times to the end of the nineteenth century. The author has marred a most valuable work, characterized in the main by fair and balanced judgment, by revealing here and there the anti-scientific bias of the literary High Church man. This appears most strongly in a chapter entitled "A Science of Society"; in this chapter, after trouncing Herbert Spencer and other of the older writers who have aimed at creating a "sociology," he selects the present writer's *Introduction to Social Psychology* as a sample of latter day efforts in this direction and holds it up to scorn and ridicule as a dreadful symptom of the present state of English culture. There can be no doubt that in all this Mr. Stratford represents a very large, if not dominant, section of the cultivated world, which remains resolutely opposed to all attempts at systematic interpretation and analysis of human

personality and society. It may be hoped that in these circles the work of Mr. Wallas may at least find the hearing which is strongly denied to those of any merely academic writer of similar tendencies.

Of special interest and value from this point of view, that is as a contribution to social psychology from a man of the highest distinction in practical affairs, is the address on *Higher Nationality* delivered by Lord Haldane at Montreal in September, 1913. As a good metaphysician of the German School, Lord Haldane recognizes a sphere of conduct governed by "the individual conscience" or "the categorical imperative." As a lawyer he recognizes a sphere of conduct governed by law and legal sanctions. But as an observant man of good sense he recognizes a third and larger sphere of conduct governed by what he calls "Sittlichkeit." He rightly sees that in all this sphere of conduct the agent expresses not merely his own individuality but rather the nature of a larger self, the society of which he is a loyal member and a more or less adequate representative. "Thus we find within the single state the evidence of a sanction which is less than legal but more than merely moral, and which is sufficient, in the vast majority of the events of daily life, to secure observance of general standards of conduct without any question of resort to force." He goes on to ask: "If this is so within a nation, can it be so as between nations? . . . Can nations form a group or community among themselves within which a habit of looking to common ideals may grow up sufficiently strong to develop a General Will, and to make the binding power of these ideals a reliable sanction for their obligations to each other?" He replies: "There is, I think, nothing in the real nature of nationality that precludes such a possibility"; and he goes on to justify this faith in "the higher nationality" especially as regards the group of nations founded on Anglo-Saxon blood and traditions. This address, concluding as it does with a plea for "the reflective spirit," is thus an eloquent exhortation to the study of social psychology, for although its distinguished author does not make use of that term, the study of the higher or collective personality, of the conditions of its genesis, of its influence and modes of operation, is the central task of social psychology.

The view stated in the foregoing sentence has been challenged by Mr. Randall Maciver (lecturer on political science and sociology in Aberdeen University) in a paper recently published under the title "What is Social Psychology?"[4] He selects for criticism the

[4] *Sociol. Rev.*, 1913, 6, 147–160.

present writer's statement that "we may fairly define mind as an organized system of mental or purposive forces; and in the sense so defined, every highly organized human society may properly be said to possess a collective mind." He finds this notion unacceptable and noxious. "It is important to clear out of the way this misleading doctrine of super-individual minds corresponding to social or communal organizations and activities." He asserts: "There is no more a great 'collective' mind beyond individual minds in society than there is a great 'collective' tree beyond all the individual trees in nature. A collection of trees is a wood, and that we can study as a unity; so an aggregation of men is a society, a much more determinate unity; but a collection of trees is not a collective tree, and neither is a collection of persons or minds a collective person or mind." The analogy seems to be very imperfect, and Mr. Maciver's reasoning leaves me unconvinced. But the question he has raised is really one of convenience and propriety of language; there is no serious question of fact in dispute; and in spite of disagreement in this point, I am glad to recognize in Mr. Maciver's admirably written paper a valuable contribution towards clear thinking in the determination of the provinces of psychology and sociology. For he is not one of those to whom the word "psychology" is as a red rag, nor of those for whom the prefixing of the word "social" makes it still more horrid. His paper is not an attack upon Social Psychology, but an attempt to define its province. He does not pretend to achieve the impossible task of marking it off from individual or general psychology; his positive contribution consists in drawing a clear distinction between psychological sociology and social psychology. He insists that the distinction is one of attitude; that both have to take account of the same facts of social activity and structure; but that while sociology is primarily concerned with these objective facts even when it seeks psychological explanations of them, social psychology is concerned with them only as throwing light upon the nature of mind. Mr. Maciver's rejection of the notion of collective mind enables him to draw this distinction clearly and sharply, and perhaps that is the real ground of his rejection of that notion. For it must be admitted that the acceptance of the "collective mind" does make it very difficult to assign to sociology a province distinctly marked off from that of social psychology. Mr. Maciver admits that the distinction of these provinces is theoretical only, that in practice there is and must be much overlapping, and it may be suggested to

him that he is perhaps sacrificing to his purer theoretical distinction a conception which may be of practical value.

Gratifying evidence of a growing recognition of the value of social psychology is the existence and activity of a section of the Sociological Society of London, which devotes itself wholly to this branch, and which has held during the winter about a dozen well attended meetings for the reading and discussion of papers.

CRIME AND SOCIOLOGY

BY ANGIE L. KELLOGG

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Since criminology is still in the early stages of its development, the social needs which have called it into existence continue most emphatically to serve as the point of departure for every short article or large volume on the subject. The avowed motive for every criminological study is the menace of crime to society—(1) the financial burden to the state of present methods of detecting, prosecuting, and punishing crime, (2) the failure of existing penal practices to repress crime, (3) the growing social insecurity due to the increase in the numbers of first offenders, of recidivists, and especially of juvenile offenders, and (4) the resulting social deterioration—together with the consequent needs of (1) experimental and statistical investigations, (2) dissemination of the facts and the tentative conclusions obtained, and (3) modification of our criminal procedure according to existing social conceptions and conditions.

Several books of a more or less popular nature have been brought forth recently tending by their accounts of actual criminals in prisons, penitentiaries, reformatories, and prisons for the criminally insane at least to prepare the general public for the view of modern criminology that, if crime is to be efficiently dealt with, its perpetrators must be not merely detected, prosecuted, and sentenced by police and attorneys, judges and juries, but also, and very widely, diagnosed and treated by psychologists, sociologists, physicians, and educators. These books have been written by prison officials, or criminals themselves, or investigators who have identified themselves with the life of inmates in a penal or reformatory institution. Such writers are Lowrie (38), ex-convict; Williams (62), formerly of Mattewan; and Osborne (44), voluntary prisoner

for one week in Auburn Prison. *How Criminals Are Made and Prevented* by Horsley (34) is based on the experience of forty years in and for the prisons, the workhouse, and the slums of London. It is not a scientific treatise; but is an expression of this widespread tendency to give to the public personal observations. *Young Delinquents* by Barnett (4) aims to interest and inform the general public concerning the treatment of juvenile delinquents in court and in reformatory and industrial institutions. The book is based on the observations of many visits to court and institution. Mosby's book (41), *Causes and Cures of Crime*, aims to popularize the principle that the suppression of crime is not a legal question but rather a problem for physicians, psychologists, sociologists, and educators. To this end it is an exposition and an exhaustive résumé of modern criminological views concerning the causes, preventive measures, and cures of crime. His main theme, to which are directed many of the quotations which he makes, is the reformative and individualistic character of the "New Penology" and the necessity of treating criminals according to their physical and mental powers of response to reformative and educational discipline as judged not by the Court but by expert physicians and psychologists.

Several articles and sections of books bearing on the prevention of crime, especially that of juvenile delinquency, emphasize the necessity of instruction in vocations and social virtues. Frequently (9, 49, 52) in the *Hibbert Journal*, the *Psychological Clinic*, the *Pedagogical Seminary*, and the *Educational Review* are discussions of the value of the Boy Scout Movement as a safeguard against crime through the training the scouts get in sentiments and practices of law and order which home does not give them. Mosby (41) emphasizes the value of vocational training as a preventive of crime. Aschaffenburg (1), while not minimizing the importance of education, emphasizes the fact that education in the sense of fitness to engage in a gainful occupation is not a sufficient guarantee against criminal tendencies. Inhibitions must be woven or wrought into the very character. Frequently articles urge the rigid enforcement of our truancy and compulsory education laws and the development of vocational instruction. Stoops (57) emphasizes the necessity of moralizing industry; and contends that it never can be moral as long as it remains individualistic. *Social Insurance* (54)—an exhaustive summary of information regarding existing schemes of insurance and an exposition of the social theories of

insurance—claims that the removal of the grosser forms of destitution by carefully devised schemes of insurance will do much to prevent crime and vice as well as relieve disease and other evils. Against the repetition of crime, Nolan (42) urges the establishment of associations to give the discharged prisoners their greatly needed social, moral and economic supervision. Dale (11) makes a plea for the proper treatment of unemployables as being the class from which our prisons are largely recruited. Abbott (2) urges the employment and compensation of prisoners. Banishing idleness from prison and penitentiary will do away with many evils of health and discipline within the wall; compensation will relieve the poverty and crime of those who are reduced to distress by the incarceration of a member of the family. Gordon (24) discusses the need of institutions for the care of chronic alcoholics, the necessity of propaganda concerning alcoholism and of efficient control of the production and sale of alcohol. Adler (10, 31) says public opinion should be moulded "in the direction of the conception of organicity." Men should so interpret their social relations that they shall promote each other's ends and "find the common denominator no longer in pleasures but in the moral uplift experienced in enriching and thus revealing the organic life of the whole." And, finally, recent literature is continually discussing eugenic measures of prevention. It is impossible in the limited space of this review to discuss arguments brought forth in this connection; they are so complex and conflicting. Thus the advocates of sterilization urge the simplicity of the measure and the certainty of checking the procreation of criminals in the direct line; opponents urge the grave danger of increased sexual license and the consequent menace of the spread of venereal disease. The matter of how to control these evils which would attend sterilization is still problematical (7, 14, 22).

A great deal is written upon the subject of the rational classification and treatment of criminals. Davis (12) includes in her "plan of the rational treatment for women offenders" (1) the Court to decide simply upon the innocence or guilt of the accused, (2) a clearing house composed of a physician, a psychologist, and field workers, and (3) a commission to assign the guilty to proper institutions on the basis of their physical and mental tests. The sentence should be absolutely indeterminate. Gault (20) urges laboratories for the study of criminals in connection with the Courts. Diagnoses from the psychological, neurological, and

sociological points of view are necessary for the judge to make efficient decisions. The protection of society demands the segregation of hopeless persons and the industrial training of the remainder. Fernald (15) writes that offenders should be classified not on the basis of varieties of offence or experience in crime but on a social basis, as degrees of responsibility. The recidivists are largely recruited from those whose mental equipment is not adequate for their honest self-support. They should not be sentenced with reformable criminals but should be segregated for a long continued training, specially adapted to their needs, in a custodial industrial institution of which the hospital features are prominent. Miss Town (60) finds four groups of delinquents needing special treatment; the feeble-minded need institutional care; the backward and the moral imbecile need protracted observation under favorable educational and environmental conditions followed by life under normal or institutional conditions according to the final diagnosis; the normal delinquent needs a change of environment. Peyton (48) commends a differential diagnosis of criminals at the time of the investigating court trial. Pyle (50) finds a close relation between crime and mental defects; he urges that the delinquent be put in the hands of teachers and physicians of the highest qualifications. Healy (28) also points out that no social success is possible to the mentally defective, the insane, or the epileptic; that, therefore, for their own protection and that of society they must be segregated. The values of parole and indeterminate sentence are widely appreciated.

Various reforms are suggested in the matter of criminal institutions and practices (55, 59). Articles in the *Journal of the American Institute of Criminal Law and Criminology* advocate the institution of scientific police (6, 45, 58). The school of scientific police in Rome is discussed, where police study criminal anthropology for the better identification of criminals; criminal psychology, for the better treatment of criminals; and criminal sociology for the better understanding of the relation of the criminal to society. The police thus become able to contribute to criminology. As to reform in criminal procedure, mention has already been made of the demand that criminal procedure be not merely legal. Henderson (10, 31) urges the need of an investigating spirit in our legal procedure. Our attorneys are litigious, not investigating; they suppress and distort evidence; they aim to win the case; not to secure justice. He recommends inquisitorial commissions. Cohen

emphasizes the necessity of viewing the judge as creator not merely finder of the law. Overstreet (46) finds judicial independence a menace to public welfare. Frequently arguments are brought against the existing jury system and demanding expert jurors and also against the law that the criminal shall not be obliged to incriminate himself. Other arguments contend that judges should have more power to control the conduct of the trial and to charge upon the facts.

A number of articles and books have been written whose main theme is the necessity of viewing our legal conceptions in the light of social philosophy. *Moral und Gesellschaft des 20 Jahrhunderts* (5) emphasizes the necessity of bringing into one view our moral, legal, political, economic, and social problems. Hocking (31) writes that jurisprudence is a sociological discipline, and that sociology is or ought to be philosophical; that conservative law is in opposition to a progressive social order; and more concretely, that the Courts should have power to make or modify law by considering behind existing law its sources in social conditions. Law should be adjusted to changes in conceptions of social justice. The establishment of a conference on legal and social philosophy suggested by the action of American Law Schools is a recognition of a conscious philosophy of law. Pound (31) emphasizes the necessity of working out social ends so that they may be realized through rules and standards formulated by the judge and the legislators and developed by the jurist. Lewis (10, 31) comments on the growing distrust in the justice of the law due to the fact of our passing through a period of rapid change in our fundamental social conceptions. Lawyers and judges because they are grounded in principles expressive of past ideas are not apt to be in touch with current social conceptions. Law students should have a trained interest in the social ideas upon which the laws are based.

Garofalo (17) urges the necessity of a sociologic conception of crime, and conceives of criminality as injury to the altruistic sentiments of pity and probity. Maxwell (39) shows that the origin of the conception of crime is social; that the moral factor in the notion of criminality is foreign to the primitive notion. The moral element was brought in through the influence of religion and philosophy; the religious idea that makes of crime a sin confounds its criminality with its immorality. If social defence is to be efficacious, criminal science ought to react against this false notion.

As to the causes of crime, Dureker (13) discusses bad neighborhood conditions, bad home conditions, and bad example of parents. He holds that many children are forced to truancy through poverty. Rawnsley (51) comments on the inconsistency of allowing our amusements undo the work of our education. The cinematograph show with its crime films, and its appeals to the horrible and sensational, and the vulgar and indecent postcard are direct factors in the production of crime. Flexner (16) finds that prostitution is an urban phenomenon, the supply and demand of which are stimulated artificially to a large extent. Feeblemindedness and other defects are factors to a degree but most active in the production of this evil are poverty, the breakdown of home influences and street amusements. A study of one thousand cases of young repeated offenders by Spaulding and Healy (27) shows that in 44 per cent. inheritance is undoubtedly responsible for crime. There is no proof of the heredity of criminal traits as such. Aschaffenburg (1) likewise finds no specific inheritance of a criminal disposition *per se*. Inherited bodily and mental weakness favor the development of criminality in so far as it decreases the powers of resistance of the individual under certain circumstances in which he may be placed. *The English Convict*, a statistical study by Goring (25) extending over five years of investigation and three of tabulation, follows the life histories of three thousand criminals; and concludes that there is no such thing as a type of human being born to be criminal. Defective intelligence is the powerful factor in the production of crime. Apart from mental deficiences, "the force of circumstances" has little to do in the causation of criminality.

It is impossible in this review to do much more than catalogue the recent writings on punishment. The general demand is for efficiency in repressing crime. Existing penal codes and practices are condemned as failures. The constructive attitude is to regard crime as a natural phenomenon and to treat the individual criminal on the basis of the particular causes conducing to his criminality and on the basis of his physical and mental powers of social responsibility. The theme of *Wards of the State* (33) is the failure of imprisonment. It points out that while prisons can not be done away with immediately a great deal may be done in the way of amelioration. There are many incarcerated who might with safety to society and benefit to themselves be released, paroled, or treated under supervision or probation; there are many others who

should be in hospitals, asylums, or custodials. Heath (29) writes forcefully of the failure of penal measures and emphasizes that the criminal problem is not legal but social. The diminution of punishment depends not on deterrent punishment, not on punishment at all, but on a hundred social factors and on rational methods of treating criminals. Garofalo (17) and Aschaffenburg (1), each in his own way, stand strongly for the principle of individualization of punishment. In Garofalo's scheme, emphasis is placed on enforced reparation and payment of damages on the part of those who are neither violent criminals or confirmed thieves. Retributory and reformatory theories of punishment are erroneous in Garofalo's view, because they presuppose moral responsibility. Lisle (37) writes that if penal justice is to be a factor in reducing crime, it must be freed from the evil effects of the theory of moral culpability. Stoops (56) says penology must be based on a sane psychology; the old notion of freedom of the will is a bad foundation; the will is not free from instinct and habit. Self activity and self recovery must be substituted for retaliatory punishment. Hall (26) emphasizes the fact that pain and social wrong are incommensurate quantities and that the goal of the punitive relation is the redemption to social relations of the offending one; the conservation of the social purpose. Holbach (32) argues for rewards as valuable in the establishment of justice. In an article on the sociological conception of punishment is a statement "Dans son essence, la peine est uniquement lieé à la conservation de la formation sociale." "Elle est formellement caractérisée par les besoins d'une uniformité, par la necessité de passer au moule les individus qui, dans leur conduite, s'ecartent du type exigé par la conservation sociale" (40). Ives' (35) book is historical in character to a large degree. His main thesis is that punishment is a survival of savagery. He finds four potent crime causes, "want, waste, drink, and competition." Competition is the most important; so long as there is competition, prisons will remain. And finally *The Rationale of Punishment* by Oppenheimer (43) maintains that punishment is an evil inflicted upon a wrongdoer as a wrongdoer on behalf of and at the discretion of the society in its corporate capacity, of which he is a temporary or permanent member. He classifies ten theories of punishment and claims that the true function of punishment is to frighten those who are contemplating crime and to educate through the criminal law.

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PSYCHOLOGY OF RELIGION (PRACTICAL)

BY ELLSWORTH FARIS

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"A philosophical tendency so far-reaching as Pragmatism would naturally have something to say about religion. Is then the pragmatist also a religionist, and, if so, of what type?" This question Morgan (4) attempts to answer by setting forth the leading characteristics in the general system known as pragmatism. The pragmatist has a passion for the concrete, is willing to try any belief and unwilling to reject anything until it has failed to "work"; he rejects final authority, thinks of "purposes" instead of "a purpose," is evolutionary, "modern," and neither an optimist nor a pessimist. Pragmatism is opposed to absolutism but they agree in denying any opposition between the divine and the human substance, though idealism makes for pantheism while pragmatism finds the divine in the many "eaches" of the human. The answer to the question of the religious effect of pragmatism is found in the case of Prof. James. A letter to Prof. Leuba is quoted to show that, since pragmatism failed to satisfy Prof. James, therefore it cannot meet the needs of any man. "In the one signal case in which it was put to the test, it failed to 'work well' and therefore it stands condemned out of its own mouth and by its own standards."

The question of the utility of religion is raised by Mayer-Oakes (3) whose answer is found in his conception of the origin and nature

of the religious experience. He concludes that religion is universal, all races and peoples being possessed of some religious beliefs and practices. Also, religion is permanent, meeting fundamental needs that shall never cease to be felt. It is due to a perception of the fundamental need of God, a "sense of the Infinite" which comes from seeing the "multitudinous phenomena of the universe." Religion must not be identified with an institution, a book, or a theology but is to be thought of as a personal relation issuing in "loving service" to others. The reviewer was impressed by the difference in the conception of religion in the beginning and in the latter part of the article. For the religion that is found among the savage races is hardly a religion of "loving service." The chief benefit of religion is held to be its power to put a divine interpretation on all the incidents of life, including its misfortunes.

Stoops (6) discusses one question raised in the foregoing, but from a slightly different angle. Christianity is often said to care more for the hundredth man who is needy than for the ninety-nine who are at home. This is true but it is a half truth. Christianity is not only or chiefly individualistic. In the beginning religion arose from institutions and neither in the early Hebrew, nor the Greek, nor the Roman systems is it possible to find an individualistic religion. It is true that individualism did come into the conception of the Roman religion about 200 B. C. when the oriental mysticism undermined the older faiths and caused the leaders to disbelieve while they, at the same time, supported the old cult as a means of controlling the common people. But in Christianity the two streams were united, the new doctrine of the inner life and the older religion of social institutions blend into a complete religious life.

The chief value of religion, according to Morse (2), is its power which it shares with education to enable us to overcome the limitations of prejudice. Or, if it is too much to hope to overcome them entirely, at least to make them a help instead of a hindrance. We need to keep our minds open to truth from every source and in this education and religion can help. A careful analysis of prejudice reveals the fact that each of us is a worshipper of many idols of cave, and forum, and theater.

Educated men are not hostile to religion, according to Mayer-Oakes (4), for scholars have always held, essentially, to the great facts that religion emphasizes. These are, the existence of God, the dignity of man, the fact of evil, and the necessity of redemption.

The author regards the Christian religion as the true key to the riddle of existence. The article was originally produced in the form of an address to an association of ministers.

The conditions in the colleges receive careful analysis by Wilm (7) who sets forth with clearness and fairness the weakening influences in the present-day American institutions. A summary and condensation is made which names three classes of discouraging influences: (1) a weakening of moral principle through intellectual confusion; (2) positive immorality like drunkenness, gambling, and licentiousness; and (3) enfeeblement of the will, due to a comparatively aimless life and the scattering of intellectual and moral energies. The obvious remedy is to seek to strengthen the influence of and secure the coöperation of the instructional and administrative staff and this is the most hopeful direction from which to expect improvement. And yet the intellectual preoccupation of many instructors causes them to regard teaching as a secondary part of their work and even to consider it at times in the nature of an interruption of more important and interesting research and writing. And the increase of student activities has caused the class-room to be far from the focus of his interest. Last of all, the elective system has resulted in a condition in which the association of instructor and student is very short lived. The remedy lies chiefly in restoring the personal relations between the teachers and the students as well as in definite moral precepts and in formal religious instruction. Religion is taught in nearly all the state universities. The college is by no means in a desperate condition morally and still remains the best institution we have for the preparation of the youth for an active career. The evils that exist are capable of being overcome.

The book by Coffin (1) is designed as a text book in practical ethics with especial reference to the needs of denominational schools. The language is clear and untechnical and there are questions at the end of each chapter as a device to aid in class work. The theoretical position as to the origin of the moral ideal is an attempt to combine the rationalistic and the empiricist views. The supreme moral end is the realization of a socialized personality and the moral criterion by which conduct is to be evaluated in the pursuit of this end is the socialized conscience, with its virtues of intelligence, prudence, purpose, justice, and good-will. In separate chapters the criterion is applied to the social institutions, the home, school, vocation, state, and church. The moral ideal is not static but must ever be a growth.

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SPECIAL REVIEWS

What makes a people lethargic or energetic? I. E. Ash. *Amer. J. of Sociol.*, 1913, **19**, 370–379.

Claparede's theory that there are two sources of energy in the human body which are available and that these sources are distinct, is accepted. "First there is the central reservoir or reserve store of human energy, available only for work that has an intrinsic interest. . . . Then there is the local production of energy within the nerve centers of the organ acting." "The former requires very little conscious effort and produces few toxins of fatigue. The latter requires constant conscious effort and produces many toxins of fatigue."

A people is consequently lethargic if their activities are of a nature which require them to draw continually on the latter source of energy. A people is energetic if their activities are of a character to make the first source continually available. Ash enumerates six conditions which rather compel people to draw on the energy of the nerve centers of the organs acting, and which consequently are not favorable to progress. These are communism, hypertrophy of institutionalism, a preponderance of old men in authority, undue reverence for past achievements, physical, social and economic isolation, and forms of industry in which emphasis and attention is on processes rather than purposes.

F. A. Dewey

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The Psychology of Revolution. G. LeBon. (Transl. by B. Miall.) New York: Putnams, 1913. Pp. 337.

This interesting book is, as its author suggests in its preface, something of an attempt to throw a new light on an historical subject. The subject is the still unfathomed French Revolution, or at least all but fifty pages of it is. The new method or the new light is that which one might expect the distinguished LeBon to bring to his topic, the application of crowd psychology.

The book, to be sure, begins with two preliminary divisions, the first of which is devoted to the general characteristics of revolution, and the second to the forms of mentality prevalent during

revolution. But they are so enriched by illustration drawn from the period of the French Revolution, the terms even being the terms of that time, that it is hard to think of them apart from the great struggle which forms their background. The second third of the volume deals with the period of the French Revolution itself. It is divided into a part devoted to origins, a part devoted to the rational, affective, mystic, and collective influences active during the Revolution, and a part devoted to the conflict between ancestral influences and revolutionary principles. Part III. discusses the recent evolution of the revolutionary principles, which leads up to the finale of capital and labor, syndicalism and administrative castes.

To one with little knowledge and few beliefs about the French Revolution the book is fascinating. To one well acquainted with the period it might be disturbing, for LeBon feels that there was as much religion as anything else in the fervor of the period; otherwise, he suggests, there could not have been the fervor. And this attitude is everywhere prevalent, and everywhere explains what otherwise might be inexplicable.

The fault of the book, if any, lies not in its fascination as history, but in its disappointments as psychology. In speaking of the Jacobins and their temporary control of France, the psychology of the situation is thus summed up:

"The first factor of their power was very important. In the conflict between powerful faiths and weak faiths victory never falls to the latter. A powerful faith creates strong wills, which will always overpower weak wills. That the Jacobins themselves did finally perish was because their accumulated violence had bound together thousands of weak wills whose united weight overbalanced their own strong wills.

"It is true that the Girondists, whom the Jacobins persecuted with so much hatred, had also well-established beliefs, but in the struggle which ensued their education told against them, together with their respect for certain traditions and the rights of others, scruples which did not in the least trouble their adversaries" (pp. 196–197).

This is probably quite true, and it certainly is interesting, but it is offered without proof or backing, perhaps with the not misplaced confidence that the reader's inferences are quite in accord with the author's. That this is on page 198 referred to as "the law already stated, by which the weak invariably fall under the

dominion of the stronger wills" in no way detracts from the value of the suggestion, but the attitude is slightly Mosaic. One has only, though it be solely for the sake of argument, to demand proof in order to realize that the law is uttered and not proven. One such case would be insignificant; the book, however, is nearly all such cases. Unproven laws, however true, seem to yield small fruit till proven; if the book does yield small fruit it is in its psychology and not in its interest.

F. A. DEWEY

Sociologie et Psychologie. La conception de la religion et de la magie, discussion des theories de Durkheim et d'Hubert et Mauss. J. H. LEUBA. *Rev. Philos.*, 1913, **76**, 337–357.

Leuba divides his discussion into three parts. The first is headed "The Sacred as the Fundamental Characteristic of Religion." The importance of the sacred to Durkheim is pointed out, as is the fact that in Durkheim's idea of the sacred the divine is not essential. The second part criticizes the tenets of Hubert and Mauss because they do not differentiate between magic and religion. The fundamental in religion is not as important as the differential, and when we deal with religion and magic anthropopathic dealings with personal or quasi-personal beings are differential. Religion has them. Magic does not. The third part discusses the relations of psychology and sociology and the problem of the origin of religion. Leuba feels that Durkheim narrows psychology and broadens sociology too much when Durkheim fails to make allowances for a social psychology. This, and the apparent failure of the distinguished sociologist to consider the rôle of individual psychology, as for example the inner life of great mystics, in the development of religion, is held to be a shortcoming.

F. A. DEWEY

The Socialized Conscience. J. H. COFFIN. Baltimore: Warwick and York, 1913. Pp. viii + 247.

James' theory of the social self and the general point of view developed in Dewey and Tuft's *Ethics* are utilized to emphasize the effect of institutions upon the ethical life. Among the problems briefly treated are the newspaper, the stage, the vocation, eugenics, and the church. Chap. II. gives the author an opportunity to analyze in detail the social character of the ethical situation, an opportunity of which he does not avail himself to an extent sufficient

to throw further light on the contribution of social psychology to ethics.

E. L. TALBERT

The Family in its Sociological Aspects. J. Q. DEALEY. Boston: Houghton Mifflin, 1912. Pp. iv + 137.

A condensed account of the primitive forms of the family is followed by an analysis of the effect of modern urban life and democracy on the reorganization of the structure and inner spirit of this institution. The book is balanced; it avoids the alarmist and Puritanical preachments in which some recent works on marriage indulge.

E. L. TALBERT

The Mentality of the Australian Aborigines. G. SPILLER. *Sociol. Rev.*, 1913, 6, 348–353.

The author gathers a number of authoritative opinions on the mentality of the Australian aborigines and concludes with the following questions; "If the native Australian, who culturally stands near the bottom of human achievements, is virtually the equal of the European in inborn moral and intellectual capacity, are we not bound to admit that all peoples are about equal in innate mental and moral capacity whatever the stage or the form of culture which they exhibit . . . and that therefore the data of sociology should be viewed from the only satisfactory standpoint of all human beings being potentially fitted to live in the most highly civilized states?" This is a standpoint to which anthropology in the United States, as well as elsewhere, has given of late much support.

J. H. L.

Les Antinomies entre l'Individu et la Société. G. PALANTE. Paris: Alcan, 1913. Pp. 291.

This is an interesting book written for a large class of readers in a facile style. It deals first with the conflict between the individual and society in its intellectual, affective and volitional aspects. This done, the conflicts in particular circles of the social life are taken up, notably in religion, in education and in politics.

In the last chapter, the solutions offered by Guyau, Comte, Spencer and Durkheim are summarily set forth. These sociologists look forward to the solution of the antinomies, either under

the influence of a natural socializing virtue supposed to be possessed by the individual or under the overpowering pressure of society (Durkheim). The author persists way in thinking the antinomies insoluble. We are too much individualized ever to be contentedly absorbed in the social organism.

J. H. L.

The Religious Revolution of To-day. J. T. Shotwell. Boston: Houghton Mifflin, 1913. Pp. viii + 162.

Amherst College was fortunate in the choice of its Clark Lecturer for 1913, for it is unusual to find united, as fully as in this small volume, wide learning with the talent of exposition expected of one addressing a general audience. These three lectures attempt a survey of the gradual narrowing of the sphere of scientific thought and control. I am one with the author in thinking that "to the student of social evolution there is no larger fact in the history of mankind. The process of civilization means that society is assuming control of itself, making its own the world it once shared with superstition, facing undaunted the things of its former fears, and so carving out for itself, from the realm of mystery in which it lies, a sphere of unhampered action and a field of independent thought."

In the first chapter the modern West, standing for material and rational triumph, is compared with the modern East, still dominated by religion, and with savage societies. Whether the change taking place in religion is to be understood as a gradual disappearance or merely as a development of religion, is the question considered in the second chapter. The chief facts in the secularization of society are rapidly passed in review. Whereas the dominating focre in early societies is taboo (*i. e.*, a magical and religious power), the foremost agent in modern society is rational, scientific control.

Regarding these two forces, one may say that the battle has been fought and won by science. And yet religion remains with us a powerful factor, in part mere habit, in part a vital thing. It may be that religion is growing less only in relation to the achievements and influence of science. Unfortunately, the social sciences have so far left religion almost entirely to theology, and so no scientifically established answer can be given to this question. The author seizes this opportunity of remarking upon the present need of a social psychology alongside of economics and history. The revolution is in any case fundamental: there is a new outlook into the universe, a new attitude towards everything. "It is a

revolution in which thought itself is winning its emancipation." But is religion merely a thing of low intelligence to be discarded when reason begins its reign? With this query we pass to the fourth and last chapter, "The New Régime." The only answer offered is drawn from a conception of religion set forth at some length in the third and fourth sections. According to the author, fear, awe, and reverence are the springs of religion; while curiosity is the instigator of science. Now, since life and matter will always awaken at least awe and reverence—the emotional characteristics of the religious attitude—religion will be everlasting.

Despite sundry remarks which may seem to point in another direction, the clearest and deepest impression produced by each lecture is that, in the opinion of the author, the scientific attitude and method will continue ever to push the mysterious farther and farther from the sphere of daily life, and to become more and more completely the dominating influence.

The adverse criticisms I am inclined to make would all arise from what I consider an inadequate conception of religion. I shall therefore limit my remarks to this point. In these lectures religion is sufficiently separated neither from magic nor from emotional states which in themselves would never have given rise to religious institutions. The mysterious and the awful, which are here regarded as the fundamental basis of religion, are as truly the fundamental basis of magic. The "thrill from the mysterious" is no more truly "the first phenomenon in religion" than in magic. And, moreover, the shock of the mysterious and awful is no more fundamental to religion than are the instincts of preservation and increase. For, mere shock or emotion does not constitute religion. A peculiar response, dependent upon human needs, is necessarily included in the conception of religion, and that reaction is just as essential to it as the emotion itself.

When religion is defined too broadly—for instance, as the emotion and the attitude generated by the mysterious and the awful—a great deal of what can be said about it, particularly about its future, ceases to have application to religion in the more legitimate meaning of the term, *i. e.*, the meaning the term assumes in the religious institutions and in the experience of the acknowledged leaders.

J. H. L.

Le Rythme du Progrès, étude sociologique. L. WEBER. Paris: Alcan, 1913. Pp. xiv + 311.

Although this important book marks in several respects an antagonism to the so-called French school of sociology (see under "The Task and Method of Social Psychology"), it belongs to that movement and is to be read in connection with the work of Durkheim, Hubert and Mauss, and Lévy Bruhl.

The main theses of the book refer to the origin of the mechanical and of the speculative activities (magic, religion, pure science). They are thrown in the form of an argument against Comte's law of the three states (theological, metaphysical, positivistic). The first hundred pages treat of the idea of progress in English Evolutionism and in French Positivism. I shall limit my review to the three last chapters in which are found the essential contributions the author has to offer to the understanding of social development.

The psychologist not familiar with recent sociology will note with satisfaction that the far reaching change which took place in psychology when intellectualism was replaced by voluntarism and functionalism, has also occurred in sociology. The first human knowledge was altogether practical; it consisted in recipes for securing by physical means the primary necessaries of life; fire, weapons, shelter, etc. At this stage, according to our author, magic and religion were not yet in existence. The only known world was the one now called "physical."

In the first rough handling of stone, wood and metal, appeared the first knowledge of the properties of these substances. It is here therefore that one must look for the beginning of the manual arts, of industry and of practical science. The persistency in the arts and in science, throughout the ages, of technical skill and knowledge, and the interdependence of technical discoveries and of theoretical progress in pure science, is set forth and illustrated in interesting pages (pp. 131–136; 237–250). Thus man started with a tendency towards the utilization of matter, unencumbered by any desire to explain or, in any case, unprovided with the means of explaining. Another tendency, fundamental to human nature, led, according to Weber, to the understanding of existence. How did this theoretical function come into existence? The answer to this question is bound up with the solution of these other problems, how did action engender free ideas, and how did the notion of spiritual causation come into existence? It came into existence, we are told, through the instrumentality of language. With its

appearance a new causality was introduced in human experience, for gesture and speech produce their effects without perceptible material means. "To reach with a stone or a javelin an enemy or a pursued animal, is in a manner to lengthen the arm and transmit its movement with a visible and tangible intermediary. To call a companion and to see him come in answer to the call, is to make use of an altogether different kind of power, one that the intelligence of the savage is not able to think of in terms of matter and of movement." This inability introduces in the imagination a new element, *sui generis*, the spiritual element, that which "acts without matter." "Out of this conception and its correlated beliefs, arise all the social institutions; first of all religion and magic." This, in my opinion the most interesting thesis of the book, is developed in several places, in particular on pages 174–179, where attention is drawn to the fact that the incongruous classifications of objects found among primitive peoples are often to be explained as the outcome of verbal associations and connections, and not of associations of properties belonging to the objects themselves; and on pages 192–195, where the use of language as an instrument of action (in magic, for instance) is conceived as bringing about little by little the differentiation of the object from the idea of the object. Once aware of this world of ideas, imagination revels in the freedom it enjoys from the world of unyielding material realities, and the progress of technic is more or less completely arrested while magic and religion run riot.

If the practical arts and practical science may be regarded as the continuation of primitive technical activity, to which theoretical knowledge has added its contribution, science considered as a rational system of explanation had its birth in the discovery of arithmetic. It is in the idea of number that the categories of individuality and identity, at the root of abstract scientific thinking, have come into clear consciousness (pp. 214–223).

The theory considering language as the immediate cause of the idea of non-material causation is ingenious. But I confess to a good deal of surprise at the unconcern with which the author discards accepted theories of the origin of magical and of religious causation in order to make room for his hypothesis. There is really nothing in this volume to make one give up the opinion I have expressed elsewhere regarding the origin of magic and of religion. It appears however that the influence of language may have been of great importance in the development of magic.

The use of language in magic, when names seem equivalent to the object or person named, or when the words spoken are thought to bring infallibly to pass that which they signify, is adduced in support of the theory. But these facts are susceptible of a different explanation in which the power ascribed to names is not a primary fact. There is here an interesting and important question to elucidate.

I note with satisfaction that what I have called "mechanical behavior" corresponds in the nature and in the function I ascribed to it, in particular in its relation to science, to what Weber considers to have been the initial phase of human progress, namely the primary period of technical acquisition (pp. 132, 135, 142).

The outcome of Weber's effort is the formulation of the *loi des deux états* in replacement of Comte's *loi des trois états*. The law of the two states is descriptive of intellectual progress only; it represents progress as a rhythm of evolution constituted by alternating phases of technical and of speculative activity (pp. 250–253, 301–305). After a phase of technical activity, "reflective intelligence lays hold of the results secured by technic and uses them indirectly in order to secure a fuller understanding of experience." This generalization is convincingly supported not only by the analysis of the psychological nature of these two functions, but also directly by appeal to history (pp. 259–301). In Europe, paleontology reveals in the paleolithic period the beginning of a technic and the probable absence of magic and religion: the second movement of the rhythm has not yet appeared. In Australia, where magic and religion extend their sway over everything, and where technical activity is arrested, the first speculative phase is in full swing. At the dawn of the historical period, technic had reached a relatively high development. Greece hardly added anything to the mechanical arts, but it launched a new speculative phase which continued throughout the middle ages and came to a close with modern times. Modern philosophy is merely a transitional period. With the 19th century begins a new technical period. Metaphysical speculation is in abeyance, while industry, machine making, all the arts of transformation of matter, undergo a colossal development. It is not exact to say that modern progress is an application of science, "Science and modern industry are the results of one and the same orientation of intelligence."

It was well worth while to set forth in clear outline the presence, the alternation, and the interdependence of these two modes of

activity and to point to their workings in the history of social development.

J. H. L.

The Development of Religion and Thought in Ancient Egypt. J. H. Breasted. New York: Scribner's, 1912. Pp. xiv + 379.

This excellent book by a distinguished Egyptologist is popular in form and scholarly in substance. The author had the good fortune of being the first in America to write an account of the main currents of religious thought in Egypt after the epoch-making publication of the standard edition of the Pyramid Texts by Sethe. The book offers therefore much that is new in English. One may say, I think, that we are now for the first time in possession of a satisfactory connected and intelligible account of the main features of the religion of old Egypt.

The influence upon religion of nature and of the social forces are throughout kept in mind, the general point of view of the author being that religion is the outcome of the interaction of natural, social and individual forces.

J. H. L.

The Soul of America. S. Coit. New York: Macmillan, 1914. Pp. x + 405.

I regret that the character of this journal does not permit an extensive review of this stirring and prophetic book. Its talented author describes his work as an attempt to induce men and women to invest their time, money, and mental and physical energy in the preservation of American spiritual resources, *i. e.*, of "conserving and developing the sense of the reality and power of those principles and ideals which have emerged in the history of the American people as manifestations of its essential and unique moral genius."

These resources are to be preserved, (1) "by preaching in the Churches, in the schools, in the homes, and in the Press that America is primarily and essentially an organic spiritual being"; (2) "by teaching that America herself is the living Church of which every citizen, whether he will or not, is an active member." Going further in the same direction the author indicates the first steps to be taken in order to bring about the realization of his hopes.

The reader who should begin by thinking that this is the dream of a religious enthusiast, will probably alter his opinion before he

reaches the end of the volume. He will have to concede that "every citizen is spiritually dependent for his character and for his standards of manhood upon the psychic influence of his nation," and he may even come to agree with the author on this less obvious proposition that "national idealism in the hearts of the citizens is in the nature of worship, of religious praise, and of that spiritual communion and dependence which inform prayer."

Part II. is a reinterpretation of Christianity in the light of science and of American idealism, and the third and last part treats of the expression of a National Religion in scientific language and democratic symbol. In those two parts the author covers some of the topics to which is devoted an earlier book, "National Idealism and a State Church."

J. H. L.

The Culture of Ancient Israel. C. H. Cornill. Chicago: Open Court Publ. Co., 1914. Pp. 167.

This is a series of interesting lectures by a professor of Old Testament history in the University of Halle, on the rise of the people of Israel, Moses as the founder of the monotheistic religion, music in the Old Testament, and the Psalms in universal literature.

J. H. L.

Work and Wealth: A Human Valuation. J. A. Hobson. New York: Macmillan, 1914. Pp. ix + 367.

In the first part of this treatise, the author is occupied with the exposition and illustration of a method of evaluating human welfare. He takes as material for demonstration the goods and services that constitute the real income of the British nation and seeks to reduce that income to terms of human welfare. "The second part applies the humanist principles established in the first, to the discussion of some of the great practical issues of social-economic reconstruction in the fields of business and politics."

J. H. L.

L'Idéal Createur, essai psycho-sociologique sur l'évolution sociale. D. Draghicesco. Paris: Alcan, 1914. Pp. xv + 440.

The author seeks to understand the origin, the meaning and the future of the idealistic movement which, he thinks, characterizes our times. He finds in contemporary philosophy a religious orientation. It is, however, in religion and in socialism that idealism

comes to concrete expression. The last chapter is devoted to an historical sketch and a criticism of socialism which, under certain conditions, "might become a religion. It comes nearer being a religion than it seems."

J. H. L.

Worship in the Sunday School. H. HARTSHORNE. New York: Teachers College, Columbia University, 1913. Pp. vii + 210.

Religious education is looked upon as a process of fostering attitudes and sentiments; recent discussion of the theory and art of teaching is used to present the aims and methods of religious instruction. An extended chapter on the psychology of feeling, and the analysis of Christian attitudes or "emotional responses," which the writer considers essential, reveal the influence of the doctrines of Shand and McDougall. The important attitudes are gratitude, good will, reverence, loyalty, and faith. The ritual, music, and instruction of the school are to be considered in the light of means to the end of rationalizing these attitudes and feelings. A noteworthy feature of the book is the suggestion of a method of finding out the actual effect of religious ceremonials upon children. Chapter VII. recounts an experiment in Sunday-school worship. In the Union School of Religion of New York City the opening exercises, for successive periods during one year, were devoted to the illustration and deepening of the attitudes noted above. The influence of the exercises upon the pupils was gauged as well as possible by means of oral and written answers, by the impressions of teachers, and the judgment of Professor Coe and the chorister. The evidence tends to show that there was an improvement in the group atmosphere, and a widened comprehension of the content of the sentiments encouraged by the ritual and lessons. A method of determining the fruits of school procedure, however rough the measure, is a valuable precedent and if followed by religious organizations generally would doubtless lead to a needed re-examination of pedagogical aims and practices.

E. L. TALBERT

Das Apriori der Geistesbildung und dessen Betonung als Andacht. H. LEHMANN. *Zsch. f. Religionspsychol.*, 1913, **6**, 341–372; 375–387.

In the unfolding of spirit there is a moment of pure unmediated activity in which the particular and sensuous are transcended.

This independent creative moment, which must be postulated a priori, may be termed an indifference point: from this center in varying degrees of phenomenal and conceptual determination proceed the phases of experience which are fundamental,—the religious, the ethical, the aesthetic, the logical-scientific, and the psychological.

The interrelation of these types of experience is formally analyzed. In religious devotion, spiritual activity is felt as the inner working of that which is beyond space and time; that which is felt as formless acquires determination in the moral demand for universal laws of duty and right; the ethical gives an end to piety by demanding the realization of good in humanity. The illustration and expansion of the doctrines of Kant is the declared purpose of the writer.

E. L. TALBERT

La psychologie des phénomènes religieux. J. H. LEUBA. (Trans. by L. COUS.) Paris: Alcan, 1914. Pp. 441. 7 fr. 50.

One of the criticisms of Professor Leuba's original book was that it did not correlate the respective standpoints of the "individual" psychologists and the "social" psychologists (sometimes termed "mere" sociologists). Sociologists tend to claim that a sufficient method is a structural analysis of practices, institutions, and "social forces," which, operating in a given group, set up a collective mind not describable in concepts ordinarily offered by an "atomistic" psychology. The "individual" psychologist returns the compliment, points to the abstract, metaphysical nature of the sociologist's categories, betakes himself to describing the "contents of consciousness" open to the introspectionist, and insists that only the "inside" viewpoint is tenable.

To discuss this moot point several new sections are added in the French edition. In chapter 2 Durkheim's identification of the sacred with the traditional is questioned on the grounds (1) that the definition is too wide, since much that is traditional is not sacred, and (2) that Durkheim neglects to give an analysis of the elements of awe and subjection to superior powers which attach to sacred objects. A specific type of behavior in the religionist must be an essential side of the concept. A like defect is evident in the work on magic done by Hubert and Mauss. They do not make a clean distinction in kind between religion and magic. The more social, organized, public, and traditional rites are said to be religious, as contrasted with the more private, individual, and suspicious

character of magical ceremonies. This statement does not give an adequate differentia. As is well known, the author finds the differentia in types of attitude for the understanding of which a psychological description is called for.

In the appendix is added a section which deals with the relation of individual to social psychology. Noting that Durkheim does not use the term social psychology to characterize his field, the author proceeds to show the necessity of correlating the method of the introspectionist and the "objective" method in the explanation of the phenomena of religion.

E. L. TALBERT

The Psychology of Religious Sects. H. C. McCOMAS. New York: Revell, 1912. Pp. 235.

Material on the origins and present status of sects, an attempt to distinguish "types" of mentality and to trace environmental conditions in relation to sect-grouping, and advocacy of a union of separate sects now warring over belated and trivial issues constitute the chief items of this book. Since the book was written there have appeared several interpretations of social psychology which advance our knowledge beyond the point reached by the author. As compared with the discussion in Coit's *The Soul of America* one notices little recognition of the national significance of wide-awake religious groups which, like political parties in their platforms, may set themselves to the task of formulating and defending the nation's changing moral ideals. The writer insists that "natural" influences explain sect-grouping. He does not extend this viewpoint so as to relate the genesis and function of religion to social processes. Hence that aspect of religion which Coit strenuously contends for, its function as the "higher politics" of the nation, is unstressed.

E. L. TALBERT

Comment se maintient et se renforce la croyance. J. M. LAHY. *Rev. phil.*, 1913, **75**, 568–592.

The ceremonials and beliefs of the natives of Melanesia are illustrative of the forces operative in popular religion. For appreciating the phenomena of non-rational tradition the norms of collective psychology are indispensable. The critical scientific bent craves facts open to direct inspection: the mind of the Melanesian group is filled with vague images, inhibiting taboos, emotions,

and biases. In communal ritual and myth the Melanesian feels vaguely the unity of his experience. Spirit entities serve to coordinate the confused items of his world.

In the Duk-Duk ceremonial the drama of birth, regeneration, and death is symbolized. Expectations aroused by general belief are embodied in the coming of the mysterious Spirit. The ritual is carried out under emotional strain, and in its function of connecting past, present, and future so that members of the group may realize their common destiny the ceremonial is comparable with the Mass of the Roman Church. The attitude generated in the "secular" festivals is identical with the group feeling intensified by the religious ritual: seriousness and mystery, hope and fear are more vividly experienced in the elaborate dramatization in which spirit agencies appear.

Although the native women are said to joke clandestinely about the mummery and human character of the ritual, even they are controlled by the power of suggestion, repetition of tradition, and fear. To assert that fraud is consciously practiced is to forget the ideal world of illusion in which the Melanesian lives and to fail to take the non-scientific standpoint of primitive men.

The author discusses the importance of initiation ceremonies, the nature of taboo, myth, suggestion, and feeling, employing conceptions familiar in recent anthropology.

E. L. TALBERT

The Social Function of Religion. C. A. ELLWOOD. *Amer. J. of Sociol.*, 1913, 19, 289–307.

Religion is belief in the reality of spiritual life. Following the consensus of recent opinion, it may also be defined as the participation of the individual in ideal social values. An emotional, valuing attitude always obtains. Genetically the dominant function of religion has been to lend support to custom and moral ideals: it has also been non-conservative in its advocacy of standards beyond the ones achieved. Two dangers beset it,—the materialization of human desires and a mechanical and negative outlook due in part to the vogue of natural science. The conclusion is that until a church is socially effective in the fostering of moral idealism, law, and government, science and education will not succeed in making social and individual life more harmonious and progressive.

E. L. TALBERT

BOOKS RECEIVED

REY, A. *Psychologie et Philosophie.* Paris: Cornely, (no date). Pp. 355.

REDDINGIUS, R. A. *Wat is zien?* The Hague: Nijhoff, 1906. Pp. 169.

HÄBERLIN, P. *Wissenschaft und Philosophie; ihr Wesen und ihr Verhältnis.* Bd. II, Philosophie. Basel: Spittler, 1912. Pp. 427. M. 6.

BRANDELL, G. *Skolbarns intressen; en psykologisk-pedagogisk undersökning.* Stockholm: Carlsons, 1913. Pp. viii + 256.

BRANDELL, G. *Fantasien; en allmänpsykologisk studie.* Stockholm, Carlsons, 1914. Pp. 105.

WALLACE, W. *The Musical Faculty: Its Origin and Processes.* London: Macmillan, 1914. $1.75.

HOLT, H. *On the Cosmic Relations.* Boston: Houghton Mifflin, 1914. 2 vols. Pp. viii + 989. $5.

NOTES AND NEWS

THE present number of the BULLETIN, dealing with Social and Religious Psychology, has been prepared under the editorial direction of Professor J. H. Leuba, of Bryn Mawr College. Arrangements had been made by Professor Leuba for reviews of German and French publications similar to that of British contributions by Mr. McDougall, but on account of the war the authors could not prepare their promised articles.

DR. G. R. WELLS has been promoted to an associate professorship of psychology in Oberlin College.

DR. JOHN ELLIS EVANS, of Columbia Unversity, has been appointed instructor in psychology in the Ohio State University.

ON October 19 Dr. C. E. Ferree, of Bryn Mawr College, lectured before the Section of Astronomy, Physics, and Chemistry of

the New York Academy of Sciences on the 'Efficiency of the Eye under Different Conditions of Lighting.'

PROFESSOR J. H. LEUBA, who is in Switzerland, writes: "The Swiss universities will open as usual this winter and few of the professors will be absent. It is also understood that the Italian universities will open. The Sorbonne will open, although many of the professors and lecturers are under arms. No definite information regarding the German universities has been received."

THE following items have been taken from the press:

DR. TH. LIPPS, professor at the University of Munich, has died at the age of sixty-three years.

THE Civil Service Commission of Cook County, Illinois, announces an examination during the last week in January for the position of director of the Psychopathic Institute in connection with the juvenile court. The position carries a salary of $5000 a year.

J. C. DE VOSS has been appointed professor of psychology and education in the Kansas State Normal School at Emporia.

AT the University of Pennsylvania E. B. Twitmyer has been promoted to a full professorship, F. N. Maxfield to an assistant professorship, and D. Mitchell and F. N. Reiter have been appointed instructors.

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.

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