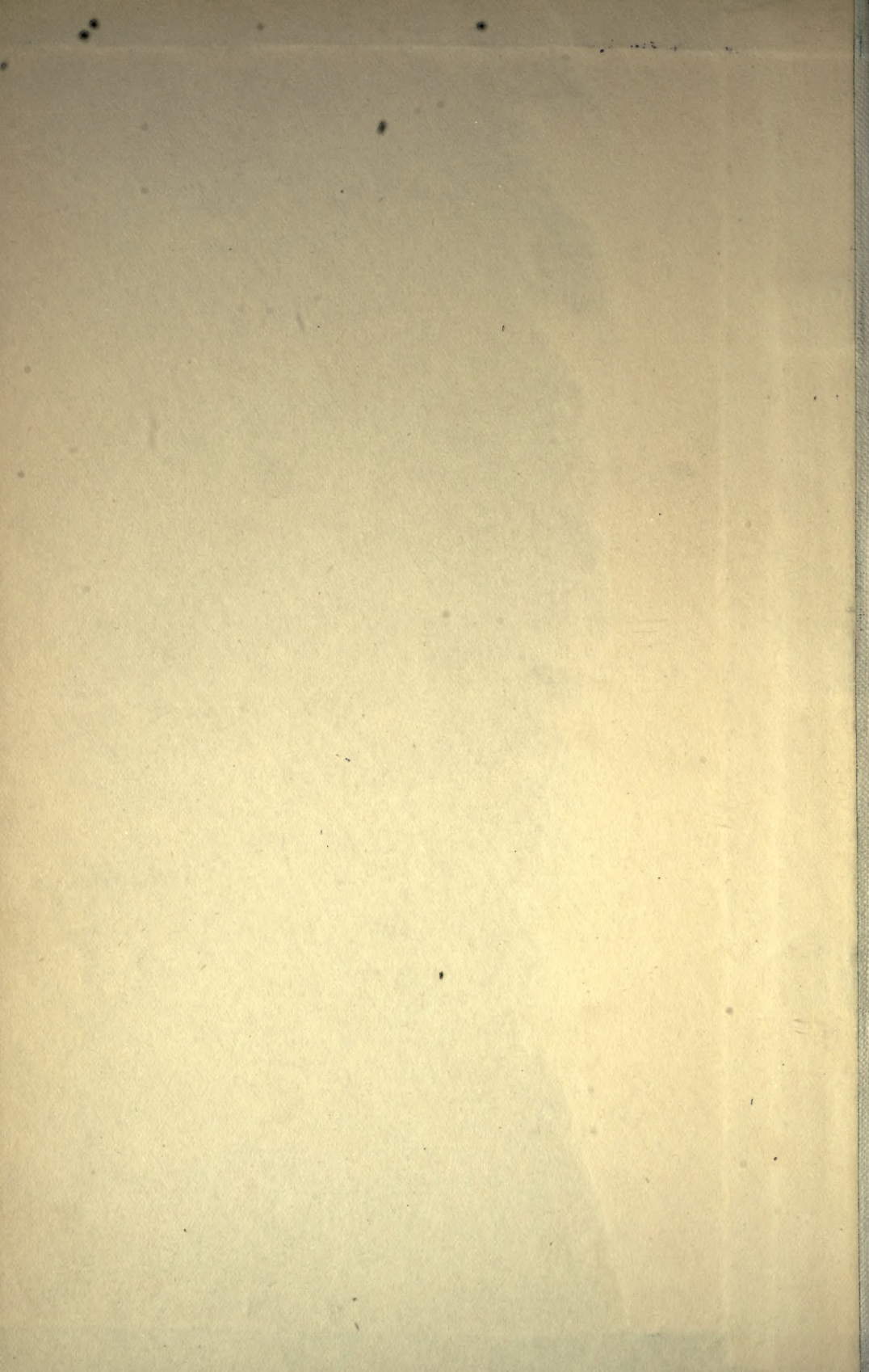
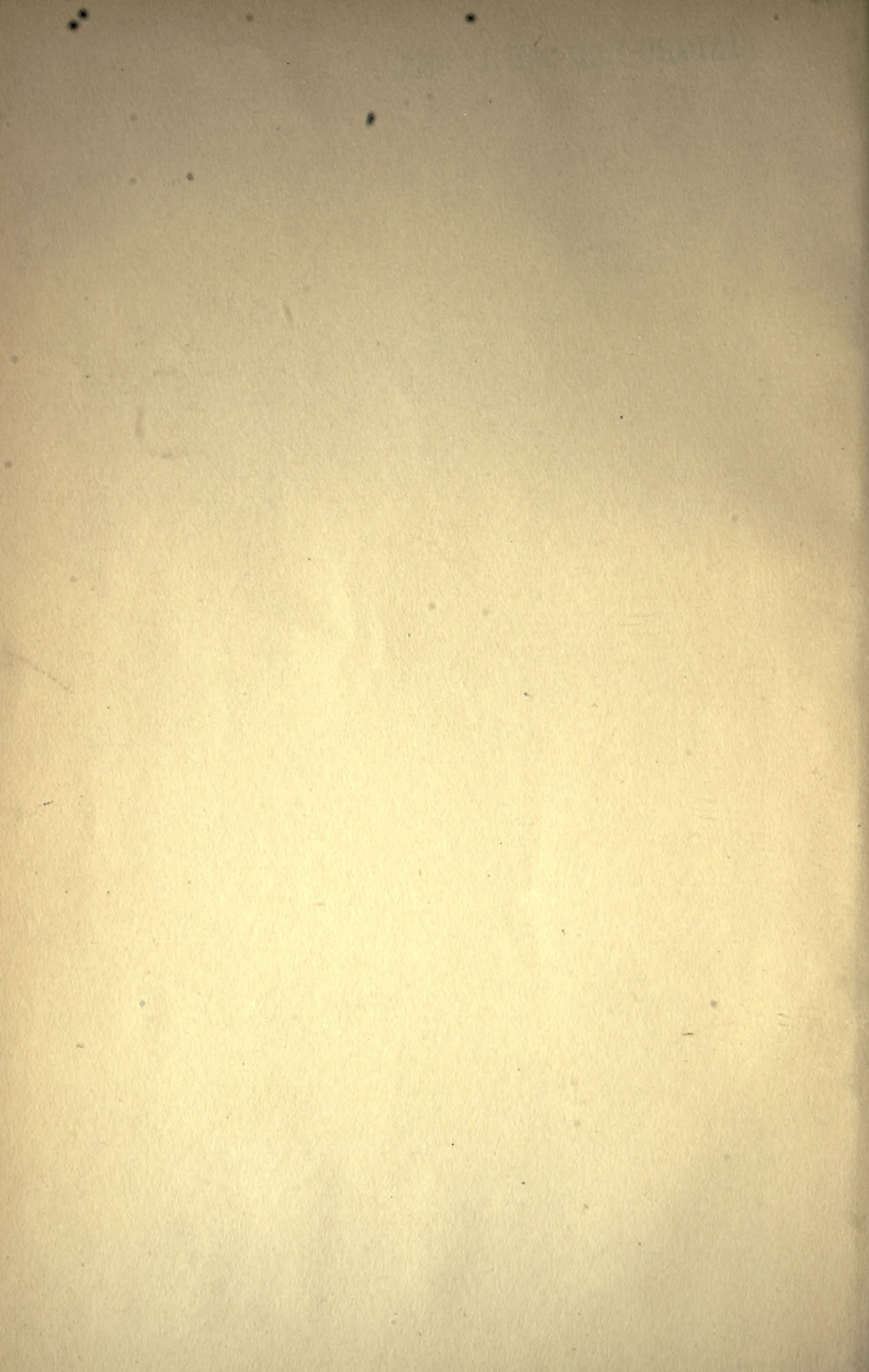


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THE

Psychological Bulletin

EDITED BY

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F'THE LUWA
MIKE HAVE A
HEART, I'VE BEEN
THRU FOUR UV
THEM.



CAN'T HELP IT
YOUR NAME
AINT ON THIS
LIST

GOSH!
WHAT
KIND
UV
WAR
IS THIS
ANYWAYS



ON THE FIRST PAGE NOTICE
A SQUARE WITHIN THAT SQUARE
IS A TRIANGLE AND IN THE
SQUARE AND TRIANGLE IS A
CIRCLE, IN THE CIRCLE NOT
IN THE SQUARE BUT IN THE
TRIANGLE PUT THE FIGURE
FOUR BILLION AND NOTHING.
DO NOT WRITE UNTIL I SAY
GO, WHEN I SAY
GO, GO!



UNDERLINE TWO WORDS WITH THE
SAME MEANING, PALAEOZOIC,
FOSSILIFEROUS, PERIPHRASTICALLY
SZAIBELYTE, NOW I'M NOT TOO
SURE ABOUT THOSE
TWO?



LET'S SEE HERE'S ONE
THAT'S GOT ME STUMPED,
A ZULU HAS HOW MANY LEGS?
EPIGASTRIUM SHOULD, ESOPHAGUS
IS WHAT, I'LL HAVE TO GUESS
AT THAT ONE!



GOSH! I USED TO BE SMART FOR
THIS KIND OF STUFF. NOW LET'S
SEE IF 6 IS MORE THAN 4 CROSS OUT
5, 6 IS TO 11 WHAT 3 IS TO 6 THEN
WHAT IS
8 TO 9
?



WE CIRCLED AROUND THEM, THEN DROVE
THEM INTO A TRIANGLE, AND THEN BOXED
THEM INTO A SQUARE. GEN.
CZAI BELYTE WAS
OUR COMMANDER
WE FOUGHT ZULUS,
CROSSED EPIGASTRIUM
AND ESOPHAGUS, ALL WE
NEEDED WAS THE WORD
GO. GOSH! IT WAS A
AWFUL WAR.



SCARE LEBURE
U.S.A. '18

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

HISTORICAL CONTRIBUTIONS

BY WOODBRIDGE RILEY

Vassar College

The work of the year illuminates the statement of Chiappelli that the object of philosophy is not a stable entity but a progressive synthesis, a vast integration of the sciences, from the numbers of the Pythagoreans to the élan vital of Bergson (5). Thus Alexander describes Plato's cosmological speculations from the humanistic point of view, and points out the importance of the Platonic tradition in the idea of an orderly and comprehensive system of the universe (1), while Robin shows that besides the teleological physics of Plato there is a mechanical side, even the Demiurge, as servant of the elements, coming under mechanical causation (17). So, too, Aristotle's "other logic" contains not only the characteristics of the traditional system, but also those further meanings which have been introduced into the science under the "new logic" (19). And the same holds true of the Middle Ages, the philosophical programme of the University of Paris being closely affiliated with a classification of human knowledge which was accepted by all the scholars of the thirteenth century, its sociological value lying in its satisfaction of the international aspirations of the times for one science, one system and one religious faith (6).

In modern philosophy, likewise, the theoretical and the applied are to be found conjoined in those speculations of Descartes connected with such varied subjects as optics, colors, the circulation of the blood, the refraction of light, and the weight of the air (13). Even the idealistic Berkeley perceived that most of the traditional

Euclidean geometry must be rejected, and in examining the logical basis of mathematics brought about an eventual establishment of a method of limits akin to that of Newton (8). In France, also, it is contended that Destutt de Tracy's ideology was based on a sound economic science of the happiness of society, and that his abstract logic gave way to a clinical method of observation (9). So much for European philosophy. A French comparative study shows that the logic of India and China, like that of the West, begins as a sophistic and ends as a scholastic, but that while Plato, for example, hypostatizes, the Orient gives no ontological value to its logical concepts, considering such to be merely so many states of mind (10). The same author reviews recent studies in Islamic and Jewish mysticism, in Buddhistic psychology with its subtleties and crudities, in Hindu realism, neglected because of the better known Buddhistic idealism, and in early Chinese philosophy, similarly little known because of the intervening Confucianism (11).

As to work by American authors we have a number of contributions indicating a rapprochement with French thought such as Marvin's scholarly history of European Philosophy (12), a translation of Flournoy's brilliant treatise on William James, emphasizing his rejection of monism and his advocacy of pragmatism and "tychisme," (7) the latter akin to Boutroux's contingency. Reciprocally, Schinz investigates the French origins of American transcendentalism (18), Riley contrasts this with the German transcendentalism (15), and also traces other French influences from Voltaire to Cousin (16).

Coming to the war Yerkes contrasts the lack of practical applications of psychology in Europe with the remarkable work done by the American Psychological Association in our army training camps, from segregating the incompetent to classifying recruits according to their mental capacity, and assisting in the selection of competent men for responsible positions, such as gun layers, air pilots, and officers (20). This is positive; from the negative side the New York Psychiatrial Society observes with distrust the growing tendency of some untrained psychologists to deal with the problems of diagnosis, social management, and institutional disposal of persons suffering from abnormal mental conditions and deplores tests carried on in schools, courts and correctional institutions and so-called psychological clinics quite independently of competent medically trained workers (2). As to Freudianism Putnam asks what justification there was for the defection of Adler and Jung from

Freud, and answers that Freud's strong accentuation of the sex motive prevented him from adequately filling the position of a judicial student of human motives as a whole (14). Burrow, on the other hand, contends that these two critics have contributed, more than any others, to check the necessarily difficult progress of the Freudian tide, largely because of the rigid scientific formulation of Freud with respect to the sexual libido (4). An exaggerated case in point may be found in Blanchard's psycho-analytic study of Auguste Comte, which puts Comte's own account of his "crises" in the Freudian jargon, and attempts to show a discrepancy between the early Positivism and the later Religion of Humanity (3).

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GENERAL STANDPOINTS: MIND AND BODY

BY WALTER T. MARVIN

Rutgers College

The American Philosophical Association selected Mechanism versus Vitalism as the subject for an organized discussion to be held at its meeting last December. Five leaders of this discussion were appointed and these leaders held a preliminary conference last June, after which they published "A Basis of Reference" and abstracts of their papers (13). This Basis of Reference attempts to present "an objective statement of the present condition of science bearing on the problem of mechanism and vitalism." The five papers were published later. Henderson (11) points out that there are two antimechanistic theories now in the field: Haldane's theory and vitalism, such as that of Driesch. Against Driesch Henderson maintains that his argument against mechanism is not of the character of scientific proof. Driesch talks too confidently about things that no one of us as yet understands. Against Haldane's view that biology is concerned with organization and not with physicochemical phenomena Henderson maintains that organization is not merely biological and that the fact of organization is not sufficient to overthrow the mechanistic hypothesis. Jennings (14) finds three classes of vitalistic theories. The first questions the adequacy of experimental formulation for the phenomena of life. "The second, accepting such formulation, maintains that when applied to the living it yields elements and laws diverse from those reached by the study of the non-living. The third class holds that life reveals the characteristics of the universe more directly than does the non-living, so that biology is more fundamental than physics." The first class of vitalistic theories is liable to lead to experimental indeterminism, in other words, to a belief in the failure of the experimental method in biology. As to the second class, biological science can do little at present either to refute or to establish such theories. The third class of theories is consistent with experimental biology but lies in a field of discourse outside that science. Warren (20) finds the argument against mechanism based chiefly upon four lines: (a) Inconceivability of mechanistic explanation; (b) Organization cannot be explained mechanistically; (c) Voluntary selection or choice in human beings is non-mechanistic; (d) Teleology, or "the adaptive

character of behavior is not fully describable in mechanistic terms." Besides pointing out the fallacies in the first two arguments Warren shows that psychology is today explaining voluntary selection and teleological behavior mechanistically. Marvin (16) finds the issue between mechanism and vitalism not merely scientific but religious. Vitalism is distinctly allied with romanticism and its reactionary religion; whereas mechanism is allied with the religion of progress, optimism, and enlightenment. Hoernlé (12) supports the thesis: "Not mechanism *or* vitalism, but mechanism *and* teleology." Biology has to concern itself "about the larger questions of the origin and status of life in the system of nature as a whole." Mechanism and teleology are not contradictory but cumulative; and teleology is *logically dominant* over mechanism in biology. Freed of vitalistic implications we need teleological concepts, "concepts so general that conscious designs or desires are but a special type falling under them."

A similar symposium was held by the Aristotelian Society. Haldane (10) points out that physical categories practically sufficient as short cuts in physics are insufficient practically in biology. Hence in biology we must use special biological conceptions, "the relation of which to the physical conceptions must for the present remain more or less obscure for lack of data." Similarly biological conceptions are insufficient practically in psychology. Thompson (10) states his position thus: the material body of a living being (apart from consciousness) is a mechanism. It cannot be studied except with the help of physical and chemical methods. "It is a part of a physical system; I study it, as well as its environment, according to the working hypotheses, or categories, of physical science, with all my might and without either hesitation or fear. It is its physical or material phenomena, admittedly, that I am studying. What more, outside of psychology and outside of metaphysics, can I do?" Mitchell (10) believes that though life and mind cannot with our present knowledge be explained in terms of physics yet the trend of science is ever toward synthesis. At present this trend toward synthesis is moving away from the mechanical and is approaching rather than receding from psychology. Hobhouse (10) finds the organic in a general sense purposive, purposive and mechanical being fundamentally distinct categories. "The mechanical view must break with evolution and postulate a detailed predestination." Predestination (determination by an exterior purpose) seems the only alternative to the admission of determination by internal purpose.

The problem of vitalism versus mechanism is discussed also by Mourgue (17). He points out that physical science itself is not a closed system with fixed premises but that the physicist adapts his postulates and resulting theory to the special problem he is trying to solve going even so far as to admit principles quite contradictory to classical physics. Hence it is irrelevant to maintain that a certain physical theory fails to explain a given biological fact. Some biological facts we know to be explicable by certain physical theories. Other biological facts may call for quite novel physical assumptions. The two important points are first not to let vitalism be the name of a dogmatism and second to see in physics an experimental method rather than a fixed doctrine with fixed postulates.

Behaviorism also continues to be a prominent subject of discussion. De Laguna (8) in a study of Washburn's *The Animal Mind* finds a far less radical difference than is usually supposed to obtain between the treatment of problems as set by the dualist and the treatment of these problems as set by the behaviorist. "What the dualist does in effect is to add on an interpretation which can only be characterized justly as 'metaphysical.'" On the other hand the behaviorist can find "a place for much of the empirical procedure which is labelled introspection" and this without becoming a dualist. Bawden (1) writes on the presuppositions of behaviorist psychology. Mind is behavior of a certain sort. "It is behavior in which certain objects which serve as excitants are undergoing experimental reconstruction into stimuli adequate to the incipient response." Mind is thus not a faculty over and above the mechanism of behavior. It stands for certain observed uniformities, which psychology as a science attempts to describe and explain. Bode (3, 2) argues to much the same result. Consciousness is "a name for the control of conduct by future results or consequences." It is essentially experimental; for "all experience is a kind of intelligence, a control of present behavior with reference to future adjustment." "The relatively unorganized responses of the present moment, in becoming reflected in the experienced object, reveal their outcome or meaning before they become overt, and thus provide the conditions of intelligent action." It is "this behavior that is the peculiar subject-matter of psychology." Behaviorism is not to be confused with neurology or biochemistry. It is the study of certain facts in relation to other facts, viz., "the ends that are achieved through conscious behavior." It is when we ignore this relation that "consciousness is able to maintain

itself in a state of metaphysical isolation" as in the traditional psychology Marshall (15) finds in Watson's behaviorism an abandoning of psychology altogether and a discarding of the concept of consciousness. As to Bode's belief that consciousness is a particular kind of adaptation, "this is as though, having found that a definite form of crystal refracts light in a certain way, one should say that this particular kind of refraction is the definite form of the crystal." Dewey (9) protests that "there is no more reason for supposing that personal events have a nature or meaning which is one with their happening, and hence open to immediate infallible inspection, than is the case with impersonal events." They too set as a task, the discovery of their connections. Robinson (18) after examining the behaviorism especially of Watson and of Holt concludes that behaviorism cannot explain recognition, memory, or response to a foreseen situation. "Psychology is the science of the conscious organism *qua* conscious." "Behavior is not the characteristic, still less the sole, category of psychology."

Finally, the mind-body problem also continues to be a frequent topic of discussion. As pertinent to the present issues Dashiell (6) endeavors "to trace back the distinction of mind and body to its manifold roots—roots in unreflective as well as reflective manners of thinking, primitive as well as sophisticated." Broad (4) defends interactionism. The mind in acting on the body probably does not alter the total energy but is merely directive and selective. In the case of voluntary action the mind probably directs by modifying the resistance of certain synapses. To regard the body as merely a physicochemical system assumes that it would behave as it now does if no mind were connected with it. Carr (5) maintains that interaction is not theory but fact. Mind and body are individual organizations and complement and coöperate with one another. They interact as whole with whole. They represent two antithetical principles, freedom and necessity, and as such are essential to the process of living action. Sellars (19) offers the following answer to the question: What is the probable function of consciousness? "The cerebral processes involved in choice are processes of internal adjustment within a system in the making." The function of consciousness is "to aid in the bringing together of the parts into a new integration by the cues it affords. Literally, it assists the brain to solve problems." "Of this process of integration, the only part open to inspection is, of course, consciousness itself." De Laguna (7) finds the solution of the mind-body prob-

lem in the fact that the central nervous system is not primarily a physiological organ. Its primary function is to adjust behavior to environment. It is this function that constitutes the correlate of feeling and thought.

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CONSCIOUSNESS AND THE UNCONSCIOUS

BY A. P. WEISS

Ohio State University

The opinions of the professional psychologists on the topic of consciousness and mind seem to have shaken down to a degree of uniformity that does not call out lengthy discussions. Contributions are mainly directed toward an analysis and criticism of behavioristic and psychoanalytic conceptions of consciousness and its derivatives. Calkins (4) is disposed to attribute the force of Holt's teaching to implicit references to the "frustrated or confiding child; to the truthful or untruthful parent," regarded as *purposing selves* in social relation, rather than as higher organisms of *integrated reflexes*. Bawden (1) in discussing the natural-science conception of mind, calls attention to the fact that no matter how profound may be the transformation through which our ideas of subjective experience may pass, scientific method will not deny a place in the system of the universe to the *facts* represented by it. The distinguishing marks of the mental he regards as: The capacity of an organism to use one part of its experience to control another and especially the capacity to control experience by the use of language symbols; the social-individual amplification of experience. Mind, he concludes, is not an organ or function or faculty over and above the mechanism of behavior. Like gravitation or evolution, it is merely a generalization from certain facts—the statement of a type of relationship. Explaining wish-fulfillment from the standpoint of behavior, Watson (12) points out that in the development of habits there is always conflict. We cannot become both saint and millionaire at the same time, and those tendencies to action that are thwarted lead to more or less maladjustment which is exhibited whenever our higher and well-developed habits of speech and action are dormant, as in sleep, in emotional disturbances, etc. Where the maladjustments approach a pathological condition, psychoanalysis may reveal their nature so that the physician can assist the patient to form new sets of habits which do not conflict. After differentiating four factors in the art of mental healing, Rahn (10) contributes directly to the reviewer's topic by ascribing to the *libido* of the psychoanalysts a function similar to that of the *Aufgabe* or preliminary instructions in an experiment in normal psychology. The concept of the libido whatever its scientific status, he regards

as of high pragmatic value in teaching the patient "to know the good and how to do it." Woodworth (14) holds that the tendency toward fixed symbolism in dream interpretation is of little value in scientific psychology, whatever may be its value in abridging the labor of psychoanalysis. Continuing his scrutiny of other Freudian concepts such as the libido, suppression, complexes, the censor, he concludes that if we eliminate the exaggerations, the spectacular applications that are the exception rather than the rule, the implication of psychical determinism, we find only such phenomena as are amenable to regular psychological explanation.

Prince and Haeberlin independently report that an attempt to analyze the individual peculiarities of action in the carrying out of a post-hypnotic suggestion, reveals very few ideational components. The subject merely "feels" he must do it. Under subsequent hypnosis, however, a wealth of ideational elements are reported as having been *subconsciously* present at the time the act was performed. Prince (9) regards this as indirectly demonstrating that subconscious processes exist and proposes the name *coconscious* to distinguish them from those mental processes actually present during the action. He further concludes that these coconscious images may actually emerge into consciousness, masked as hallucinations, symbolisms, dreams, somatic phenomena. By the aid of an interesting diagram he shows how coconscious images may be related to other mental processes. Haeberlin (6) who believes that psychology must understand the unconscious out of the conscious, uses the example to illustrate how the transition from the conscious to the unconscious may take place. The "feel" he regards as an affective tone which under normal conditions is amplified by ideational components of the experience represented. There are however affective tones that are not so amplified yet which refer back to some specific experience in exactly the same way. To such unamplifiable affective tones Haeberlin proposes to restrict the term *unconscious*. A more rigorous definition seems necessary, he thinks, because of the many shades of meaning that are being developed as the term unconscious is being introduced into anthropology, sociology and cultural history. Brink (2) considers the unconscious as merely a working concept to express that the mental life is a genetic and dynamic unity of which only a small part appears to *conscious* cognizance and thought. The concept of the unconscious implies for him the survival of a vitally affective past, created from past psychic experiences which now

influence the present and thus make the past accessible to scientific observation. Ultimate causes and explanations must include not only the individual span of experience but also the various grades of human culture represented by anthropology, mythology, religion and linguistics.

Insofar as a general tendency can be detected among psychoanalysts themselves, this is in the direction of an historical and anthropological analysis of psychoanalytic symbols. Burrow (3) examines the incest-awe and traces its origin to the subjective reaction resulting from an affront to an inherent psychological principle of unity. White (13) commenting on the Adlerian concept which holds that the fundamental psychological element in the neurosis is the feeling of inferiority, which feeling in every case finds in an inferior organ, regards this conception as a broad formulation of great scientific and philosophic value, constantly reminding us that the capacity for psychological readjustment may be much assisted by organ analysis. To make the concept more practical and of greater therapeutic value however, its interpretation along more strictly Freudian lines is held to be necessary. Jelliffe and Brink (7) compare some of the dreams of animals reported by their patients with the fables in the *Metamorphoses* of Ovid and with earlier religious practices in which animals played a part. They find striking resemblances and conclude that animals are used, first as objects of the libido and later as libido symbols, especially for repressed incest feelings toward the parents. Animals lend themselves well for unconscious elaboration because they represent the lower forms of man's nature. Rank and Sachs (11) maintain that the origin and development of civilized life cannot be completely understood when the study is restricted only to conscious factors. It is regarded as equally important to include the psychology of the unconscious. Following a chapter on the "Unconscious and its Forms of Expression" are six chapters devoted to illustrating the significance of psychoanalytic methods in (1) myth and legends, (2) theory of religion, (3) ethnology and linguistics, (4) æsthetics and psychology of art, (5) philosophy, ethics and law, (6) pedagogy and characterology. Lay (8) has written a popular exposition of psychoanalysis which should prove interesting and instructive to the class of readers for whom it is intended. In an article showing the influence of psychoanalytic principles on sociological problems, Groves (5) gives quotations from other writers which he believes support the conclusion that Freud has established a causal category

in the science of mind that will be of greater value to sociologists in the understanding of human conduct than the parallelistic relationship between mind and body held by some psychologists.

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BIBLIOGRAPHICAL

BY HOWARD C. WARREN

Princeton University

Poffenberger (10) has devised a scheme of classification for psychology according to the Dewey decimal system, based upon the plan used in the Psychological Index. The Dewey scheme was devised before the new movement in psychology was fairly started and presents numerous defects from the present-day standpoint. The Index plan was not found practicable for general library use owing to its detailed subdivisions. The new scheme has been adopted in the Columbia Library and is reported to be satisfactory.

A brief list of books and articles by army officers on the psychology of war, leadership, and kindred topics is given in the preliminary report on S. A. T. C. courses (12). The literature on these topics is very limited at present for obvious reasons. It may be expected to take a decided leap before our next report.

The literature on "mental tests" continues to pour forth in steady volume and a bibliography of the topic is much needed. Mitchell and Ruger (8) give 1,428 titles covering the entire field, with brief notes on each title. It is the most complete list to date. Kohs (6) gives 457 titles (also annotated) for the years 1913-17; the work is not confined to the Binet tests exclusively. Crafts includes a number of titles of mental tests in his bibliography on juvenile delinquency (5). This and the companion list (3) give a bird's-eye view of recent progress in scientific criminology. Most of the references are repeated in Crafts's larger bibliography (4), which contains 956 well-chosen titles. Otis's lists (9) are more recent and do not duplicate Crafts's work.

A bibliography of Josiah Royce's writings was noticed in our last report. Loewenberg (7) supplements this with a list of Royce's unpublished lectures and other papers. Among other psychological material is the course of public lectures delivered at Harvard in 1893 on "Topics in Psychology of Interest to Teachers." It is to be hoped that these are in sufficiently complete form to justify publication. The bibliography of C. S. Peirce's writings (2) contains several papers of psychological interest.

The Psychological Index (1, 11) has continued to appear during the war period, despite numerous difficulties. The number of foreign titles is somewhat less than usual, owing to the suspension of psychological activity in the countries most vitally affected by the war; but the production in America does not appear to have diminished up to the close of 1917.

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APPARATUS

BY C. E. SEASHORE

University of Iowa

The problem of chronoscopes is still unsolved. The whole matter should be surveyed by a committee of the American Psychological Association for the purpose of determining the relative merits of existing instruments for the guidance of those who are equipping new laboratories. Klopsteg (4), Claparède (1), and Warren and Reeves (9) report modifications of the Hipp chronoscope; but the most suggestive contribution is that of Dunlap's (2) account of the "Johns Hopkins Chronoscope" which is essentially a synchronous motor with magnetic release and stop of the pointer.

McComas (6) has designed a rather complicated serial action apparatus in which four colored light stimuli are associated with four reaction keys, and a graphic time record is made of the responses in a continuous chain of reactions. Richmond (8) has pointed out a series of errors in the ordinary reaction key, and recommends that it be suspended in the air clasped by thumb and finger, reaction being made by the withdrawal of the thumb. Kohs (5) has made a careful analysis of a series of errors in the Smedley dynamometer and finds them very serious, even as much as fifteen pounds. He thinks that the dynamometer can be used if each instrument is standardized by itself.

Goddard (3) reports on the successful use of the very simple

tilting board and rotation table which is made by suspending ropes from the ceiling. G. R. Wells (12) describes a modification of the mirror writing apparatus by which deviation from the star which is to be drawn is registered by the electrical contact device. The instrument, however, seems to be of doubtful value, as it does not give detail in the record and is much more complicated than the ordinary apparatus.

Weiss (11) has given us what seems to be a very serviceable exposure apparatus in which the degree of focus, size, and illumination, and time of exposure are under control. It seems to be admirably adapted for a large range of experiments in which such full control of stimuli is needed. Weiss has also described (10) what seems to be a very satisfactory construction of the limen color mixer, in which the essential factors are under control.

A valuable contribution toward the reviewing of available color filters—the neutral filters—is given by Reeves (7) working with the Eastman Kodak Co.

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TEXTBOOKS AND GENERAL TREATISES

BY HERBERT SIDNEY LANGFELD

Harvard University

Angell's *Introduction to Psychology* (1) cannot be considered a revised edition of his older textbook. Although the arrangement of the book is similar and the cuts are taken from the earlier book, there is an entirely new presentation of the subject matter. The author still holds to a structure-function distinction, but considers that such a position is too well-established to require any further justification. He has accepted from the behaviorists certain doctrines which he considers sound, but he has not been persuaded by their arguments to discard the data from introspection.

One influence of this movement which the reader will observe is the less frequent use of the term "consciousness"; another is a more explicit mention throughout the book of the adjustment of the organism to its environment. The influence of unconscious factors is also more strongly emphasized than formerly, although the principles of subconscious activity, especially attributed to Freud, are not included. The author also states more clearly his position in regard to imageless thought. Throughout the book he is whole-somely conservative and unbiased, with the desire to give full weight to those doctrines which have withstood the test of thorough investigation, and with a reluctance to accept theories which are chiefly characterized by their popularity.

The book is scarcely half the size of the old one. The same field has been covered, but the chapters have been very much condensed, only the most essential facts for a very general conception of psychology being given. It might be considered a skeleton of the former book. It is a good book for the layman who desires a knowledge of psychology, and for preparatory schools, but does not contain sufficient material to be used as the only textbook in a college course. It is written in the author's clear style, which makes it well adapted to the immature mind.

The book starts with the usual introduction on the methods and subject matter of psychology, and the various fields covered by the science. A short chapter follows on the various forms of behavior, both inherited and acquired, together with a description of the transition from conscious to automatic action, and several pages upon instincts. This chapter is presumably inserted here in order

to give the "functional set" to the reader's mind. Between the chapters on the "Nervous System" and "Sensation" are a few pages upon the formation of habit with special reference to movements and the rôle of consciousness, and a chapter upon "Attention," which further describes the process of adjustment of the organism, particular stress being placed upon the motor aspect of attention in analysis and synthesis. Under "Sense Perception," we have the usual treatment of space, time, and optical illusions. There is a short chapter on "Memory," which gives the main features and conditions, together with some of the abnormalities, of that process. Under "Imagination" one finds an explanation of the image, and the association of ideas. Under "Reasoning" is described the thought process, which concludes with a section explaining the disparity between human and animal intelligence. After explaining the variety of simple and complex feelings, attention is given to the relation of feeling and behavior. The James-Lange theory and Darwin's genetic view of emotions occupies most of the next chapter. After a few pages on instincts and their origin, there follow a few pages upon voluntary action, which includes facts of motor learning based upon the misleading results of Bryan and Harter. The book concludes with three short chapters on "Will, Instinct, and Character"; "Sleep, Dreams, Hypnotism, and Multiple Personality"; and "The Self."

Under the title *Dynamic Psychology* (10) are collected eight Jessup lectures for 1916-1917, given by R. S. Woodworth. There is a general plan to the book which unifies the various chapters into a short introduction to psychology, from the author's particular point of view, and polemic in style. A brief description of the contents will probably best explain the nature of this approach.

There is a short sketch of the development of modern psychology, followed by a chapter upon the problems and methods of psychology. Part of this latter chapter is taken up with a discussion of the merits and faults of introspective and behavior psychology. The dynamic view, according to the author, must utilize the data from both methods and that of brain physiology as well. According to this psychology, there are two problems—the one of "mechanism," and the other of "drive." These are the "how" and the "why" of mental activity, and it is the author's purpose throughout the rest of the book to answer these questions. In so doing, he draws from the various facts of conduct, both human and animal and of society. The distinction between "drive" and "mechan-

ism" is not an essential one in that a mechanism can become a drive. That is, the satisfaction derived from the fulfillment of an act can in itself become incentive and drive for sustained or future action, independent of any external motive. This is extensively illustrated and especially emphasized in the following chapters, as for example, in the next lecture on the "Native Equipment of Man" which deals principally with the instincts and takes exception to McDougall, who the author says would classify such native capacities as described in the chapter as intellectual processes rather than instincts; that is as mechanisms requiring drive. In disagreement with this position, "The great aim of the book is . . . to attempt to show that any mechanism—except perhaps some of the rudimentary that give the simple reflexes—once it is aroused, is capable of furnishing its own drive, and also of lending drive to other connected mechanisms." In dealing with "Acquired or Learned Equipment," particular attention is given to the conditioned reflex, and an extensive quotation from Locke is included to show that this form of adaptation is not an entirely modern concept. The author also considers the method of learning by trial and error, and by the use of the mechanism of skilled action. The results of Bryan and Harter with their "higher unit mechanisms," unfortunately form the basis of discussion here, as they do also in Angell's book. Under "The Factor of Selection and Control" is found the discussion of inhibition and facilitation of impulses, and of the selective agency or "mental set." In this context, the "drive becomes both a stimulus to activity" and the cause of selection. The discussion of the "Factor of Originality" begins with a description of the genius, and then turns to the originality of the ordinary man. Attention is called to experiments in the solving of problems. The two factors which inspire originality are the inner need of the individual and the obstruction to its fulfillment. The four qualifications for a good thinker are: (1) experience; (2) keen observation and sagacity; (3) flexibility; and (4) control.

In the lecture on "Abnormal Behavior," the author again applies his concept of "drive," which he believes to be behind abnormal reactions, although he admits that in the feeble-minded there is absence of both drive and mechanism. Further, he shows how the method of trial and error, and of substitution are employed by the abnormal mind. There is also included a criticism of Freud, which leads to the discussion of the sex impulses. The author

takes pains to show that this is not the only impulse in the complex emotion of love. The last chapter is entitled "Drive and Mechanism in Social Behavior." Here is reviewed the theories of motive, domination, submission, etc. The main contention is that there is a social motive drive just as there is a musical or mathematical motive. Man is interested in the social attitude as such.

Swift's *Psychology and the Day's Work* (9) is a collection of essays for the general reader with the efficient adaptation of the human organism to the varying conditions of the environment as the keynote. The text is profuse with illustrations drawn from the author's experience, from the biographies of great men, and from the general literature. In the opening chapter on "Mental Efficiency," the author gives many examples of both intelligent and unintelligent adaptation of men and animals. In the chapter on "Thinking and Acting," there are illustrations of correct thinking and various forms of arriving at conclusions and beliefs, and the process of productive imagination. In "Habit in Preparation for Efficiency," the advantages and disadvantages of habit of thought and action are shown. Several chapters are devoted to the results of well-known experiments on learning and fatigue. "Curiosities of Memory" is concerned chiefly with forgotten memories, and the various methods of recall by crystal-gazing, hypnotism, etc. This is followed by practical hints on the improvement of memory, based upon the results of classical experiments. In "Psychology of Testimony and Rumor," many of the vagaries of memory and the influence of suggestion are described. In "Our Varying Selves," the author shows that the normal mind is a complex of multiple personalities. The last chapter is upon "The Psychology of Digestion."

In *The Language of Color*, Luckiesh (5) has attempted to explain in a popular manner the numerous facts concerned with the color sensation, with special attention to the place of color experience in our total mental equipment. He has sketched the subject with bold strokes, devoting only a few pages to each of the many subjects treated. The book thus becomes a collection of suggestions rather than a handbook. He tells of the use of color names in mythology, effect of association in the use of such terms, and the use of color in the description of nature and its moods. There are also chapters upon the philological aspect of color names, and the references to color in literature. There are short descriptions of the place of color in painting, in the church, and in the theater. The second

part of the book is concerned with the symbolic value of the various colors, each color being treated separately, and examples being given from the various poets. The third part of the book deals chiefly with the psychophysiology of color, color preference, and the emotional and attentive value of color. The æsthetic value of color forms the subject matter of the fourth part of the book. Here we find the results of psychological experiments upon the effect of various distributions of color and a description of the harmonious relations of color. There are also chapters upon the use of color, and upon chromesthesia.

In Hocking's book, *Human Nature and Its Remaking* (2), there are sections, especially those upon instincts, which are of value to the psychologist. After describing the nature of instincts and pointing out that an instinct is a part of consciousness and therefore material for re-making, he discusses the number of instincts in the original nature of man. There are three reasons why some investigators have failed to find original instincts: (1) many instincts are balanced by their opposites; (2) the nervous arc—stimulus, central adjustment, muscular response—is not always clear; for instance, several instincts may have the same stimulus; (3) the same satisfaction is shared by several instincts; for example, a successful wooing may offer satisfaction not only to the mating instinct, but to the instinct of acquisition (if there is such). An interesting table of instincts is given. They are classified as positive (expansion) and negative (contraction), the latter being subdivided into aggressive and offensive. Curiosity, play, pugnacity, and fear are instincts of the second order. Classifications of instincts according to James, McDougall, and Thorndike are also given with an explanation of their general scheme. Thorndike in his attempt to apply consistently his plan of stimulus-response, becomes a "splitter," while McDougall is a "slumper" in the matter of classification. There are a number of instincts such as curiosity, which cannot be brought under the scheme of reflexes. These the author terms central instincts. He considers them the most significant of human motives, and therefore calls them necessary instincts. All these instincts have something in common, a nucleus which is the substance of the human will, and which the term "will power" in large part describes.

In Part Three, entitled "Conscience," the author in discussing the relation of conscience to instincts, says: "My own view is that conscience stands outside the instinctive life of man, not as some-

thing separate but as an awareness of the success or failure of that life in maintaining its status and its growth." The remainder of this part of the book is concerned chiefly with "Sin." The other parts of the book are entitled "Experience," including a chapter on the nature of pugnacity; "Society," including chapters on education and punishment; "Art and Religion;" and "Christianity."

Jastrow's book, *The Psychology of Conviction* (4), is a collection of essays, most of which have already appeared in magazines. Three of them are printed for the first time. "The Psychology of Indulgence," "The Feminine Mind," and "Militarism and Pacifism." The nature of the last essay does not call for a description here.

In the essay upon "The Psychology of Indulgence: Alcohol and Tobacco," the author takes a stand against unreasoning prohibition. Indulgence has its virtues, for there is a benefit in relaxation, change, social intercourse, etc., and the conditions under which indulgence in tobacco and alcohol can continue without harm should be studied scientifically. If indulgence leads to excess, the fault lies not in tobacco and alcohol, but in the individual. If the laws cannot control indulgence in a certain race so that the benefit remains greater than the harm, prohibition may be necessary, but the problem should be approached in a spirit of intelligence and open-mindedness, and with the knowledge that suppression may cause still greater evils.

In "The Feminine Mind," the author reviews the sex-determined differences of the masculine and feminine mind. He considers that the mind of woman is a distinct type. That tests fail to disclose marked differences is because of their inadequacy. He believes that the results of tests which show that women are as well-fitted as men for all vocations are false. Either the tests are incapable of discovering the truly significant differences, or the interpretation of the statistics is incorrect. Also the fact is overlooked that small differences may be extremely important in determining the field of activity for which the individual is best equipped.

In *The New Rationalism*, Spaulding (8) devotes a few pages to the nature of consciousness, which he defines in agreement with several other realists, as a relation. He shows that this view is compatible both with the psychological theory that specific consciousnesses are events, for "events are themselves relational complexes," and with the behaviorists' point of view, in that when

physiological conditions are related in a specific way to the stimulus, then knowing is present and the behavior can be studied under this specific relation. He enumerates several fundamental problems of consciousness, such as the extent of consciousness in the universe and the nature of illusion, the latter problem being answered according to the theory of Holt. The illusions do not only exist in consciousness, but are real parts of the world; for example, two rails can be both parallel and convergent, depending upon the total conditions. There are also a few pages on the thought process with special reference to meaning as represented by words.

Hocking, in his book *Morale and Its Enemies* (3), gives the result of keen observation of the soldier both in France and in this country. The book contains many interesting psychological facts concerning the fighting man, together with an analysis of ethical and political values. There are two parts: "Foundations of Morale," and "Morale of the Fighting Man." He explains the importance of morale and its nature, which must be gleaned in the world of experience, as the subject does not lend itself to laboratory experiments. The fundamental of morale is a state of faith, and this being so the great aims of the war must be held in the mind if morale is to be of the victorious quality. In speaking of instincts, of which the tribal instinct and pugnacity are important, he says there must be intelligent motives back of the instincts, for the army is not a mob swayed by unreasoning impulses, but a group ruled by intelligent leaders. On this ground he takes exception to much that has been written upon mob psychology in connection with the war. Several chapters deal with national morale, the Potsdam attitude, and the true nature of the state. In the "Psychology of the Soldier," he states that the soldier is always upon the front line, in that his habitual attitude is one of protecting rather than being protected. His chief characteristics should be endurance, severity and courage. The author corroborates the experience of so many who have seen our men in France, that they have learned to face the truth and reality of life, and to live their natural lives. He further explains the nature and value of discipline and drill, and of prestige for command. A number of practical hints for establishing morale are given, such as appeal to the imagination, and the influence of the community upon the soldier. There are also chapters upon the nature and control of fear, and upon the sexual question, including the value of prophylaxis in this connection.

Norsworthy and Whitley's *The Psychology of Childhood* (7) is a

textbook intended for normal schools, and presupposes a general course in psychology. The source and characteristics of original nature and of social and non-social instincts are discussed. There are also chapters upon affective states, imagination, memory, habit, learning, moral, religious, and physical development, exceptional children, methods used in child psychology, and child life at five and eleven.

W. H. Mitchell has translated Cardinal Mercier's *The Origins of Contemporary Psychology* (6), which first appeared in 1897. The author's standpoint is that of Aristotelian and scholastic philosophy. He shows at great length the influence of Cartesian philosophy. Under contemporary psychologists he refers to Spencer, Fouillée, and Wundt. He also deals with positivism, mechanism, and neo-Thomism. He believes that no greater service can be rendered to scholastic psychology than by putting it in touch with results of modern science, including human, animal, and abnormal psychology, and anthropology.

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DISCUSSION

STUDIES IN HUMAN ACTION

The course of "Studies in Human Action for the S. A. T. C." as outlined by the subcommittee of the National Research Council was, I assume, something of an experiment in adapting psychological tradition to military needs. If that assumption is correct its value for future instruction will doubtless be increased by the frank criticism of those who taught it.

The S. A. T. C. at Wesleyan University was very fortunate in many respects. The military staff and the academic authorities worked in complete harmony. The morale of the unit was excellent. The continuity of work was less interrupted by the epidemic of Spanish influenza than was the case at many institutions.

The course of Studies in Human Action was given a fair trial under these favorable conditions. It was elected by 29 students, of whom 6 were civilians. A much larger number (about 80) had elected it and would have taken it save for conflicting requirements from the War Department. The class was conducted as a single section. The general plan and spirit of the recommendations sent out by the committee were closely followed. Sets of questions on the topics suggested in the outline and related themes were dictated to the students from time to time, to be used by them as their guide in preparation for the discussions. Frequent reports were required, based on readings in the literature, which included references to general texts, social psychology, various branches of applied psychology, and to articles on military psychology by psychologists, and by military and naval authorities. Special mention should be made of the courtesy and promptness of the Adjutant General's Office, the Bureau of Medicine and Surgery of the Navy Department, the Headquarters of the Port of Embarkation, Hoboken, N. J., and the Naval War College, Newport, R. I., in furnishing valuable literature otherwise inaccessible.

The results of the teaching of a course so new in its whole conception and under such conditions could not be ideal. The following paragraphs will suggest limitations which developed in the experience.

1. There was too much ground to cover in one term by the discussion method. It was found necessary from lack of time to omit entirely the section on Psychology of Observation and Report, which in any case was hardly a climax to the course. The omission was fortunate inasmuch as appetite for the purely military applications was dull after November 11. The difficulty occasioned by the overplus of material might have been remedied by dividing the theoretical nine hours devoted to the course each week into six hours of discussion and three hours of study. However none but the hardest students would have elected such a course.

2. The suggested outline involved rather too much repetition. For example, discipline and methods of influencing men were discussed under leadership and again under motivation and morale.

3. The only really serious difficulty lay in the lack of adequate literature. What was available was either too purely military (and not psychologically scientific) or else too theoretical for a course planned on the inductive basis. As a result the course was too much of a "snap" from the student point of view.

In spite of these limitations, experience at Wesleyan decidedly justified the course in the mind of the instructor. The following facts are significant.

1. The inductive method worked. While thinking for themselves about their everyday experiences—both human and military, so to speak—the men acquired half unconsciously a very considerable amount of psychological theory.

2. The method of discussion ensured interest and attention and stimulated original thinking. It is, however, to be noted that some of the best students, *i.e.*, men who in normal times were high-grade men in most subjects, did not do very well in the work. The reason for this is doubtless the fact that the course placed a premium on quick mental reactions, on thinking on one's feet, and not on mere memory.

3. Students recognized the actual military value and importance of the work. They were visibly impressed by the testimony of men like Napoleon and Foch to the significance of the mental factor in war; and the spectacle of the coöperation of the psychologists of the country in war work inspired respect for the course. The students also correlated between the work in the class room and their military duties, often citing illustrations from their experience at drill. The course undoubtedly gave them a more intelligent and enthusiastic interest in their military training.

4. The plan of the course turned out to have at least one outstanding advantage over that of the ordinary introductory course in psychology. It kept before the student the conception of the whole human mind reacting to varied situations; and thus avoided the atomistic view of consciousness almost inevitably suggested by the study of sensations, perceptions, etc., as separate topics. The course made a comprehensive and intensive application of all relevant psychological principles to the typical reactions of the soldier and officer.

5. In conclusion it may be noted that the non-military students were among the most appreciative of the value of the course. In spite of the fact that illustrations and applications were chosen predominantly from the military field, the bearing of the principles on other fields of life was recognized by these men.

EDGAR S. BRIGHTMAN

WESLEYAN UNIVERSITY

DISTRIBUTION OF EFFORT

The experiment to be described in this paper was designed to determine whether the efficiency of distributed effort is confined to certain stages in the learning process or whether this mode of acquisition is uniformly effective for all stages in the development of a habit. In a problem like the maze, it is conceivable that distribution may be very effective in the initial trials while concentrated effort may be more effective in the final stages of mastery. .

A class of 20 undergraduate students of psychology was required to learn pencil maze A, a diagram of which is given in Webb's monograph on Transfer and Retroaction.¹ The class was divided at random into two groups of 10 each. The members of group A were given 10 consecutive trials on the first day, and thereafter but one trial per day for 10 days. Members of group B were first given one trial per day for 10 days and 10 consecutive trials on the eleventh day. One group thus concentrated their effort for the first 10 trials and distributed it for the second 10 trials. This procedure was reversed for group B. Distribution obtained for the first period and concentration for the second. A comparison of the graphical records of the two groups will thus reveal the relative efficiency of the two modes of procedure during the initial 10 trials as contrasted with their effectiveness for the eleventh to the twentieth trials.

¹ Webb, "Transfer of Training and Retroaction," *Psychol. Rev. Mon. Sup.*, Vol. 24.

The average error records for the two groups are given in Fig. 1. Time records were taken but it is hardly necessary to publish them. The following results were obtained from the experiment:

Eight of the twenty subjects mastered the maze on the basis of a criterion of four perfect trials out of five. Of these six were members of group B whose initial 10 trials were distributed. This fact indicates that distribution in the early trials is more effective ✓ than in the later stages.

During the initial trials group A made 1126 errors to 784 for group B, a ratio of 1.43 to 1. Concentrated effort thus increased the number of errors by 43 per cent. ✓ In the final 10 trials, distri-

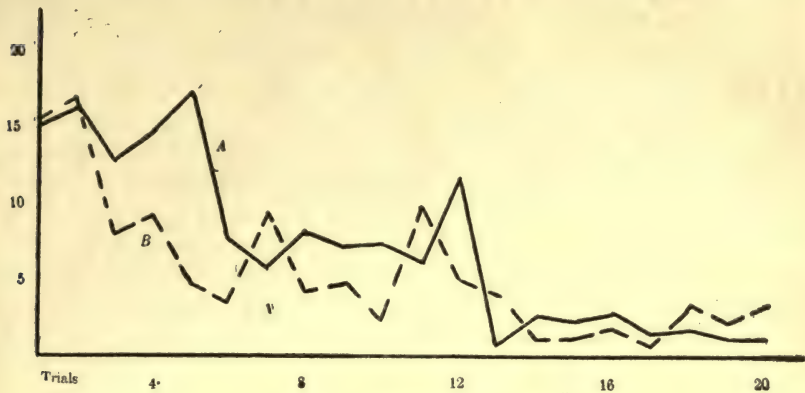


FIG. 1. Distribution of Effort

bution obtained for group A and it made 319 errors to 327 for group B, a ratio of .98 to 1. The difference is too small to be significant but it favors the group with distributed trials.

The graphs remain at the same level for the first two trials. The curve for distributed effort then falls the faster and remains below the level of that for concentrated effort up to the 10th trial. In the second period the two graphs do not materially differ.

There is no apparent difference in the height or course of the two time graphs (not published) at any stage of learning. Group A spent a total of 118.54 min. for the first 10 trials, and 41.16 min. for the final 10. The corresponding values for group B are 123.25 min. and 49.80 min. respectively. Group A thus made the better time records when their trials were concentrated as well as when they were distributed.

We may thus conclude that for the maze problem, the effective- ✓

ness of distribution of trials is limited, in the main, to the initial period of rapid error elimination. For our problem the maximum effectiveness was evident during the period from the second to the sixth trials. For the remaining periods the results do not allow of any assertions as to the relative effectiveness of the two methods. From the data the two methods seem equally effective upon the time values.

The above conclusion receives some confirmation from Ulrich's study of distribution¹ in which he used white rats with a circular maze. One group received 5 trials per day, another 3 trials per day, and a third but 1 trial per day. Comparing the records of the two extreme cases of 5 and 1 trial per day, the two graphs remain at the same level for the first two trials, the curve for the group with the greater distribution then falls the more rapidly and remains at the lower level up to the ninth trial, the curve for the 5 trials per day group then falls the more rapidly for the ninth to the eleventh trial, and thereafter the two graphs maintain the same relative position in reference to each other. The greater efficiency of distributed effort is again limited to the initial period of rapid progress from the second to the ninth trial. Three trials per day was more effective than five, and this greater effectiveness was confined to the period from the second to the fifth trial. Apparently distribution is mainly effective during the initial period of rapid elimination.

HARVEY CARR

UNIVERSITY OF CHICAGO

CHARACTER AND HANDWRITING

A recent report by Hull and Montgomery on the testing of certain graphological assumptions by correlation of rankings obtained by (1) objective measurements of chosen graphic elements and (2) character-ratings based on traits of which the chosen graphic element is supposed to be symptomatic leads me to report a summary of a similar investigation, a complete account of which will appear in a forthcoming book on *Graphology and the Psychology of Handwriting*.

The method utilized in the two experiments was somewhat similar although my procedure and material was less standardized. The latter consisted of thirty autograph letters from well-known

¹ULRICH, "The Distribution of Effort in Learning in the White Rat," *Behav. Mon.*, 2, p. 20.

psychologists; the measurements on the chosen graphic elements were made by myself; the character-ratings were kindly furnished me by a dozen eminent psychologists. A tabular summary of my results follows:

CORRELATIONS OF CHARACTER WITH HANDWRITING

Feeling of Self-Worth (Pride) with Size and Emphasis of Capital..	+.24 (P.E., .12)
Aggressiveness with Line-Quality (Pressurè).....	+.23 (P.E., .13)
Preoccupation with Details with small filiform writing.....	+.61 (P.E., .082)
Temperament with variations in Slant and Alignment.....	+.27 (P.E., .12)
Explosive-Inhibited Make-up with graphic complex.....	+.53 (P.E., .10)

A detailed comparison of my results with those of Hull and Montgomery will prove of interest. In both instances, "Pride" was a trait of character chosen for study, but in the one investigation it was correlated with "upward sloping lines" and in the other with "Size and Emphasis of Capitals." Both result in inconclusive figures. Again, both investigations measured the slope of the line, but in one case it is taken as symptomatic of ambition or pride and in the other (with slant) of optimistic-pessimistic make-up. Again, our results are inconclusive. Both experiments sought to determine the extent of correlation of force (aggressiveness) with heavy writing (pressure). Again, with inconclusive results.

The fact that the two investigations choose in one case the same character-trait but utilized a different graphic sign as an index to it, and in another case choose the same graphic element as indicative of different character-traits may serve as an illustration of the difficulty encountered in any attempt to test graphological assumptions in a scientific way. In justice to the graphologists it must, however, be recalled that they list, often, a multiplicity of causes for the same effect, and diverse results from the same cause, and that they insist that a given graphic detail can be properly interpreted only as one element in the whole graphic complex. The proper weighting of graphic symptoms in a "graphological diagnosis" would seem to demand extensive experience and art!

But that it is no mere evasion to cite a number of causes as capable of producing the same graphic effect is shown by the outcome of various psychological experiments which cannot be canvassed here. Size and alignment are especially variable elements and subject to modification by a number of external conditions, not to mention subjective ones. The principal mechanical factor

involved in alignment is that of pivotage of movement (Osborn). That variation in emotional condition may, however, have some effect upon alignment is shown by observations reported elsewhere in which a comparison is made upon the chirography of the *same individual* under *different conditions*. The graphological explanation of the significance of alignment is that it is one instance of emotional mimicry. Upward-sloping movement is a centrifugal gesture, symptomatic of expansive emotions; down-sloping movement centripetal, indicative of withdrawal, retreat. But even though one had conclusive evidence of shifts in alignment (and size) in the writing of a given individual under defined conditions, it is difficult to see how to effect a transition from intra-individual to inter-individual interpretation.

A glance at my table will show that in at least two instances I obtained really significant correlational coefficients. My highest coefficient (+.61) is obtained in the one case in which I used an aspect of intelligence as a basis for the judgment. Binet's report, as cited by Hull and Montgomery, shows a greater degree of success with graphologists when their ability to read intelligence from writing is put to the test than results when they occupy themselves with character or morality. One might, not unreasonably, expect the reverse conditions to hold. But undoubtedly our character-concepts are very vague, and loosely analyzed notions. I have been particularly impressed with this fact in a recent investigation where I have sought to obtain judgments on such traits as aggressiveness and pride. Quite possibly casual judgments on character are quite as ambiguous as graphological symptoms.

In any case one cannot ignore complications of character by intelligence, or the reverse. For instance, a hyperkinetic constitution conjoined with high intelligence might make one famous; the same constitution with low intelligence, infamous. The temperamental factor which in one case enforces intelligence, in the other undermines morality. How many of Binet's geniuses and notorious criminals alike possessed an explosive make-up? It would be immensely interesting to examine his documents with this query in mind.

Whatever might be the issue of such an examination, my figures seem to suggest a significant index for the correlation of explosive-inhibited make-up with the graphic complex. Personally, I believe that this point of attack is most promising. From this point of view I find Klages' work *Die Probleme der Graphologie*,

the most suggestive of all books on graphology with which I am acquainted, although it is less well known than many others. It does not lend itself readily to schematization but suggests instead many possible fields of exploration.

Certainly I do not think we are quite ready yet to dismiss graphological diagnosis as leaking at all points, although, possibly, handwriting will be a lost art before scientific acumen will have succeeded in penetrating its secrets.

JUNE E. DOWNEY

UNIVERSITY OF WYOMING

NOTES AND NEWS

THE December number of the BULLETIN, dealing with race and individual psychology, was prepared under the editorial direction of Professor R. S. Woodworth, of Columbia University.

At the Baltimore meeting of the American Psychological Association the following officers were elected: President, W. D. Scott; Members of the Council, 1919-1921, B. T. Baldwin and L. M. Terman. The time and place of the next meeting were left to the council's decision.

THE publication of the cartoon issued with the present number of the BULLETIN has been made possible because of the courtesy of Maj. G. F. Arps, S.C., U. S. A., who furnished the original sketch, and to permission for reproduction from the office of the Surgeon General, U. S. A., and from the publishers of the *Camp Sherman News*, in which the cartoon originally appeared. A few copies have been printed on larger sheets, suitable for framing, and these may be obtained for fifty cents each from the Psychological Review Company, Princeton, N. J.

THE PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-SEVENTH ANNUAL
MEETING OF THE AMERICAN PSYCHOLOGICAL
ASSOCIATION, BALTIMORE, DECEMBER 27
AND 28, 1918

REPORT OF THE SECRETARY, H. S. LANGFELD, HARVARD
UNIVERSITY

The twenty-seventh annual meeting of the American Psychological Association was held in affiliation with the American Association for the Advancement of Science, at Johns Hopkins University, on Friday and Saturday, December 27 and 28, 1918. Although a number of members were unable to attend, having made other arrangements when the first notice announcing the postponement of the meeting reached them, the meeting was very well attended, especially by the men in service. At most of the sessions there were about ninety in the audience.

Owing to the short time at the disposal of the Program Committee, it was deemed advisable to have a brief program covering two days. There were, however, twenty-six papers announced for three sessions, and all but four of them were read at the meeting, so that there was very little time left for discussion. With one exception, all of the papers were upon war problems. The sessions were held in Gilman Hall.

On Friday morning, there was the regular program of the Association; Friday afternoon there was a joint session with Sections H and L of the A. A. A. S.; at 4:30 p. m. Mr. Thorndike, as retiring Vice-President of Section H, delivered an address on "Scientific Personnel Work in the Army," which was followed by Mr. Buchner, as retiring Vice-President of Section L, with an address on "Scientific Contributions of the Educational Survey."

Saturday morning there was another joint session with Section H; Saturday afternoon there was a symposium upon "The Future of Pure and Applied Psychology." The leaders in the discussion were Major Yerkes, President Hall, and Mr. Thorndike. Major Yerkes stated that he thought certain educational institutions should specialize in applied psychology and that the others should continue with general instruction and should engage in applied work only in so far as it furthered such instruction. Mr. Thorndike said that he believed that in twenty years there would be as many "doing" as teaching psychology, but that both groups must be scientific. He saw no reason why the Ph.D. in psychology should not represent both types. President Hall stated it was his belief that psychology must remain a science, but that there was such a thing as at its being too pure. We should keep the science pure, but not so pure as to get our feet off the earth and thus not be able to help mankind. Our motto should be "service" in the best sense. The members then discussed the relation of psychology to the National Research Council and voted to recommend the following: That there be in the National Research Council a division of the sciences of man, such as psychology, medicine, anthropology, sociology, and education.

The annual dinner was held at the Southern Hotel, and was followed by the business meeting and smoker. About seventy members and guests took part.

The President, Mr. J. W. Baird, was not able to preside at the meeting, owing to illness.

Excellent provision for the comfort and entertainment of the members and for the two days' sessions at the University, was made by Mr. John B. Watson, the local member of the Executive Committee.

TRANSACTIONS AT THE ANNUAL BUSINESS MEETING

The annual business meeting was held at 8:00 p. m. on December 27, at the Southern Hotel.

It was voted to appoint Mr. Thorndike chairman of the meeting in the absence of President Baird. Toward the end of the meeting Mr. Thorndike withdrew in favor of the new President, Colonel Scott.

It was voted that the minutes of the previous meeting be accepted as printed.

The following items of business reported by the Council were then acted upon:

I. The Secretary reported the deaths of the following members of the Association during the past year: Harry Kirke Wolfe, July 30, 1918, aged 60; and James Jackson Putnam, November 4, 1918, aged 73.

II. The Treasurer's report as printed below was read and accepted. The following budget prepared by the Council was also read and adopted:

ESTIMATE OF RESOURCES

On deposit.....	\$236.48
Dues.....	330.00
Interest.....	50.00
Sale of monographs.....	?
Withdrawal from principal funds.....	<u>400.00</u> \$1,016.48

ESTIMATE OF EXPENDITURES

Printing and supplies.....	\$275.00
Postage.....	100.00
Reprints.....	75.00
Abstracts.....	50.00
Incidentals of meeting.....	25.00
Apparatus exhibition.....	25.00
Election committee.....	50.00
Secretary's stipend.....	250.00
Other committees.....	
Outstanding accounts.....	<u>64.11</u> \$914.11

III. It was voted to authorize the secretary to withdraw the \$400.00 from the principal funds of the Association.

IV. It was voted to postpone until the following year the matter of the increase of the annual dues to \$2.00.

V. It was voted that the time and place of the next annual meeting and the appointment of the local member of the Executive Committee be left to the Council with power.

VI. Mr. Buchner moved that J. E. W. Wallin be appointed the representative on the Council of the A. A. A. S. The motion was carried.

VII. The secretary reported the following nominations for membership in the Association, and was instructed to cast the ballot of the Association for their election: Edith Mulhall Achilles, Ph.D., instructor in extension teaching, Columbia University; Ada Hart Arlitt, Ph.D., associate in education, Bryn Mawr College; Robert

Chenault Givler, Ph.D., instructor in psychology, Harvard University; Samuel C. Kohs, Ph.D., assistant professor of psychology, Reed College, Portland, Oregon; Florence Mateer, Ph.D., psycho-clinician, Bureau of Juvenile Research, Columbus, Ohio; Mark Arthur May, Ph.D., assistant in religious education, Union Theological Seminary, New York City; George Haines Mount, Ph.D., professor of psychology, Cedar Falls, Iowa; Constantine Frithiof Malmberg, Ph.D., vocational advisor, Board for Vocational Education, Pittsburgh, Pa.; Harry H. Wylie, Ph.D., professor of psychology, Geneva College, Beaver Falls, Pa.

VIII. The members of the program committee for the ensuing year were announced as follows: Messrs. Angier, Baird, and the secretary.

IX. In view of the fact that the nomination and election ballots were sent to the members after the date fixed by the constitution, it was moved to legitimize the election of the President and two members of the Council. The motion was carried.

X. It was voted that when the Association met with the A. A. A. S., only the address of the retiring Vice-President of Section H should be arranged by the secretary of that section, the make-up of the joint session being left to the Secretary of the Association.

The Chairman then called for the reports of committees. Major Yerkes, Chairman of the Committee on Election of Officers, reported the results of the ballot of the Association to be as follows: for President, Colonel Walter Dill Scott, of Carnegie Institute of Technology; for members of the Council, elected for three years, in succession to Messrs. Bingham and Dunlap, Messrs. Baldwin and Terman.

Major Haggerty submitted a brief report of the Committee on Qualifications for Psychological Examiners and Other Psychological Experts. It was voted that the Council be authorized to withdraw from the principal funds, at its discretion, a sum not to exceed \$150 to pay for the printing of the complete report of this Committee.

The Chairmen of the other committees reported that owing to the war work, no progress had been made. It was voted to continue the various existing committees.

New business: It was moved to express the regret of the members at the absence of President Baird, and to extend their best wishes for a speedy recovery. There was a unanimous rising when Mr. Bingham moved to express the thanks of the members to Messrs. Watson and Dunlap and the Johns Hopkins University

for their kind hospitality. This motion was carried unanimously. The meeting then adjourned.

REPORT OF THE TREASURER FOR THE YEAR 1918

DR.

To balance from previous year.....	\$2,366.92	
Dues received from members.....	348.40	
Interest from July 1, 1917 to July 1, 1918.....	74.14	
Sale of Monographs Nos. 51 and 53 year ending December 31, 1917	11.60	\$2,801.06

CR.

By Printing and supplies.....	\$123.40	
Postage	51.08	
Express	6.75	
Telegrams	6.36	
Reprints of Proceedings.....	16.93	
Reprints of President's address.....	10.48	
Incidental expenses of 1917 meeting.....	25.00	
Printing of abstracts 1917 meeting.....	10.35	
Secretary's stipend.....	250.00	
Exchange on checks.....	.10	
Council's Expenses to extra meeting, April 21, 1917.....	61.00	
President's war expenses April 10, 1917 to August 14, 1917..	391.05	
Secretary's expenses for annual meeting.....	40.00	\$ 992.50
Balance in Fifth Avenue Bank.....	235.48	
Balance in Union Dime Savings Bank.....	1,573.08	1,808.56
		<u>\$2,801.06</u>

ASSETS

Cash on hand and in bank.....	\$1,808.56	
Dues receivable.....	40.00	
Monographs No. 51 and No. 53.....	178.20	\$2,026.76

LIABILITIES

Outstanding accounts (Bills payable).....	64.11	
Appropriations for committee work.....	00.00	64.11
BALANCE.....		<u>\$1,962.65</u>

H. S. LANGFELD,
Treasurer
Audited by the Council

CAMBRIDGE, MASSACHUSETTS,
December 23, 1918

TITLES AND ABSTRACTS OF PAPERS

Psychological Service in Army Camps. GEORGE F. ARPS, Ohio State University.

To meet immediately the national emergency hundreds of thousands of young men from practically every known occupation poured into the various army cantonments like a stream of immense volume, there to be speedily organized into the various army units. The multitude assembled, the concrete problem of whipping and shaping this huge mass into an effective fighting machine in a few months confronted American genius.

Obviously the reduction of this mass of men, representing the entire gamut of social divergencies, into a disciplined fighting machine was the job for an intelligent commissioned and non-commissioned personnel. These men were needed in tens of thousands and never in the history of the Republic was the need more urgent.

How to select the most intelligent, how to select them quickly and with the minimum of error, was the immediate pressing problem. Upon the commissioned men and especially upon the non-commissioned officers fell not only the problem of reducing this conglomerate, inarticulate aggregation of independent American young men into an army of disciplined soldiers, but upon these officers fell the all-important work of developing military morale, stamina, grit, and like qualities.

Each of the psychological examining stations classified the above mentioned aggregation of men into eight or nine grades of intelligence. These grades were then made available as one factor in the selection of officers, rejection of men from the line, discharge of men and in many other ways which can not be detailed here.

The variety of service rendered by the Psychological Board at Camp Sherman, Chillicothe, Ohio, is fairly representative of this type of service in all other Army Camps. This service consisted essentially in examining the following military, semi-military and extra-military organizations.

I. *All Recruits entering Depots.* All commanding officers were furnished with an intelligence rating of every recruit as soon as possible after his induction into the service. These ratings were then entered on the service records and could be consulted by the proper military authorities whenever it was desirable to learn something of the general intelligence of a soldier. This eliminated

what one officer characterized as the "guess method" which necessarily prevailed because of the limited opportunity of getting acquainted with the men and observing them. This officer remarked that he was glad to give up "trying to estimate intelligence by observing 'anatomical topography' and various other phrenological marks of intelligence."

II. *Commissioned Officers of all Organizations.*

III. *Development Battalion Schools.* A complete plan of organization and pedagogical procedure was put into effect by memorandum. The teachers were selected on the basis of intelligence rating and the men attending these schools were initially classified on the same basis.

IV. *Individual Examining.* The psychologist assisted the psychiatrist in eliminating from the line the low-grade men whom it would be dangerous to retain in any line organization. The hopelessly low grade were discharged; the just usable and those somewhat better were transferred to service organizations while the more or less doubtful class was assigned to development battalions.

V. *The camp base hospital and other hospitals forming for immediate overseas duty.*

VI. *Medical department of the depot brigade.*

VII. *Members of the army nurse corps.*

VIII. *Student nurse corps.*

IX. *War prisoners.*

X. *Drug addicts.*

XI. *Conscientious objectors.* A fairly complete intelligence and sociological report was returned to the Commanding Officer of the Camp of Conscientious Objectors on each recruit who classified himself as conscientiously opposed to the military service.

XII. *Candidates for officers' training schools.* All candidates for the (1) Infantry School of Officers, (2) Machine Gun School, (3) Artillery School, (4) Quartermaster Schools, and (5) Signal Schools were given the Psychological Tests and the ratings used in determining entrance to these various schools.

XIII. *Members of the fourth officers' training school.*

XIV. *Personnel of the camp adjutant's office.*

XV. *Personnel of the camp surgeon's office.*

XVI. *Prostitute women.*

XVII. *Y. M. C. A. organization.*

XVIII. *Knights of Columbus.*

XIX. *Jewish Welfare Board.*

XX. *German war prisoners.* The various lines of work, barely indicated above, cover, in a general way, the psychological service in Army Camps.

The Function of Psychology in the Rehabilitation of the Disabled Soldier. B. T. BALDWIN, University of Iowa.

This paper was accompanied by 28 lantern slides, demonstrating the aim, scope, and methods of the psychological service in the Walter Reed General Hospital, with particular reference to the remedial aspects of Occupational Therapy on partially ankylosed joints, with emphasis on the value of psychology in determining the range and strength of limited, voluntary movement, through the use of special, adapted apparatus and progress curves.

The patient's attention is repeatedly called to the specific remedial movements involved in the various types of shop work, and at the same time, the movements are initiated by the patient as an integral and necessary part of a larger and more complex series of coördinated movements. The purposive nature of the movements and the end product of the work offer direct incentives for sustained effort. The periodic measurement in increase of range and strength of movements gives the patient a concrete method of watching his progress from day to day, and frequent comparisons between his progress curves and those of others, afford opportunity for explanation in helping him to overcome plateau periods or regressions which necessarily must occur; this consequently evokes an attitude of interest, cheerfulness, and optimism in the patient.

An analysis of movements involving different types of work was given, and a classified summary of the types of therapeutic activities which involve the voluntary flexion, extension, abduction, adduction, supination, pronation, circumduction, rotation of the various joints of the body.

To this institution belongs the distinction of being the first general army or reconstruction hospital in the United States to have a trained psychologist on its official staff.

Army Personnel Work. W. V. BINGHAM, Carnegie Institute of Technology.

A brief sketch is presented of the Army system for getting the right man in the right place. This system as installed and super-

vised by the Committee on Classification of Personnel was employed in the classification and placement of three and a half million soldiers. Its essential features include a qualification record card for every man, which gives instantly his occupation, trade skill, previous experience, former employer, nativity, citizenship, schooling, linguistic ability, mental capacity, physical capacity, leadership ability, military experience, and kind of service preferred; an index of about seven hundred civilian occupations called for in the personnel of our military establishment; a manual of trade specifications, or definitions of duties and qualifications of workers in these occupations; tables of occupational needs for all the various kinds of army units; personnel specifications for several hundred sorts of army officers, indicating for each the duties to be performed, the general and technical qualifications required, and the limits of age, physique, schooling, occupational experience and degree of leadership ability called for; similar but more concise definitions of duties and personnel specifications for all the grades of enlisted men in each of four hundred sorts of army organizations; a system of standardized trade tests, to aid in determining with more accuracy than by the most careful interview, what degree of skill a tradesman actually possesses; reports of inventories of available personnel in camps, divisions and new draft increments; personnel requisition forms; a procedure for consolidating demands for skilled personnel throughout the entire army and apportioning them against the available supply; a routine for locating quickly the individual soldiers or officers needed, and effecting their transfer; a uniform method of rating officers as an aid in making promotions, demotions, and assignments; a system of supervision and inspection of the work of camp personnel organizations in interviewing, trade testing and classifying recruits, in filling requisitions, in making assignments, and in so balancing the personnel of units as to expedite training by insuring an optimal distribution of intelligence and skill. Many of the features of this army personnel system, as for example the concept of personnel specifications, are suggestive for industrial and educational practice. Samples of these Army specifications or definitions of duties and qualifications are presented in the paper which will appear in full in the *Journal of Applied Psychology*.

The Relation of Intelligence to Occupation as Indicated by Army Data. J. W. BRIDGES, Ohio State Univeristy.

The data for this paper were obtained by psychological examiners from the *soldier's* qualification cards (c.c.p. 1). Distributions of scores for *alpha* (literate), and for *beta* (illiterate) cases were secured for each occupation, and for each degree of skill, viz., apprentice, journeyman, and expert. For the most part this classification of skill was based upon a personal interview; but some results in which it was based upon *trade tests* were also obtained. In the former case the distinction proved unreliable; and, as no difference in intelligence was found in a few sample cases, the data on these three degrees of skill were combined to obtain rough occupational standards of intelligence.

A comparison of the occupations was made by obtaining a percentage distribution of letter grades for each, and then arranging them in the order of the proportion of A plus B grades. In this way the results with the two scales could be combined with the least inaccuracy, since the letter grades are practically equivalent. A comparison of median alpha scores would be misleading; for omission of beta cases (illiterates), which vary from no per cent. in professional and clerical occupations to over thirty per cent. in unskilled labor, would greatly minimize the differences in intelligence. A chart was exhibited to illustrate results for twenty occupations. The order is shown to be roughly: professions, clerical occupations, trades, partly skilled labor, and unskilled labor. The greatest differences are at the upper end of the scale, while the differences within the group of trades are comparatively small. Differences in range of intelligence are also marked and probably significant. The range becomes less as we go up the scale.

Charts were exhibited showing the difference between recruits who passed certain trade tests as apprentices or better and those who were not trade tested at all. Those who passed are uniformly superior in intelligence, and the proportion of beta men (illiterates) is, with one exception among those studied, always less. The exception is heavy truck drivers (23t) for which the trade test is wholly performance.

Charts were also exhibited showing the relation between the intelligence of apprentices, journeymen and experts in four different occupations. A marked correlation between intelligence as measured by the army group tests and skill as measured by the trade tests is evidenced. The Pearson coefficients of mean square

contingency were determined for eight trades. These vary from .67 in the case of horse hostlers to .13 for truck drivers.

Cautions to be observed:

- (1) The trade specifications of the Committee on Classification of the Personnel has proved invaluable in this study; and in all future work on occupation a careful definition of the trade will be a first essential.
- (2) There is danger in inferring from the intelligence standard of an occupation as indicated by the data obtained from recruits, its correct standard in civil life because of: (a) draft-board selection operating more in some occupations than in others, (b) greater selection of officers from some occupations than others, (c) the sex factor—no female representatives of the trade among recruits, (d) the age factor—recruits are young men many of whom are engaged in temporary occupations or have not yet found their industrial level.

A Program of Mental Engineering. RAYMOND DODGE, Wesleyan University.

Every organic reaction may be analyzed into factors that are accidental or ephemeral, factors that are permanent or general, and factors that are prophetic. If we psychologists would evaluate our own reactions to the great war stimulus we must make some similar analysis. While we are justly proud of our contributions to the common cause, it may be that we are thinking too much these days of what we have done and too little of the new situations that we now face.

There will be a strong inclination to perpetuate our satisfying reactions. We are sure to ask how our war-born techniques may be used in peace. We have a paternal affection for the nice instruments that we have created and we naturally ask what new uses they may find now that their war uses are over. Psychologically this is a disastrous mistake for any organism. Our real service depended not on ready-to-use methods but on our unique ability to estimate the new human and mental situations that confronted the war machine. We analyzed those problems and developed workable reactions often before the professionals knew that the problems existed. Our success was due to our ability to analyze the situations, to pool our resources, and to find expert help where our resources stopped. These are the factors of our reactions that deserve perpetuation, and give promise for the future.

Our present business is to forget our reactions to war, to analyze the new situations of peace, to pool our resources once again, and to seek the help of experts. In particular it is obvious to most of us that this war has enormously depressed some of the great cohesive forces of society. At least one of our great new tasks is to pool our intellectual resources with the historian, the sociologists, with the real leaders of capital and labor for the discovery and systematic exploitation of all the social factors that make for a stable social equilibrium.

Let us admit that the task is gigantic. But let us not forget that in the last two years scientific men have grown enormously in the capacity to coöperate, in self-confidence, and in the confidence of the community. The new tasks are no larger proportionately than the war tasks were. They are equally insistent, and vastly more enduring. To be successful this new organization of our intellectual resources must start with the ability to command the services of the best minds of the country, and to put across any plans of propaganda that it decides to be necessary. In a task of this magnitude we cannot afford to start as a piker. The course of events has put America under bonds to find and develop the social and mental factors that make for a stable social equilibrium. It is peculiarly the job of American psychology. Any necessary expense however vast is a mere bagatelle in comparison with the importance of the task.

Psychological Investigations in Aviation. KNIGHT DUNLAP, Johns Hopkins University.

This paper has appeared in *Science* for January 24, 1919.

Results and Values of Psychological Examining in the United States Army. MABEL R. FERNALD, Washington, D. C.

From the beginning of psychological examining in the United States Army up to the present week, examinations have been given to 1,679,713 enlisted men and 41,623 officers. Of the enlisted men 0.5 per cent. have been recommended by the psychologists for rejection or discharge, and 1.2 per cent. for service organizations or development battalions.

Numerous lines of evidence are available indicating the importance for the military situation of prompt recognition of low-grade cases. For example, the percentages of men ranking below the average in the psychological examinations is notably large among

such groups as the following: disciplinary cases, men having difficulties in drill, men reported as "unteachable," and men designated by their officers as among the poorest from the point of view of military usefulness.

Comparison of negro troops with white has shown a markedly inferior mental rating for the former, whatever basis of comparison has been used. A further difference based on geographical classification has also been noted, Northern negroes appearing as superior mentally to Southern groups. The full significance of the data on negroes offers an interesting problem for further investigation.

Comparison of various army groups, distinguished from one another on the basis of actual attainment in the service, shows that the psychological tests discriminate between these groups with great definiteness. This point may be illustrated by reference to the percentages of men making A and B grades in Examination Alpha, among representative groups such as the following: officers—83.0 per cent., O.T.S. candidates—73.2 per cent., sergeants—53.4 per cent., corporals—39.7 per cent., literate privates—18.8 per cent. Comparison of measures of central tendency shows equally striking differences. Within the officer group significant differences have also been noted between officers of different branches of the service.

Increasing use has been made of the psychological examinations as an aid in selection of men for admission to Officers' Training Schools, Non-Commissioned Officers' Schools, and other work requiring special ability. It has been shown that the data obtained from psychological examinations can be used to decrease the necessity of elimination and thus increase the efficiency of the schools.

Another important direction of usefulness has been coöperation with personnel officers in using the results of psychological examinations in connection with balancing of organizations and assignment of men to various branches in accordance with specific needs.

The above summary obviously offers merely a suggestion of certain main lines of activity and types of results. The task of making results of examining effective in meeting military needs has been regarded as the one task to be accomplished during the war, and opportunities for usefulness have varied widely from camp to camp.

The Speed of Adjustment of the Eye for Clear Seeing at Different Distances. A Study of Ocular Functions with Special Reference to Aviation. G. E. FERREE AND GERTRUDE RAND, Bryn Mawr College.

By speed of adjustment is meant here the speed in the action both of the extrinsic and intrinsic muscles in adjusting for clear seeing at different distances. The amount of lag in this function is found to vary a great deal from individual to individual. In the paper submitted, the time required to change from the adjustment for clear seeing at or near the near-point to that for clear seeing at six meters, and the converse, has been measured in several cases. So far the investigation has been conducted primarily as a study of the method with special reference to its applicability as a test for fitness for vocations for which speed and accuracy of adjustment are a prerequisite. In this particular especially the writers believe the aviator must excel. The rapid development of the science and art of aviation brought about by the late war emphasizes the need for tests which will facilitate the selection of the supernormal eye. It is scarcely to be expected that the conventional acuity tests, designed more particularly for the separation of the subnormal from the normal eye, are fully adequate for this purpose.

The paper contains a description of the apparatus and method used in making the determination and a statement of the results obtained under certain selected conditions. Other types of ocular lag are also considered briefly in passing; and points bearing on the application of the method to the selection of aviators, to the work of the clinic, etc., are discussed.

The apparatus described is now being used in France for the study of the diurnal variations in the aviator's ocular fitness for his work. It is also being used by the Ophthalmological Division at the Medical Research Laboratory at Minneola. Among the problems in prospect there, the following three may be mentioned: (1) the standardization of the test for the selection of aviators, (2) a study of the diurnal variations in the aviator's ocular fitness for his work, and (3) a study of the ocular effects of oxygen poverty.

Psychology of Morale. WILLIAM S. FOSTER, Cornell University.

The problem of morale, from the military point of view, is the creation of an eager and settled collective determination to win. Sporadic attempts to solve it are as old as military history. New in this war, however, are full realization of the importance of the

problem, systematic and specialized effort, and full use of the methods of psychology, business and common sense in attacking it.

In October, 1918, for the first time in our history, a specially selected Morale Officer with no other duties, and an assisting organization, was authorized for each camp and division, and a special branch in the General Staff was established to supervise the work and to act as a clearing-house for methods.

As early as March of that year, the present Chief of the Branch called attention to the need of systematic "psychological stimulation of troops" in view of experience in this regard of the European armies, especially those of our enemies and of Italy and France. He further pointed out the importance of such effort in this country on account of our mixed population, our lack of incentive of fighting in direct defense on home soil, and our lesser military traditions and training. In June of the same year and under his direction as Commanding Officer at one of our training camps, the first "system" of morale work was put into effect. It involved a military organization with centralized control of civilian morale agencies, and a modified program for their stay in camp thereafter.

In the beginning, the two officers and some twenty enlisted men forming this organization, were all psychologists. Later, men were chosen on the basis of ability, experience, and personality alone. The primary object of the program was more effectively to reach the individual, so likely to lose sight of primary ends in the confusion of novel conditions and personal experiences, to clarify his purposes, to stimulate his individual determination and weld it into an effective part of the collective national and military determination.

Among the various features of the system, the following may be mentioned: special attention to detail in the methods of reception and military initiation of recruits; the establishment of numerous informational centers; the regular detailing of all men to write letters home, enclosing a letter from the Commanding Officer of the Detention Camp; detailed and simple explanations of military customs, discipline and duties; repeated standard talks on the causes, aims and progress of the war; inspirational addresses by qualified chaplains and others; systematic opportunity for, and training in, singing, athletics and games; the selection of entertainers by test, their assignment to a special company, and their division into balanced troupes, making possible a nightly schedule of vaudeville, boxing, and moving pictures in each section of the camp; intensified publicity for camp and individual activities, the printing and dis-

tribution of special literature and posters; bulletin boards for each company and section, constantly filled and changing; and a complete organization of elementary educational effort.

Adapted to other conditions and with numerous additional special features, similar systems have been in effect in 38 camps since October, and recently the work has extended to hospitals and transports. Since the armistice, the direction of effort has changed, so that at present, beside promoting and maintaining contentment, discipline, and enthusiasm in the men, the machinery of the staff, field and civilian organizations, has been adjusted to the end of sending men back from the Army better citizens, with a better preparation for and better understanding of their opportunities.

Some Problems of Reëducation. SHEPHERD IVORY FRANZ, Government Hospital for the Insane.

Cases of cerebral paralyse were considered as examples of the problems of reëducation. In the paralyzed individual whose normal activity has been lost because of a cerebral lesion the first problem is to get the individual to move, and the other problems are those of the acquisition of habits of movement combinations. These problems are much the same in the reëducation of all kinds of individuals; they are problems of habit replacement.

The reëducation of the paralyzed and other individuals was brought forward as an illustration of a factual difficulty confronting the upholders of psycho-physical parallelism or of interaction.

Some Possible Effects of the War on American Psychology. G. STANLEY HALL, Clark University.

The following points were brought out:

1. After such a war we tend to revert to first principles, to ask what human nature is and why it is that wars break out and how we must change our civilization to meet the future needs of man.

2. The war has given applied psychology a tremendous impulse. This will, on the whole, do good, for psychology, which is the largest and last of the sciences, must not try to be too pure.

3. The war has brought us face to face with the problems of the feelings. We have learned that the all-dominant emotion is fear, courage being only fear controlled, and cowardice fear yielded to. Our tests must cover the whole life of the soldier, even infancy. We need deeper studies of religious feeling, honor, hate, patriotism, etc.

4. Mass psychology has its chief illustration in the way in which the individual is subordinated to the whole army structure, like a cell in a larger organic unity. Here suggestion may easily become contagion, and the solidarity is so perfect that, we are told, man's consciousness of his kind is the only true and living God, that theology is anthropology, that democracy is theocracy.

5. War has taught us that the range of conscious awareness is limited and that unconscious energies chiefly dominate man's soul, especially in great emergencies. This is illustrated by the shell-shock cases, and is shown also in the adrenalin type of soldier.

6. As we have put more psychology into this war than any other nation, and as we have more laboratories and more men than all others we should henceforth lead the world in psychology. Hitherto we have borrowed from Wundt, Binet-Simon, Paulsen, Lazarus, but now we should take larger views and lead the world. Another motive for doing this is that the war has made democracy dominant in the world, and in that movement we lead. Now democracy rests on education, education is bringing out the power of the human soul, and nature would honor far larger drafts than we have yet made upon it. Hence the future of the world depends in a peculiar sense upon American psychologists.

Army Trade Tests and their Practical Application. J. W. HAYES,
University of Chicago.

The army trade tests were constructed primarily to classify, on the basis of trade skill, the great numbers of men who were taken into the army during 1917 and 1918. The interview method first used, under which was largely accepted the man's own statement as to the variety and degree of trade skill which he possessed was found to be far too untrustworthy for army classification and placement. The army tests were devised to meet the demand for a method of evaluating trade skill which should make possible a high degree of accuracy with a minimum expenditure of examining time and should, moreover, make available as examiners men not possessed of trade skill. The success of the tests in the actual army situations in which they were used was largely dependent on the empirical nature of the standards of trade skill adopted. Each trade was studied in its own industrial environment so as to analyze the essential factors of trade knowledge and skill. The test items formulated on the basis of this study were calibrated by comparison with the performance of actual tradesmen of known degrees of

trade proficiency. The resultant test represented exact trade practice and terminology plus standards of measurement based on actual performance in the trade. By adopting a rigid test procedure it was possible to utilize, as examiners, men who were trained only as examiners and lacked all technical knowledge of the trade in which they were examining. By careful elimination of purely local factors in trade practice and terminology it was possible to insure a high degree of uniformity in the results obtained in widely separated portions of the country.

Principles Underlying the Classification of Men in the Students Army Training Corps. TRUMAN L. KELLEY, Teachers College, Columbia University.

The problem of classification in the S. A. T. C. follows directly from its purpose. One of the main purposes in its establishment was to provide for securing material fit for officer training. It was anticipated that from thirty to forty thousand men a year would be selected from S. A. T. C. units for transfer to training in officers' training camps. Not only was it necessary to select these men, but it was desirable to assign them for training to those branches for which they were best fitted and in which they were most needed. Accordingly the scheme for the classification of S. A. T. C. men, drawn up by Dr. Thorndike, attempted to accomplish the following things:

1. Pick specialists.
2. Divide the soldiers into three parts upon the basis of general merit as officer material, the upper part going to officers' training schools, the middle part to non-com schools, and the lowest part to camps, continuing upon the status of privates.
3. To do away with the necessity of each corps conducting a separate recruiting campaign.
4. To reduce to a minimum the tendency to exercise personal bias.
5. To be just to the soldiers, both from the standpoint of their abilities and from that of their interests.
6. To determine scores for each man selected for officer material indicative of his respective degrees of fitness for the different branches of the army.
7. To lead to an allotment of officer material to the different branches which, both in number and quality, would be appropriate to their needs.

The solution to so complex a problem demanded a procedure involving the closest synthesis between the abilities of men, the special needs of different branches of the service, and the numbers required in the branches.

The salient features of the plan adopted involve:

1. A method of elimination from consideration of such men as are not fit for any officer post.

2. A rating of men with respect to possession of certain traits—traits which promise to be important when judged by certain essential criteria.

3. A rating of officer jobs in the different branches of the army with respect to the needs of the branches for men possessing the given traits.

4. A scheme for utilizing these ratings in allotment whereby the men would be best placed and the jobs best filled considering the total supply of available officer material.

It will be noticed that items 3 and 4 are unique contributions to the problem of classification.

Action of "Antipyretic" Analgesics on the Psychological Reaction Time. D. I. MACHT, S. ISAACS AND J. GREENBERG, Johns Hopkins University.

Following the investigations by Macht and Isaacs on the effect of morphin and opium on the reaction time, the present authors undertook the study of the effects on the reaction time of the large class of so-called antipyretic analgesics. The method of investigation was the same as that followed in the opium experiments. Simple and complex reaction times were measured by means of Dunlap's chronoscope. After the normal reaction time had been established, the subjects were given the antipyretic drugs by mouth, and the effect of the drug was judged by repeated readings afterwards. The experiments were performed, for the most part, on the authors themselves and occasionally on other subjects. About forty experiments were made in all; each lasting from two to five or more hours. The drugs employed were quinin, acetanilid, acetphenetidin (phenacetin), antipyrin, phenyl salicylate (salol), acetyl salicylic acid (aspirin), pyramidon and the following combinations: acetanilid and salol, phenacetin and salol, acetanilid and phenacetin, aspirin and salol, and antipyrin and aspirin. The doses of the drugs never exceeded those employed by conservative therapeutists.

The results obtained were quite different from those found in the case of morphin and opium. No primary stage of stimulation or shortened reaction time was noted except possibly after small doses of quinin. It was found that, in all cases, the ordinary doses of antipyretics produced either very little effect on the reaction time, or if affecting it at all, always delayed it as shown by the prolongation of the mean readings or an increase in the mean variations or by both. The most powerful or depressant drug in this respect was pyramidon. It was furthermore very interesting to note that when the antipyretic drugs exerted an influence on the reaction time, the simple reflexes or reaction times for sound, light and touch were more delayed than the more complex association tests. Of the three simple reactions, that for touch was more generally retarded than that for sound or light. The association tests were also somewhat depressed or impaired but usually in a *lesser* degree than the simple reaction tests.

The experiments with combinations of two antipyretics gave results which could be explained by a simple summation of the individual effects of the two components. No so-called "synergism" or potentiation of one drug by the other was found.

The Official Method of Rating Army Officers. WALTER DILL SCOTT, Carnegie Institute of Technology.

The Rating Scale is one of the coördinated methods employed by the War Department to place "the right man in the right place." These coördinated methods or devices include

- (1) The psychological tests,
- (2) The trade tests,
- (3) Special tests for special aptitude,
- (4) The trade and personnel specifications,
- (5) Tables of occupational needs,
- (6) The classification system, and
- (7) The Rating Scale.

The Rating Scale is one of four rival systems for appointing and promoting officers in the United States Army, *i.e.*,

- (1) Seniority,
- (2) Alphabetical,
- (3) Personal acquaintance,
- (4) Systematic records based on the Rating Scale.

The Rating Scale was introduced into the army experimentally but on a small scale in July, 1917. At the present time it is the

only method in general use in the army and is the official system for recommendation for commission and for promotion of commissioned officers both in the United States and in the American Expeditionary Forces.

There are certain psychological assumptions and theoretical difficulties inherent in the rating scale system which created skepticism on the part of many army officers. However, in actual use the system has been so helpful that it has been extended until its use has become universal in the army both for candidates and for promotion of officers.

Research on Special Aptitude for Flying. G. M. STRATTON, University of California.

It is highly desirable that there be a lessened number of those who are admitted to the flying schools and who nevertheless fail to learn to fly.

To this end, there were tried at Rockwell Field in the summer of 1917 tests in the following regions: dexterity; steadiness of standing; power to perceive very gradual tilting of the body; emotional responsiveness; simple reaction to light and sound; and the power of continuing in imagination certain fragments of curves presented visually. The correlation between any particular test and flying ability proved to be small but by the use of a combined score from these tests, the lowest six of the fifty persons tested yielded five who were relieved from instruction because of their poor flying.

In the spring of 1918, these tests were tried again at Rockwell Field, with improved apparatus, on 150 aviators. And there was added a test of the power to discriminate sudden jerks of the body to the right and to the left, and a test of coördination involving at once the two hands and the two feet. Considered in conjunction with data from Kelly Field, the tests that proved most effective were those on the steadiness of standing, the power to perceive gradual tilting, the power to discern sudden jerks (when combined with visual and auditory reactions), and emotional responsiveness. Again the correlation of any particular test with the ability to fly was found to be small; but again a combined score gave a sufficiently high correlation to warrant the use of certain of these tests in the actual selection of aviators, for hitherto the work had wholly the character of research.

A number of farther tests are at present being studied at Taylor and Southern Fields, to supplement or supplant, if possible, the

tests above described. These tests are in the following regions: judgment of intersecting motions; pursuit movements of the hand; dynamometry; the power to trace and retrace a specified course. It is still too early to state what success will attend these farther tests. But even without them it has been shown that in so exceedingly complex a power as that involved in flying, the usual methods of selecting candidates can profitably be supplemented by special psychological methods.

Speech Reconstruction in Soldiers. WALTER B. SWIFT, Cleveland Public Schools.

The war has given a new phase, or has developed what was the coming phase of speech building. Like many other inventions and many a scientific progress, war has hastened us to crystallize our dreamy thoughts into solid forms. The old methods of speech correction were largely directed to the mouth—the education of its parts—in a word, the training up of the external speech mechanism. The war, on the other hand, has shown us that all these external parts may be injured, and too reconstructed in new ways; that the nervous system connecting the external parts of the brain may be injured in new forms; and that the three central brain parts controlling speech in the central nervous system may be in the same old ways and also in markedly new ways, put out of function or destroyed altogether. This situation has demanded a deeper speech reconstructor, a more intimate anatomical knowledge of the external speech mechanism, its minute musculature, and functions, as a more thorough understanding of brain anatomy and the function of brain parts. Speech reconstruction in soldiers or speech construction in soldiers is largely a parallel case to educational and occupational reconstruction. They both deal with minute muscular mechanisms and adjustments, they both have a peripheral nerve anatomy and central nerve functions and psychological activities. Speech building may be considered more intricate, more complex, needing a larger previous training, a much more many-sided training than these other fields.

The psychological sides of speech building consist in testing kinesthetic functions, acoustic functions, and visual activities, and the building up of the speech consists in the functional rehabilitation or reconstruction of these three forms of speech control. This naturally shows how wide the modern problem is, and how incomplete the attempt is where only one of these brain areas is

furnished with a makeshift function—such as lip reading. The lip reading efforts of the war department have been admirable. I think nothing has equalled the speed and efficiency of the results attained at Cape May, but you cannot subordinate the whole speech and all its functions to the ear. That would be to classify a whole under a part. It still remains to be accomplished—a thorough, many-sided approach to speech function, with proper medical specialists and properly trained teachers, for other lines than lip reading.

War speech cases are not going to stop for hospital reconstruction; they have not done so in Canada. They will quickly disperse to their homes all over the country. We are now planning for a widespread meeting of this problem by the education of many teachers stationed in numerous states. The demands are for a wider diagnostic capacity; no mere phonetic training will suffice; no mere mouth treatment will reach all cases. We need the phonetician, medical man and psychologist, all combined in one. We need the expert who can carefully examine and diagnose the speech type—as the psychologists should now be doing in the diagnosis of mental types—and after this scientific investigation, apply vocal and psychological treatment to fit the type.

Revision of the Definition for Moron. R. H. SYLVESTER, University of Iowa.

The term moron was coined to label individuals having a Binet mental age of between 8 and 12 years. It has generally been defined in those terms. But early tests of Army recruits indicated that many men testing under 12 years were fit for regular service, and finally S. G. O. orders recognized that some as low as 9 years should not be rejected.

Mental Age in Years (Stanford-Binet)

Wages in Dollars per Week	Camp Dodge			Camp Grant		
	8	9	10	8	9	10
11-15.....	4	30	37	4	44	21
16-20.....	2	27	14	9	33	23
21-25.....	1	12	11	6	27	14

This table shows in terms of mental age and weekly wages, 138 low-testing recruits at Camp Dodge and 181 at Camp Grant. The writer made part or all of the examination of each Camp Dodge

case and he believes that not one was a moron. They were sifted from some 1,500 individual white examinees according to specifications which follow, and the 1,500 had in turn been sifted from some 35,000 group examinees. The Camp Grant part of the table shows the corresponding group at that camp. Perhaps several other men should have been included with the 138 and the 181, but these were the only ones within the age and wage limits who were tested under absolutely favorable conditions and whose statements as to wages and social competency were reliable beyond reasonable doubt.

Specifications which each case met were: (1) white; (2) born in United States; (3) native English-speaking; (4) free from symptoms and histories of psychosis, neuroses and feeble-mindedness; (5) successful as farmers, farm hands or laborers; (6) free from records of arrest or of serious trouble; (7) apparently fit for regular military service.

These men were well muscled and healthy; narrow in interests and in knowledge; well oriented as to time, seasons and home environment; proficient in using small but clear vocabularies; and normal emotionally. They were dull and slow but certainly not morons according to Tredgold's or any other definition of feeble-mindedness except those based directly on mental age. The writer is convinced that the definition for moron must be revised so as not to include men of this type and at the same time not to exclude the feeble-minded who score above them in the mental age tests.

Methods of Testing Intelligence in the United States Army. LEWIS M. TREMAN, Leland Stanford Jr. University.

The methods used since January, 1918, include a group examination for literate men (Alpha), a group examination for illiterates (Beta), and three methods of individual examination—the Stanford-Binet Scale, the Yerkes-Bridges Point Scale, and a Performance Scale. Approximately 70 per cent. of an average draft receive their grades on Alpha, 25 per cent. on Beta, and 5 per cent. on an individual examination. Of those individually examined somewhat less than half take the Stanford-Binet, about one fourth the Point Scale, and the remainder the Performance Scale.

The group examination for literate men has proved especially successful. It satisfies reasonably well all the criteria of a good scale. It yields a score whose P.E. is only one eighth of the standard deviation found for unselected recruits. Its reliability coefficient

is about .95. It correlates about .60 with officers' ratings of men; .80 to .90 with Stanford-Binet; .80 with the Beta test for illiterates; .94 with composite score of Alpha, Beta, and Stanford-Binet; .60 to .75 with teachers' ratings of school children; .75 with Trabue Band C Completion Tests; and .80 to .90 with grade location of school children of a given age. It measures well from fourth grade ability up, and if given to the public will prove extremely useful in the grading of school children. It has been rendered relatively coach proof by the preparation of five "forms," almost equally difficult, alike psychologically, but non-duplicative in content. The Alpha test can be given and scored by any intelligent person, as the procedure is rigidly defined and the scoring is done by stencils.

The first method of group examination used for illiterates was the Stenquist Skill Test. Because of its inferior value as a measure of general intelligence it had to be abandoned. It was succeeded by the Beta test, which was the result of extensive experimentation in Camps Devens, Lee and Dix. It is a pencil and paper test, the instructions are given by pantomime, and the scoring is by stencils. As a measure of general intelligence it is good, but on the whole slightly inferior to Alpha. It has given a fairly satisfactory measure, however, of hundreds of thousands of soldiers who were not sufficiently literate to take the Alpha test. It correlates .80 with Alpha, .73 with Stanford-Binet, and about .50 to .60 with officers' ratings of men.

The methods originally prepared for the individual examination of recruits included twenty separate tests. Although most of these were individually satisfactory they were little used because of lack of comparative norms and because they were not systematized into a scale. The Stanford-Binet, the Point Scale, and the Performance Scale which succeeded them have been abbreviated so that a majority of individual examinations can be given in fifteen minutes. Each of these abbreviations correlates .90 to .95 with the complete scale of which it is a part. The individual examinations have been made largely by enlisted men of limited psychological training, working under the direction of an experienced clinical psychologist.

The unexpected close of the war prevented a revision of Beta and the preparation of a new scale for testing officers.

The Selection and Training of Telegraphers. L. L. THURSTONE,
Carnegie Institute of Technology.

When the Carnegie Institute of Technology started a night course in telegraphy for drafted men of Class IA arrangements were made by which mental tests were given to the candidates at the time of their physical examinations. These tests included analogies, opposites, spelling, language completion, number completion, and a special ability test by which the candidate was asked to recognize a series of rhythms of varying difficulty. The general intelligence tests were given by the time limit method to groups of about fifty at a time. The Rhythm test was given at the same time. Each candidate was given a blank on which he was asked to reproduce the dots and dashes which were sounded by the examiner on a buzzer. The rhythm patterns were given in their order of difficulty, beginning with such simple patterns as dot-dash and terminating the test with more complex symbols such as dot-dot-dot-dash-dash-dot-dash-dash-dot. The number of errors in the list of thirty-five sound patterns constituted the candidate's score and these were subsequently correlated with his performance in sending and receiving the telegraphic code.

A speed test in receiving was given all the classes at every session. In order to obtain the candidate's most representative speed for the evening the receiving test was divided into five parts which were given at different speeds. After one hundred hours of practice the highest speed attained by each candidate was correlated with his scores in the general intelligence tests and the rhythm test. It was quite interesting to note that the highest correlation coefficient (Pearson .49) was obtained with the Rhythm test and that the Opposites test was second in diagnostic value with a corresponding coefficient of + 0.42. When the tests were combined by the method of multiple correlation the total coefficient, R , was found to be .53. In other words, the prediction obtained by the Rhythm test was noticeably raised by the addition of the intelligence tests.

The age and general schooling and occupation of the candidates were also checked up with their subsequent performance in telegraphy and it is of some practical value to know that both age and years of schooling have zero correlations with ability to learn telegraphy. The occupational classification can not be treated as a continuous variable and hence no coefficient could be calculated for it, but inspection of the occupational classification shows that

previous occupation has nothing to do with ability to learn telegraphy. The few candidates who had not finished the sixth grade were all below the average in telegraphy but the coefficient for age for the whole group is zero.

It seems apparent that the ability to learn telegraphy is a special ability. This conclusion is verified by the fact that the frequency surface of speed in telegraphy after one hundred hours of practice is significantly bi-modal, a condition which is quite unusual in mental test work with random samplings. The Rhythm test has a higher diagnostic value than the general intelligence tests and age and general schooling.

Examination of Emotional Fitness for Warfare. R. S. WOODWORTH,
Columbia University.

In the hope of providing a means of quickly sifting out from the draft and holding for individual examination at the hands of the neuropsychiatrist, those of neurotic tendencies, a questionnaire was made up from symptoms believed to indicate such tendencies. When a given symptom was reported by twenty-five per cent. or more of an unselected group, it was eliminated as not being sufficiently diagnostic. After several preliminary try-outs, the most important on draft men at Camp Upton, a list of about a hundred questions was adopted. Qualitatively, such a list of questions can be used to furnish clues to be followed up by oral questions. Quantitatively, the plan is to score one against the subject for each symptom reported, and to base the question of further examination on the total score, the idea being that, while any single "symptom" (of the minor sort here in question) appears in a proportion of normal persons, the accumulation of many such symptoms is a sign of difficulty in adaptation and significant enough to warrant examining the subject with more than the usual attention. As a matter of fact, where the average college student reports about ten out of the hundred symptoms inquired about, the average neurasthenic or hysteric recognized at Camp Upton scored over forty. At the Plattsburgh reconstruction hospital, returned "shell shock" cases with the same diagnoses scored about thirty on the average.

This work was done under the direction of a committee of the American Psychological Association and later under that of a subcommittee of the Psychology Committee of the National Research Council. Of individuals contributing to the work, mention should be made of Captain A. T. Poffenberger, who with the writer

made the start, and of Captains E. G. Boring and H. L. Hollingworth, co-members with the writer of the subcommittee last referred to.

The Work of the Psychology Committee of the National Research Council and the Division of Psychology, Surgeon General's During 1918. ROBERT M. YERKES, University of Minnesota.

The Psychology Committee of the Research Council appointed in April, 1917, has served the military establishments of the country as a war organization chiefly through subcommittees and conferences. Thus it has rendered important service to various departments of army and navy.

The lines of psychological service conducted for the Department of the Adjutant General have been controlled by the Committee on Classification of Personnel in the Army. For this conspicuously important service the Psychology Committee is only remotely and indirectly responsible.

Through a sub-committee and individuals, assistance was given the Department of Military Aeronautics in the selection, classification and placement of men as well as in the development of special tests.

In the Medical Department a Division of Psychology was organized as a result of Research Council activities. This division directed the examination of more than seventeen hundred thousand soldiers. Of these, more than eighty-two thousand were individually examined. Practical applications of psychology within this department are numerous and, like those of the Personnel Committee, significant in connection with increase of military efficiency.

The Morale Branch of the General Staff, recently established, is indirectly the result of work of individuals and subcommittees of the National Research Council. At times as many as twenty-five psychologists have been engaged in practical morale work for the army.

By special request of the Division of Military Intelligence, methods were prepared for the selection and training of scouts and observers. Varied assistance was rendered this Division by psychologists on duty in army training camps.

For the Committee on Education and Special Training of the War Department the Psychology Committee adapted courses of instruction to be used in Students' Army Training Corps institutions. The army tests of intelligence were also adapted with the

expectation that they would be used to assist in the selection and classification of students and for the guidance of teachers in connection with instruction.

The Chemical Warfare Service was aided by the Committee in perfecting the gas mask. It is understood that the latest improved type of mask embodies the principal recommendations of the psychologists who worked on this subject.

To the Navy, psychological service was rendered in connection with the selection and training of gunners, the testing of men for distribution or assignment in the gun-fire squad, the selection and training of listeners and of lookouts. In each of these several directions psychological contributions promise to be of far-reaching value to the Navy.

In addition to the lines of service enumerated above, the Committee directed numerous special studies of acoustic problems of military significance, of problems of emotional instability and unfitness for warfare, of problems—educational and psychological—presented by the procedures of military training and discipline, of problems of morale and of varied problems in mental and physical reëducation or rehabilitation.

Finally, it has been one of the important functions of the Psychology Committee to consider ways in which the science of psychology and its technological developments may most surely be advanced. Efforts are being made to secure wise provision for this science in connection with the permanent organization of the National Research Council.

The war work of the Psychology Committee has been greatly appreciated by the other divisions of the Research Council and the coöperative relations established between psychology and the other sciences represented in the Council are invaluable.

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THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

RELIGIOUS PSYCHOLOGY

BY JAMES H. LEUBA

Bryn Mawr College

Wells (8, 9, 10, 11) published during the past year several papers of interest both to the psychologist and to the philosopher of religion. "Two Common Fallacies in the Logic of Religion" (8) gave rise to a discussion (2, 7, 11) very briefly summarized here. That paper may claim the merit of providing names for long recognized fallacies. The "pragmatic fallacy," as Wells calls one of them, results from the "confusion between the value and the truth of belief"; the other, the "fallacy of false attribution," consists in ascribing as cause to the religious experience an "outside," higher force, where in reality the cause is "merely physiological—from below." James is singled out as a chief or rather, perhaps, the most conspicuous sinner with respect to both these fallacies.

Wells' critics (2, 7) do not deny the existence of the pragmatic fallacy, but they object to his criterion of truth and of value, and to his understanding of the effect of false metaphysical belief. It would be inappropriate in this journal to follow in detail this discussion; much of it belongs rather to a philosophical periodical. We may say, however, that Brightman's (2) main objection is to the clean cut separation made by Wells between truth and value. He urges that "description of reality is not complete truth until we know the truth about its value; and *vice versa*." "Religion will always be more interested in reality as value than in reality as fact"; but the "philosophy of religion can never rest 'content'

until it finds some consistent way of understanding reality—existence and value—as a whole.”

Moore's criticism (7) is directed mainly against Wells' statement that metaphysical beliefs—whether true or false—cannot lead to objective results either harmful or beneficial, because such beliefs “refer to no empirical objects.” Metaphysical beliefs—true or false—may, on the other hand, possess values—either positive or negative—of a *subjective* sort. This means, for instance, that “to believe in God, even if there be no God, can have no bad indirect, objective effect,” and may be productive of much subjective good. Moore affirms that this distinction between “subjectively valuable” and yet “objectively false” presupposes two false postulates and he adds, “it is perfectly conceivable that false religious beliefs may be comforting and even inspiring—may have both hedonic and moral value—and yet at the same time be positively harmful to the spiritual nature.” On the other hand, pursues Moore, a false “scientific” belief (as, *e.g.*, in the non-reality of pain) may be “subjectively” valuable and yet “objectively” harmful (as in the case of the example, in hindering a cure of the disease which causes the pain). That, Wells does not deny; he claims merely that if such beliefs are to possess a balance of positive value, they must be true. To the first of Moore's criticism Wells retorts that “the ‘spiritual nature,’ in Professor Moore's sense of the term, does not count as a factor of biological significance in the struggle for existence,” and is, therefore, beside the point.

This discussion is of interest to the psychologist of religion chiefly because of the failure on the part of every disputant to differentiate the “scientific” beliefs in gods from those that are metaphysical in the sense in which Wells uses these terms. “Scientific” beliefs refer, he tells us, not to the Whole, but to detail of the physical environment, to discreet facts of experience; whereas “beliefs in transcendental realities of any sort . . . would be called ‘metaphysical.’” Everyone of them assumes that the beliefs in the gods of the various religions are metaphysical beliefs. I hold, on the contrary, that they are “scientific” or, rather, pseudo-scientific beliefs, *i.e.*, inductions from specific, concrete experiences.¹ Conceptions of this sort differ from metaphysical conceptions of God in their origin, nature, and function. The failure to keep these two kinds of Gods separate continues to obscure and make barren many of our discussions about religion.

¹ This I have tried to demonstrate at some length in Chapter XI of my *Psychological Study of Religion*.

The fallacy of false attribution is illustrated by Wells in connection with James's interpretation of mysticism.¹ Brightman (2) remarks that the fallacy of false attribution is a fallacy only from the standpoint of a positivist who rejects all metaphysics, or of a deist who finds the divine only in lawless interventions in the course of nature; but for a theist, or a pantheist, or a religious idealist, say of Lotze's type, there is no such fallacy. For these, any event in the world is capable of being explained from two standpoints; first, the standpoint of its relation to previous events in the temporal series (the phenomenal cause; in, for instance, psycho-biological terms); and the standpoint of its relation to metaphysical reality. In this last case, the mystical state appears as an aspect or activity of the real, or divine. Moore's comments on this point do not differ materially from those of Brightman.

In so far as religion is concerned, the real issue involved is met neither by Wells nor by his critics. That issue can be fairly met only when it is clearly recognized that the god-ideas of the religions are not metaphysical creations, but the outcome of scientific or pseudo-scientific inferences from particular physical or psychical phenomena. An explanation of religious experience in terms of that kind of god, cannot stand together with a psycho-biological explanation: they exclude each other. But whatever "explanation" of religion by means of a metaphysical conception of God may be given, may very well coexist with a psycho-biological account: both may be valid. Wells's practical implication in this and in the "Biological Value of Religious Beliefs" (9), namely that the question of the "truth" of God matters little, since the belief in God cannot do any objective harm and may do much good, loses all cogency if, as we claim, the gods of the religions are not metaphysical conceptions.

An important distinction seems to have escaped Wells' observation. He defines the fallacy of attribution as consisting in the erroneous interpretation of an experience whereby it is attributed to an external, divine source. But some, at least, of the facts he has in mind involve more than a false interpretation; they imply, in addition, an identification of interpreted, mediate experience with the immediate experience itself. The mystic, for instance,

¹ Incidentally, I wish to correct the statement made by Wells that the conclusion of my study of mysticism is that it is "a form of sublimated love." I do not understand how even a superficial reading of my papers in the *Rev. Phil.* and in *Mind* could produce that impression. In these papers, I assign four main roots to Christian mysticism, love is one of them.

is not aware that he interprets; he thinks that he directly experiences God. Now, that is, first of all, not a fallacy of false, but of *unrecognized* attribution. There are, then, two fallacies of attribution involved in the facts which Wells sets before us, that of false and that of unrecognized attribution.¹ They should not be confused. Of these two fallacies, the more significant one seems to me to be the latter.

"The Biological Value of Religious Belief" (9) is a semi-popular paper in which Wells mentions and illustrates the various values of religion—hygienic, ethical, industrial, artistic, etc. It seems to the author that whether true or not, religious beliefs will continue to exist among the masses, "those who predict the 'irreligion of the future' fail to take into account the emotional and temperamental basis of belief." Criticism is made elsewhere of the affirmation, repeated here, that "the question of truth is irrelevant to a discussion of the value of religious belief." The chief weakness of the paper seems to us to be the vagueness with which "religion" and "religious belief" are used, and its failure to balance the disvalues against the values of religion. In this, Wells is merely following a usage established long ago by those defenders of existing religions who will know only of the benefits they confer upon mankind. But is it not profitless at this time to tell us that religion has had and still has positive values? That which we want to discover is whether the particular forms of religion now in existence, when all their effects, immediate and distant, are taken into account show a better balance than other possible forms of religion or, perchance, irreligion.

In the "Religious and Moral Discipline of Children" the same author (10) breaks a lance for the recapitulation theory. That theory possesses, he thinks, "its greatest value when applied to the problem of religious and moral education." In our estimation the truest statement of the article is found on the first page, "the only certain way of learning the best methods of education is that of observation and experimentation." I almost wish the author had stopped there, for the recapitulation theory in its alleged applicability to education is a snare. If it purported to be merely an

¹ In the *Inter. J. of Ethics*, 1904, 14, 323, I have brought out the presence of the fallacies of false and of unrecognized attribution (without naming them so) in James's discussion of mysticism. More recently, in the *Beliefs in God and Immortality*, pp. 150-153, I pointed out the latter fallacy in writings of Professor E. E. Bacon upon immortality. In the *Hibbert Journal*, 15, 611-613, Dr. Charles Mercier mentions some instances of unrecognized attribution in the utterances of Sir Oliver Lodge.

affirmation of the impossibility in which the child is to begin his psychical life at the highest point reached by his parents or the race, it would be an innocuous platitude. If the doctrine affirmed that the child should retrace *all the steps* taken by the race, no more absurd educational guide could be chosen. As a matter of fact, no one defends that form of the theory. The tempered form of it, according to which the child is to retrace only some of the principal stages of the long, devious route over which the race has passed in its upward march, is the only one advocated. But this modified form involves in itself a denial of the pedagogical usefulness of the theory, since it implies the absolute necessity of omitting many of the stages and gives no answer to the all-important question as to which stages should be omitted and which retraced. Shall the child be made to worship animal gods? Through which one of the steps of the sacrificial rites shall he be led: the killing of animals, the offering of the blood, of a substitute for the blood? The recapitulation doctrine can be of no service whatsoever in determining *which* of the racial steps should be used and which should be discarded in the education of the child. Guidance in this matter will have to come from pedagogy and psychology. "The recapitulation theory is as useless for the determination of the succession of beliefs the child should entertain as it is in the determination of the changes of diet he is to undergo."¹

Wright's "Relation of the Psychology of Religion to the Philosophy of Religion" (12) brings us back to the problem of the nature and truth of the god-ideas. Psychology proceeds on the general assumptions of the sciences (the categories of time and space, cause and effect, matter and motion, etc.). Its task is the description of religious phenomena in terms of structures, functions, and modes of behavior of general psychology. It is concerned with religious phenomena "merely as such." Should it be found that psychological laws are not sufficient to account for these phenomena, "theism and spiritism might be regarded as experimentally proved." But if the reverse were true, "the possibility of the existence of such beings in the universe would be unaffected," and philosophy would still have to pronounce on that question. The critical remark we have made above with reference to the gods of the religions and the gods of metaphysics finds application here also. Philosophy, we would say, can not prove the reality of the gods of the religions;

¹ "Children's Conception of God and Religious Education," *Relig. Educ.*, 1917, 12, 12.

that proof can be given by science only. But philosophy may perchance prove the existence of gods of another kind, metaphysical gods. Before the respective provinces and tasks of psychology and philosophy can be correctly separated, the distinction existing between these two classes of gods and its significance must be realized.

Wright does not think that because the psychology should be carefully distinguished from the philosophy of religion, the psychologist should not be also a philosopher and treat philosophical questions. The two kinds of problems may even be discussed profitably in conjunction, provided the two methods and points of view be not confused.

The second half of the article is taken up by a consideration of some of the ways in which the psychology and the philosophy of religion will profit when no longer confused; by an enumeration of some of the problems which each discipline should attempt separately; and by a statement of the author's convictions upon religion.

"Never before in the history of the world, did rational, social values need more the sanction of religion than at present, because never before did they need to come to the consciousness of the individual in intenser form"—in these words Ellwood's paper on "Religion and Social Control" (3) may be introduced. The essential process in religion, is, according to him, the projection of social and personal values into the universe. Thus, values are universalized and made absolute; and, because of that, religion releases fully the energies of the individual in periods of crisis, in particular the energies that make for self-effacement and self-sacrifice. Thus and only thus can be attained the fullest degree of united and coöperative action. This process of projecting values into the universe does for instincts and emotions what the rationalizing processes of the intellect do for knowledge: the first provides a world of universal values, and the second a world of universal ideas; both are equally necessary to social existence.

But, if values must be given a religious sanction, the sanction need not be any particular theological notion; theology passes, but religion endures. The real religious problem is now, as always, "the problem of getting a religion adapted to the requirements of our present social life." It seems to the author that a humanitarian ethics supported by a religion of humanity is the present need of civilization.

If it could be shown that the mystic is not so alienated from

human nature as he seems, that he differs from others in degree, not in kind, a basis would have been laid for a better understanding. This Bennett (1) tries to do as he takes up successfully four characteristics of mystical life: renunciation of thought, passivity, naïve optimism, the apparent emptiness of its knowledge. Bennett finds an analogy to renunciation of thought in the scientific method "that zealously cultivated dispassionateness by which he (the scientist) is to become mere observer and reporter of pure fact." It is in the light of this analogy that the author would interpret the mystic's negations. The emptying of the mind is only a preliminary step: "If God is to be known of man, he must be first worshipped as the God who is unknown." The cultivation of passivity is not something purely negative. It should rather be understood as an effort to get rid of strain in order to act spontaneously, from "nature," as it were. The mystic is trying to become the spontaneous expression of God.

The author is less successful when he attempts to make us see in a favorable light the naïve optimism of the mystics. Still less satisfactory is he with an attempted explanation of "the apparent emptiness of the mystical knowledge." We agree with him that the mystic is "more ecstatic over the *fact* that he has seen, than explicit about *what* he has seen"; he is so impressed by his conviction of the unutterableness of what he has learned that he insists exclusively on the wonderfulness of the revelation. But we thought that the author desired to show that these revelations are not so empty as they seem. That he has not done.

In the strict sense of the word "instinct," there is no specific religious instinct; many of the common instincts and the corresponding emotions are at the root of religious activities. But if one may not speak of the religious instinct, one may speak of the religious *sentiment*, using that term in the sense given it by Shand. From that conception as a starting point, Wright (13) traces briefly the development of religion under three heads: the objects or agencies of the religious sentiment, the values that are sought through these agencies; and the religious sentiment itself. In earliest societies the religious sentiment has but one, and that an ill defined object; the sentiment itself is vague, and the moral values recognized by the group are not necessarily connected with their religion. Gradually the sentiment becomes differentiated and individuated; it splits up into a variety of sentiments, each attaching to a different object. In a third stage, the various "gods" have become more

or less completely synthetized into a higher and more concrete unity, monotheism. This paper is significant as an indication of the spread of psychological science and of the increase of its influence upon the understanding of religion. The author's general conception of the function of religion is that of an instrument serving to the organization and enhancement of moral values, these moral values possessing a validity that is independent of religion.

In the "Primitive and the Modern Conceptions of Immortality," Leuba (4) summarizes what he considers to be the chief contribution of the first part of his recent, book—*The Beliefs in God and Immortality*—namely, that in the western world there are two great historical conceptions of personal immortality, differing in their origin, their nature, and their function. These two conceptions have never before been clearly and adequately differentiated.

In "Ecstatic Intoxication," the same author (5) seeks to account for the remarkable fact that in all or nearly all savage and semi-civilized peoples, ecstatic intoxication is regarded as communion or union with the divine. The understanding of that fact is, in the mind of the author, closely connected with the understanding of certain trance-like states, known to the higher religions under the name of mystical states, and regarded as communion or union with God.

Molnar (6) recommends as a new method in religious psychology a more systematic observation of the inner life and the graphic representation of it, together with its comparison with another graph, covering the same period, indicating the "practical attitude" of the subject. The author's main directions concerning the first graph are to observe one's inner state and to grade it between two limits. Altogether nine states are named between these extremes (high moments, communion with God, peace, disquiet, dissent, indifference, backsliding, "fiat," monoideism of sin). The observations are to be plotted every two hours. In the second half of the paper, three curves, representing the religious experiences of three persons, are discussed by way of illustration.

There is no doubt whatsoever that the effort to make graphic representation of individual religious life would greatly help the making of full and precise observations; but the directions given in this paper are of such a nature that little, if any thing, can be expected from curves established according to them.

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THE INSTINCTS IN SOCIAL PSYCHOLOGY

BY CHARLES A. ELLWOOD

University of Missouri

Ever since Hobbes, the dominant influence in social theory, next after social conditions themselves, has been theories of human nature, which we may roughly call "psychology." Psychological theories, however, are usually applied in social interpretations somewhat later than their promulgation, and in the meanwhile they may have undergone extensive modifications at the hands of the psychologists themselves. Again, they are often uncritically applied in the social sciences without regard to the complexity of the phenomena which they are used to interpret. This has led some students of society to decry the use of psychology in the social sciences and to demand that these latter rely wholly upon "inductive methods." However, the sociology, economics, and political science of today are still dominated by psychology. They cannot in fact get rid of this domination, and their wiser devotees are trying to see that the psychology used by them is up-to-date.

The above paragraph almost exactly describes what has happened with the psychological theory of instinct in the social sciences. Almost any reflective reader of twenty-five years ago might have discerned a good deal of sociological dynamite in James's chapter on "Instinct" in his *Principles of Psychology*. Nevertheless, "instinct" had no vogue in the social sciences until McDougall published his *Social Psychology* in 1908. Now, however, the literature of the social sciences is swarming with all sorts of appeals to "instinct," most of them uncritical, to explain any phenomena at all obscure. We hear of "creative instinct in industry" and even of "the instinct of thought"!

While the writer of this review was one of the first to urge the proper recognition of an instinctive element in our social life, he feels now that he must warn against the present uncritical use of this concept by many writers, or else a reaction is bound to come which will discredit its use altogether. Accepting "instinct" as the racially hereditary element in behavior, it is obvious that both on account of the nature of man as an organism whose behavior is highly modifiable and of civilization as a complex series of acquired habits, its use in explaining present social conditions must be guarded. The assumption that the mores, institutions, and adult behavior of a civilized group can be explained largely through "instinct" is open to grave doubt. Rather it would seem that the concept is chiefly useful in explaining the origin of human relationships and those constant elements in social behavior which are found in all stages of human culture. Practically all adult human behavior, so far as we know, is an indefinite mixture of instinct, habit, and intelligence; and the same thing is true of human institutions. We say "indefinite" because the proportion of instinctive, habitual, and intelligent elements in any given concrete social situation is practically impossible of determination.

With these principles in mind it may be profitable to examine briefly a few typical appeals to the instincts in the current literature of the social sciences.

In the field of ethics Mr. Folsom (1) would have us interpret morality, both customary and idealistic, in terms of the gregarious complex, which Mr. Trotter calls "herd instinct." He argues that social and moral values are formed upon the basis of the instincts, and his paper is devoted largely to showing how this is done. "Moral ideals and the sentiments of custom, convention, and fashion are conditioned reflexes," he tells us, "built largely upon the original

tendencies of the herd-control complex." The instincts in this complex are "the roots of morality." He does not deny the element of habit or even of intelligence in the "mores." However, it is not habit or intelligence which gives the mores their power but "herd instinct." "Once determined, they are intrenched by instinct almost beyond the possibility of dislodgment." In addition to "herd instinct," instincts of "altruism," of anger and fear, mastery and submission, of aversion, and of self-repression and self-restraint also enter into morality. But "the essence of sin in group morality is breaking the bonds of herd instinct." In spite of this instinctive view of morality, however, Mr. Folsom concludes wisely that the best method of moral education is through knowledge and enlightenment.

But it is in the field of economics that the doctrine of the instincts threatens most to be carried to extremes. This is, of course, a natural reaction from the highly intellectualistic doctrines of the orthodox economists of the nineteenth century. The late Professor Carlton H. Parker read before the meeting of the American Economic Association in 1918 a paper on "Motives in Economic Life" (4) which probably has been the basis of more newspaper editorials than any scientific paper of recent years. Professor Parker combined the doctrine of the instincts with the Freudian doctrine of "balked disposition" to explain labor troubles and revolutionary movements. He listed sixteen instincts (among them the "instinct of thought") which must be satisfied in economic life if there is to be social harmony. Disregarding the effects of propaganda and the mores of the particular group involved, he would explain the I. W. W. movement largely through the fact that the economic conditions under which the wandering laborer works afford no adequate satisfaction to even a majority of the fundamental instincts; and this makes him a social rebel. The paper contains no recognition of the part played by habits, ideas, and standards in revolutionary movements, but would apparently explain them entirely through instinct and the repressive environment of present civilization.

Mr. Tead (6) is a follower of Professor Parker and simply develops his ideas. More cautious than his master, he lists only ten fundamental instincts, and explains that instinct is never uncomplicated by other factors in human behavior. He attempts to show in successive chapters how labor conditions may be such as to satisfy fundamental instincts and thus a balked disposition

avoided. Like Professor Parker, Mr. Tead has a benevolent purpose, and his book will do good, but it is not satisfactory from the standpoint of science.

Mr. Smyth, who is a consulting engineer, is more careful but more vague. He recognizes only four fundamental instincts—to live, to make, to take, and to control, or self-preservation, construction, acquisition, and mastery (5). In addition he recognizes another factor, the desire to know, which he calls, in engineering terms, “the social strain equalizer.” All of these must be recognized in social reconstruction, and coördinated by a rational national purpose.

Of a quite different character but still touching upon our subject is Professor Ogburn’s paper (3). Professor Ogburn appears as an advocate of the now rather badly discredited doctrine of “the economic interpretation of history.” Curiously enough he appeals to the Freudian psychology as a basis for an economic interpretation of the larger social movements. The habitual repression of economic instincts and desires leads them to appear in history in all sorts of disguises—religious, moral, and political—but they are nevertheless the real motives which underlie most social movements. Professor Fetter’s criticism in the discussion of the paper is so to the point that it is worth quoting. He turns the tables on the theory by pointing out that Marx’s materialistic interpretation of history is itself an example of a biased explanation due to unconscious prejudice. “Marx was a disappointed revolutionist who was championing the cause of labor and was seeking some philosophy that would support his practical agitation against the capitalist class.”

It would be difficult to harmonize the many discrepant statements in the above writers. The element of truth in their theories, and perhaps a good antidote to their exaggerations, may be found in the careful statements of Professor Hocking’s book (2). He shows that civilization essentially involves a continuous and progressive modification of original human nature—a “remaking” of it in each individual through the agencies of social control. The way in which these agencies of social control do their work in modifying the original nature and in building the character of the individual is what determines chiefly the character of our civilization. Human character is and should be an artificial product. Human instincts, when carefully examined, are found to offer no impediment to the realization of ethical ideals *which are socially sound*. Hence there

is no argument for getting our norms for human living from original human nature, as some of the above writers seem to imply.

Perhaps the above is sufficient evidence that social psychology has at last outgrown the suggestion-imitation stage of its existence!

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CRIME AND SOCIAL PSYCHOLOGY

BY ANGIE KELLOGG

Bryn Mawr College

The criminological journals during the past year have been full of accounts of surveys made of groups of offenders in courts, prisons, reformatories, detention houses and the like. In general, they consist of physical and mental examinations and social investigations. The purpose is to throw light upon delinquents, their physical and mental status and development, their social, economic, and occupational history and conditions; to trace as far as possible the relation between the conditions of their lives and their specific offenses; to point out the characteristics common to each group; to disclose their needs and to indicate at least the main lines of rational treatment. The following notes will be easier to read if we place them under four heads: (1) Statistical studies of delinquent women and girls, (2) Statistical studies of juvenile delinquents, (3) Miscellaneous statistical studies, (4) Non-statistical studies.

I. *Statistical Studies of Delinquent Women and Girls*.—Several studies, concerned particularly with immoral women and girls, tabulate and explain information with respect to physical and mental ages, intelligence quotients, school grades, the relations of physical and mental conditions to industrial efficiency, the use of alcohol and drugs, frequency of arrest, age of first sex offense, age

of entering life of prostitution, venereal disease, relationship of venereal disease to the number of offenses, the number of illegitimate children, the family history, physical, mental, economic and social. Thus, Anderson (1) considers one hundred immoral women as seen in court; Paddon (29) studies fifty feeble-minded prostitutes in the New York Magdalen Home, discussing in particular their emotional natures, the stable and unstable, the erotic, docile, obedient, easily influenced, untruthful, profane, quarrelsome, craving excitement, shrewd, tricky, etc. Bryant (6) studies three hundred women, particularly one hundred and eighteen of them, at the House of Correction in Holmesburg, Pennsylvania. Ordahl and Ordahl (27) present a study of four hundred and thirty-two delinquent and dependent girls who had been committed to a State Training School for Girls.

II. *Statistical Studies of Juvenile Delinquents.*—Horn (18) publishes a study of fifty-three juvenile court wards, twenty-four of whom were delinquents. Clark (10) presents a statistical study of one hundred and two boys who had been habitual truants prior to their commitment to Whittier State School. Tables and explanations are given comparing these boys with four hundred and seventy unselected delinquents committed to the school; also tables and explanations concerning the truants alone, as to ages, principal offenses, the number of offenses committed by each truant; the numbers of those who used alcohol, tobacco, and of those who were profane, the intelligence quotients, school grades reached, their ability in school subjects as determined by educational tests; all tabulated by race; the history and conditions of the families of the truants, the grade of homes by race, and the grade of neighborhood, average grade of homes, and a table of index of neighborhoods—by race. McIntyre (22) presents a study of one thousand seven hundred and ninety-two adjudged delinquents by the Manhattan Branch of the Children's Court during 1916 to show the connection between child labor and delinquency. One estimate of the study is that the working children contribute four times their share to the ranks of juvenile delinquency. Merrill (24) presents a summary of findings of sexualism in an unselected group of one hundred delinquent boys. Regarding the causes of the misbehavior which brought the boy into the court, it is stated that technically, twenty-eight were arrested for nomadism, loitering and indolence; eighteen, for dishonesty; nine, for truancy; six, for vulgarity on school grounds; six, for sexual misconduct; six, for disorderliness about the commun-

ity; and two, for irritability of temper and disobedience at home. Yet the author shows that sexualism played a large part in causing misconduct which was more directly apparent in the vagrancy cases, but was revealed by analysis in the stealing cases. Tables are given of the height and weight norms, the ages and the intelligence rating of the sex group. The physical depletion was considerable. The author states that the findings indicate that erotism profoundly affects the intellectual processes.

III. *Miscellaneous Statistical Studies*.—Bowers (3) gives the findings of a survey of two thousand five hundred prisoners in the psychopathic laboratory at the Indiana State Prison. He states more or less exactly the frequency of occurrence of diseases and of physical defects and stigmata. He tabulates information, physical, mental, social and economic of the prisoners and their parents. In addition, he gives brief descriptions of several kinds of mental disorders, of sexual perversions, and of feeble-mindedness. He describes the characteristic ways of thinking, feeling and acting on the part of those afflicted with the above maladies, and discusses the characteristics of the crimes which are outcomes, their nature, their frequency, etc. Pintner and Reamer (31) made a study of twenty-six delinquent girls to discover the extent to which the results of mental examination are prognostic of future progress in the world. Tables are given showing rankings according to mental tests; and rankings according to their probable ability to make good, which were made independently by the social investigator, the psychologist, and the superintendent of the institution to which the girls had been committed. In certain cases the two types of ranking differed radically. The conclusion of the study, based on this fact and on the actual progress of the girls after leaving the institution, is that the mental tests were not prognostic of the success. Shideler (33) presents a statistical study of nearly seven thousand six hundred delinquent boys in industrial schools in thirty-one states, giving tables showing the parental and guardianship conditions of the delinquents, the excessive proportion of delinquent boys from cities of over 25,000 inhabitants, etc. Claghorn (9) presents a study of crime and immigration, taking cases of foreign-born prisoners in Sing Sing Prison, giving tables as to country of birth; psychopathological classification; types of offense; types of offenders, as first offenders or recidivists; education; economic status; naturalization and Americanization; recidivism related to nature of offense and intelligence—all by country of birth and in numbers or

per cents. Stanley (35) studies morphinism and crime as shown in one hundred prisoners at San Quentin, stating the age at which the use of the drug began; the manner of using it; amounts used; and the sensations and feelings, when deprived of it, and when under its influence, as to feelings, appetite, digestion, dreams, sexual desire and potentialities, and desire for alcohol. The majority had been convicted of robbery or grand larceny.

It is obvious from the number of the details set forth in the above surveys that it is impossible to state all the findings, and to select certain findings would be to distort values. In general, however, it may be said that the authors agree as to prognosis, prevention, causation, and treatment. On the whole, prognosis is unfavorable; the obstacles in the way being social stigma, habit of thought, feeling and action, and false conception on the part of the public, of criminals and crime, all most difficult to overcome. Prevention requires more clinics, mental and physical, in the schools especially; more or better equipped ones in the courts and correctional institutions; and, especially, it requires training classes in the schools better suited to the needs and capabilities of the low intelligence pupils, and more rational and vocational guidance. Causation continues to be regarded as a complex of social, physical and mental factors, inherited or acquired by the individual. Individual treatment is still considered the only rational procedure, although classes are indicated for general lines of treatment.

IV. *Non-statistical studies.*—Rippen (32) and Hoffman (17) advocate what might be called a Family Court, on the ground that, for example, six delinquent members of a family can more effectively and economically be considered as a unit in one court than as six units in as many independent courts. Such a Family Court would have to do with desertion and non-support, divorce, adoption and guardianship, juvenile and youthful delinquency and dependency. Everson (11) states that the Children's Court registers the evils not only of the individual but of the family and of the community or neighborhood as well. Therefore, he and Thurston (37) emphasize that the best court standards require that the court recognize its responsibility, not merely toward the child but toward the family and the community; that the probation work is therefore not merely individual case work but family case work and community improvement, and that to this latter end social agencies must be represented in court.

As to prisons, Lyon (21) emphasizes the need of new ideas of

housing prisoners. All plans for buildings should be based on the most careful consideration of the psychological effects upon the prisoners of the various forms of housing and on the various types of treatment necessitated by the physical and mental conditions of the inmates. Osborne (28) condemns the *a priori* method of judging what kind of prison treatment is good for prisoners and what prison behavior can be expected from them and demands democracy of management as a working principle, which has proved itself. Kilbride (20) shows under what conditions as to selection of prisoners, wage, work, and environment, labor conscription in the Illinois prisons has been able to change criminals into law-abiding citizens. Hodder (16) states that reformatories of the day are not meeting the needs of the women sentenced thereto. They may be divided into three groups, those who may safely be returned to the community, those who need permanent custodial care, and those about whom prognosis is doubtful. The second group is not reformable. The third group constitute a problem requiring a new kind of reformatory which shall meet the needs of the individual, attending to the physical and especially to the psychiatric problems which are the predominating factors in crime.

With regard to the better success of probation and parole, Chute (8) advocates state supervision of probation work. Burleigh (7), defining parole of girls as reëducation through which the girl is reabsorbed into community life, states that parole should be separate from the probation system and from the institution in order to make the identification of the girl with the community more complete at the start. Whitman (38) discusses the features of the new parole law of Illinois under which persons sentenced even for murder, rape, treason, and kidnapping can be paroled. This method of administering the law makes parole a very gradual progressive merit system working towards freedom, first within the prison, then from it, and then from all supervision.

Several articles treat of the criminal irresponsibility of the mentally abnormal and subnormal, of their great menace to society, and the need, therefore, of more institutions in which to segregate them. Ballantine (2) and Gordon (13) consider the tests of responsibility in legal theory and practise, and expound the theory of degrees of responsibility corresponding with the mental status. Mead (23) does much to clarify the conception of responsibility in an exposition of the psychology of primitive justice. Several authors discuss the function of psychopathic laboratories in crim-

inology. Fernald (12), Oliver (26), Murray and Kuh (25), Bryant (5), Spaulding (34) show their value as means of diagnosis and of prescription of treatment of offenders. Harding (15) shows their functioning in the case of epileptic prisoners, and Squire (36) in the case of venereally diseased prisoners.

Criminology (30) is a review of criminological literature of value to students of law and of criminology, and to court workers.

The Pawns of Fate (4) and *The Imprisoned Freeman* (39) in the form of stories set forth modern criminological views. The former presents social problems of dependency, delinquency and defectiveness in the history of a down-and-out congenital weakling. The latter sets forth prison abuses, better methods of prison management, false attitudes of society towards offenders, social and hereditary factors in crime, Lombroso's theory of crime and Goring's refutation, all in the vivid concrete form of fiction.

The Unmarried Mother (19) is based on a study of hundreds of case-histories of which five hundred have been selected in illustration of phases of illegitimacy. It recognizes causation to be varied complexes of physical, social, and biological forces, and emphasizes society's responsibility to control and segregate the mentally abnormal woman of child-bearing age, to secure more rational and just legislation, both in regard to the treatment of the mother and of the child, to secure better social conditions and a more wholesome attitude of the public towards questions of sex.

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MAGIC AND RELIGION

BY A. A. GOLDENWEISER

Columbia University

In the domain of magic and religion, as in most other pursuits of the "idle curiosity," the last few years have proved singularly unproductive in significant contributions. But it may perhaps not be amiss, at this time, to review briefly some of the ways in which the nature and origin of magic have been conceived, especially with reference to the nature and origin of religion.

More than once magic has been characterized as anti-social and religion as social, magic as proscribed, religion as prescribed. Jevons (15) recently returns to this view; for this author the difference between the two sets of phenomena lies essentially in the circumstance that these are condemned while those are approved. From this standpoint, "it is the difference between the two sets of proceedings which is [for the author] of cardinal importance, not the similarity in the *modus operandi*" (p. 261). The crudeness of this timeworn attitude discourages careful criticism (*cf.*, however, Thomas (34)); the true source of the author's view, moreover, is revealed in a subsequent passage: "The difference is fundamental for those who believe in magic. It is fundamental for those of us who, though they believe in religion, do not believe in magic. For those of us, however, who believe in neither it can hardly be fundamental" (15, p. 274)).

Magic has been represented as referring to the individual while religion appears as a group function. There is, of course, an element of truth in this, in so far as the magic art, in its later transformations, becomes the prerogative of the individual magician, whereas religion, at all times, is participated in by the community at large. On the other hand, however, religion, no less conspicuously, remains the business of the individual, always relying on him for its inspirations, revivals, emotions and rationalizings,

while magic, during a period of great length extending over a large part of primitive civilization, belongs as intimately to the group as a whole as does religion.

The mechanical character of magical procedure has been emphasized as against the inevitableness of spiritual agencies in the religious complexes of ritual and belief. While not by any means consistently, Frazer on the whole adheres to this view in his *Golden Bough*. Again, the view may not be rejected as wholly erroneous, in so far as spiritual agencies are more uniformly present in religious contexts than they are in those of magic; also, magic, particularly in its capacity of a technique, often involves protracted processes the interconnections of which are purely mechanical, thus often bearing resemblance to matter-of-fact procedure. In religion features of this sort are somewhat exceptional. And yet, anyone who will take pains to compare the magical facts of the Australian medicine man with the strictly analogous performance of his British Columbian confrère, must realize that the participation of spirits in the proceedings is as conspicuous in one set of cases (America) as is its absence in the other set (Australia). (Cf. the relevant criticisms of Frazer's position in Lang (18), Marett (25 and 26) and Hartland (10).)

Another interpretation of magic, which we also owe to Frazer, consists in the conception of magic as a sort of primitive science, while religion represents the breakdown of that primal science, falling into a period when the conceit of the all-powerful magician began to give way before the ever more frequent onslaughts of experiential disappointments. Losing faith in himself and in nature, man turned for help to the gods. This doctrine combines a very slight modicum of truth with a fundamental misunderstanding of the entire magical world-view. The regularity and inevitableness of magical connections, however conspicuous to the outsider, form no essential part of the psychic attitude of the magician as agent or as believer in magical connections in nature. His basic belief is in *power* and in its efficacy; the rest is contingent. In criticising Frazer's contention that magic involves the belief "that in nature one event follows another necessarily and invariably," Hartland quite rightly points out that "the intervention of the magician himself is proof of the contrary" (10, p. 73); for were the succession of events fixed, the magician's act could not break into the chain nor would such intervention be necessary. Marett speaks in equally unmistakable terms when he declares that "the

magician surely does not postulate that the same causes will always produce the same effects: on the contrary, his art is based on the supposed possibility of miracle—on what might be called super-causation as contrasted with normal causation" (26, p. 250). (Cf. also Wundt who passes the following judgment on the idea of magic as primitive science: "It seems to me that the belief in magic, if analyzed objectively and kept free from ideas which do not belong to it, contains in its very essence a most convincing refutation of this view" (35, p. 180, note).)

This brings us to those conceptions of magic which ally it to or identify it with supernatural power. A notably constructive effort in this direction is that of Lévy-Bruhl (21). The author describes the supernatural idea and emotion complex of the primitive man as a general *dynamism*, and also goes a step further in suggesting a psychic mechanism by means of which the supernatural bonds are established between beings, things and events. This mechanism the author conceptualizes as a *principle of participation*, in accordance with which multifarious bonds of emotional and intellectual association are established between phenomena which, from our naturalistic standpoint, may seem wholly unrelated (21, pp. 68-151); Lévy-Bruhl's concept of a primitive *dynamism* was anticipated by Lovejoy's primitive *energetics* (22). Lévy-Bruhl thus succeeds in giving psychological plausibility and logical precision to a principle long understood and applied, if in less rigorous fashion, but the author errs in exaggerating beyond all proportion the rôle played in the psychic world of the savage by these supernatural cycles of participation. (For a critical estimate of the author's position compare my critique (5), also Rivers's article (31) and my comments on Lévy-Bruhl and Rivers (6).)

With the introduction of conceptions such as Lévy-Bruhl's the line of demarcation between magic and religion becomes blurred,—one is confronted with primitive supernaturalism, such as has been made familiar to ethnologists and others under the catch-word designation of *mana*. The contributions to this branch of the subject fall into three groups. First come the writings of those who, in the course of personal contact with primitive peoples have become familiar with manaistic conceptions, at first hand. Among these mention must be made of Codrington (2), Hewitt (11), Jones (16), Miss Fletcher (4), and Pechuel-Loesche (28) in whose hands the fetichistic phenomena of West Africa have received new illumination through the *mana* idea. The merit of these

contributions is to have established beyond cavil the presence and wide occurrence in the primitive world of a belief in supernatural magic power of a non-personal sort. By this is not meant, however, that the problem can be solved by simply identifying such conceptions as *mana*, *fadi*, *orenda*, *manitou*, etc., and regarding them as so many illustrations of the primitive concept of impersonal supernatural power. The latter concept, held perhaps by all even most primitive tribes, but scarcely ever expressed in language, constitutes but the common core of the more advanced concepts of particular tribes or tribal groups, which concepts having received terminological expression, become subject to mutations of meaning, to accretions of content, due to changing cultural settings and to other historic causes of conceptual transformations.

To the second group of contributions belong the writings of such authors as Marett (24, 25, 26) and Preuss (29), who have proceeded less cautiously and, having applied synthesis and generalization to the more concrete data of the other authors, have constructed a supernatural world of primitive animatism (Marett) or magic (Preuss). They have also chronologized the conception, giving it priority over animism. While it seems justifiable to go beyond the necessarily fragmentary picture resulting from the concrete contributions, Marett and Preuss have certainly gone too far in their elaborations of the nature and scope of *mana* or magic, the chronological reference to animism being of an especially dubious character. (Cf. also the numerous discussions of *mana* at the Third International Congress of Religions (14), which contains no original contributions, and the theoretically more guarded articles by Lowie (23) and the writer (7). A convenient summary, up to 1910, of the discussions centering about the *mana* concept, will be found in King (17, pp. 134-164).) Among the writers who adhere to the more limited use of the *mana* conception note must be taken of Wundt (35, pp. 171-177, 185-188) and Radin (31, 344-351), whose stand in opposition to *mana* deserves careful consideration in view of the author's extensive experience with two tribal groups of American Indians.

The third group of writers, finally, is dominated by the figure of Durkheim (3). The French sociologist and his disciples, Hubert, Mauss and, to a degree, Beuchat (12, 13, 27), have incorporated the *mana* conception into every part of their theories of magic and religion; but the distinctiveness of their attitude consists in the drastically social derivation given by Durkheim and his followers

to magic, religion, *mana* and the very notion of the sacred. No adequate presentation of Durkheim's brilliant but not convincing argument can be given here; suffice it to say that the individual sources of religious experience and development are no more justifiably underestimated in his system, than were the sociological and historical sources in the systems of his predecessors, Spencer and Tylor. (Cf. my critique of Durkheim (9) and Miss Campbell's *Manaism* (1). Miss Campbell's dissertation is rather carefully done, although in no sense original. She is evidently greatly influenced by Durkheim's position. See also Saintyves (32) and Söderblom (33).)

A notable attempt to analyze psychologically the nature and origins of magic and religion has been made by Leuba (19, 20). An important element of the author's attitude is expressed in the following passage: "I maintain that in seeking to replace belief in personal agents (animism) by *mana*, which leaves in solution the distinction between personal and impersonal, Marett disregards the only definite line of cleavage which can be used to differentiate religious from non-religious life; that is, the line separating the attitudes and actions that involve the idea of personal power from those that do not. In my view of the matter, when the distinction between personal and impersonal is in solution, religion itself is in solution" (20, p. 74, note 1). In this significant formulation the author definitely breaks with those who see the test of religion in an emotional attitude, such as *the religious thrill*, and transfers the weight of the distinction between religion and non-religion into the conceptual domain. Thus the author is led to see non-personal power (such as *mana*) in a different light from the authors reviewed before. We read: "The original idea of non-personal power possesses but one necessary characteristic: *it is dynamic, it does things*" (20, p. 83). Once more we have *dynamism* (cf. Lovejoy and Lévy-Bruhl), which to Leuba means "power," without any necessary connotation of the mysterious or wonderful. But as the workings of this power are to a great extent unforeseen and uncontrollable, it evokes commonly dread and awe (83). While space is lacking for either an exposition or a criticism of the author's doctrines, note must be taken of a number of important theoretical principles which place the author's discussion on a level compatible with modern ethnological theory. The principles are: god-ideas of different origin have subsequently interacted upon one another (20, p. 99); the fundamental ideas underlying primitive religious

conceptions are based on normal and universal mental processes, thus being common to primitive and to modern man ("There are few men living today," writes Leuba, "barring the mentally defective, who, if deprived of the inheritance of civilization, would not people an unseen world with these unreal creatures" (20, p. 100)); the limitation of objective knowledge in primitive society is one of the mainsprings of the peculiar idiosyncrasies of the savage (20, p. 170). The summary of the author's conclusions with reference to the nature and mutual relations of magic and religion deserves to be stated in full: (1) Magic and religion have had independent origins. Neither of them need be regarded as a derivation from the other. (2) Magic contributed very little directly to the making of religion. (3) The simpler forms of magic probably antedate religion. (4) Because they are different ways of achieving the same ends, magical and religious practices are closely associated. (5) Religion is social and beneficial; magic is dominantly individual and evil. (6) Magic is of shorter duration than religion. (7) Science is closely related neither to magic nor to religion, but to the mechanical type of behavior (20, p. 176).

In a recent article I have made the attempt to account for the basic elements in religion in an epistemological way. The treatment is very concise and must be taken in the nature of a preliminary statement. The religious thrill, the fundamental emotional reaction in all religious experience, is taken for granted; it is characterized as "one of the most deeply rooted and ancient traits in the psychic organization of man" (8, p. 639) and no attempt is made to analyze it any further. The concepts subjected to epistemological treatment are "spirit" and "mana." Having pointed out the intellectualistic character of animism ("animism as such is not a religion, but a *Weltanschauung*"), I formulate the derivation of spirit in the following terms: "The specific channels through which particular groups of men have arrived at the animistic interpretation of nature are no doubt many and varied, but a most general *rationale* of the process may perhaps be given in the following formula: *Whereas the generalized experience of the behavior of things compatible with gross and permanent materiality becomes crystallized in the consciousness of man as the world of matter, the generalized experience of the behavior of things incompatible with gross and permanent materiality finds conceptual expression in the world of spirit*" (8, p. 633). Thus we have spirit, but so far it is outside of religion, a pure concept (cf. Leuba (20, p. 111). The generalized

explanation of the association of spirit with the religious thrill is given in these words: "*The same peculiarities in the behavior of things which are responsible for the conceptualization of a world of spirit, are also responsible for the early association of the world of spirit with the religious thrill*" (8, p. 634).¹

Before proceeding to the deduction of "*mana*," it must be noted that the concept of which a psychological explanation is attempted in the essay, is not the specialized concept of *mana* or *orenda* or *manitou*, etc., but the more general and vague notion of supernaturalism of impersonal magic power, which is constantly found associated with magic and religion. "It seems fairly certain"—to quote the passage—"that the notion of *mana*, as entertained in most primitive times, must be directly correlated with the religious thrill. The psychological derivation of *mana* may be expressed in the following formula: *The generalized experience of the behavior of things associated with the religious thrill receives conceptual expression in mana*. *Mana* thus is the direct objectivation of the religious emotion, it is *that which causes the* (religious) *thrill*. We have seen before that the religious emotion, and with it, we may now add, the concept of *mana*, supernatural power, must have become associated with spirit from the earliest times. Now, while *mana* thus becomes in part absorbed by spirit, psychological plausibility again suggests the assumption that it does not become wholly absorbed. While spirits are many and varied, in form as well as in function, they all have *mana*, they all arouse the religious thrill; but so also do other beings, things, events, not associated with spirits. Thus the common thrill-producing element in all religious situations, whether centering in a spiritual or a material thing, may be expected to preserve its separate conceptualization on a par with spirit and other carriers of the religious. . . . Thus spirit and *mana* must be characterized as the fundamental concepts of all religion" (8, pp. 635-6).

The section on magic, or rather the magic act, in my essay is very fragmentary, also it is too long for incorporation in this review.

¹ This formulation must be pronounced somewhat unfortunate in so far as many experiences of the behavior of things contributory to the notion of spirit are quite free from any elements which might evoke the religious reaction. The very numerous residual cases are, however, amply sufficient to account for the association. The formula ought to read thus: *in a large number of situations the behavior of things responsible for the conceptualization of a world of spirit is accompanied by features apt to arouse the religious thrill; often the same elements of the behavior will do service in both directions.*

The principal points are these: "a magical act, as such, may be described psychologically as *an expression in behavior of a mental content the core of which is a desire*. . . . Desires, in order to lead to expression in behavior representative or symbolic of the object desired must reach a certain degree of intensity. . . . When subsequent to the magical act the things present themselves, the events occur, they are brought into causal connection with the magical act" (8, p. 638. Cf. Leuba; (20, pp. 157 and 167-87)). The saturation of the magic procedure with religious emotion, finally, is due to certain peculiarities of the magic act which differentiate it from an act of matter-of-fact behavior.

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APPLIED ASPECTS OF SOCIAL PSYCHOLOGY

BY CLARK L. HULL

University of Wisconsin

Henderschott (5) believes that men are very prone to overestimate their own value as workers. If some way could be found to bring each man adequately to realize his actual value to the employer it would greatly reduce discontent. The present industrial unrest is more psychological than economic. The wise use of social psychology should relegate the matter of wage to a secondary and more true position as an object of contention. McChesney (7) urges that the secret of efficiency in factory operation lies in the employer's having the confidence and respect of the employees. This confidence and respect functions as an active coöperation. It can only be obtained by sincerely seeking and securing the welfare of the employees. Fish (4) says that the turnover in labor which in the aggregate is enormously expensive is greatly reduced by creating pleasant mental and physical surroundings in the shops. Good mental conditions are promoted by competitive games, picnics and celebrations where employers, employees and

heads of departments mingle freely. Pensions and life insurance such as are ordinarily offered by employers are of slight value in preventing the labor turnover. The reputation of a factory for good treatment of employees insures an ample supply of the best type of applicants for jobs. Applicants responding to advertisements are very apt to be floaters and otherwise undesirable. Safety appliances in shops, while preventing accidents to a certain extent, are chiefly of psychological value. They serve as a tangible assurance to the workman of the good intention of the employer. A more efficient preventive of accidents lies in the training of the employees in safe methods of work. The disposition of the foreman is of extreme importance. Some foremen have a constructive influence and men constantly improve under them while others tend to break down the ability of workmen. Metcalf (8) pleads for a social regeneration of business through a spirit of coöperation between employer and employees.

Eastman (3) and Hoover (6) each go into the practical psychological details of making a sales solicitation. Both writers enlarge upon the means of utilizing suggestion and avoiding negative suggestion, particularly at the critical "closing" stage.

Eastman (2) writes convincingly of the vicious exploitation of suggestion by style originators who thereby induce the purchase of inappropriate, extravagant and unnecessary clothing. The general psychology of clothing both in its personal and its social aspects is discussed at length by Dearborn (1) in a quasi-literary fashion. He relates a number of anecdotes to prove that good clothes have a favorable influence upon getting jobs.

Peterson and David (9) have produced an excellent little work on the psychology of handling men in the army. While written with the strictly practical purpose of applying psychology to the achievement of military efficiency, it contains considerable vigorous theory. They believe that "in handling men it is well to take toward them the attitude of practical determinism." We often "make the mistake of thinking of men as primarily rational beings." They are not. "Instinct is the driving force . . . of our lives." "If a person's environment could be completely controlled, he could doubtless, with a proper understanding of his nature, be played upon like a musical instrument and made to conform to one's wishes." The body of the book explains in general how this may be done, particularly in the army.

Competition is a potent force in facilitating military training.

It may be either between persons or between groups. "In group competition we retain the stimulating effect of certain individuals being pitted against others and leave out the more unpleasant personalities coming up in individual rivalry." For competition to be really effective, accurate measures of performance must be available. The authors hope for the development of such methods of measurement according to the principles of the modern educational tests. The innate tendency to play may be utilized as a potent preventative of "shell shock" and other mental disturbances resulting from the great anxiety and nervous exhaustion of life in the trenches. It acts by giving the soldier temporary relief from the frightful strain. Moreover, group games and athletic contests conduce strongly to *esprit de corps* and teamplay so necessary in modern war. Formal drills are not in themselves particularly valuable in this respect. Certain individuals lacking in patriotism may respond very satisfactorily to this group consciousness.

"Success of an army more than any other organization is built upon the foundation of leadership." Leadership "unquestionably depends largely upon innate qualities" but it can be improved by knowledge and training.

Discipline, "the soul of armies" is held to be characteristically different in democracies from that of autocracies in that in the former the whole intelligence and emotional life of the soldier is enlisted "because he feels that it is necessary for the common good." Discipline has its basis largely in habit. In times of great emotional stress fairly well formed habits may fail to function accurately. Consequently the habits involved in military discipline and team play must be mechanized to the highest degree possible. The acquisition of these habits may be greatly accelerated by skillful appeals to the instincts. Individual instruction is necessitated to a considerable degree by the great individual differences among recruits.

A modern army requires in each unit a definite number of men skilled to certain degrees in the greatest variety of trades. This skill existed in chance bits scattered through the newly recruited army. The method of finding, evaluating and utilizing this skill is described by various authors (10). The first step in the process was to make out for each recruit a "Qualification card" on which was recorded much important information regarding his experience, education and skill. But as soldiers' accounts of their

abilities in the various occupations were frequently very inaccurate, special tests were devised for determining ability in a very large number of trades. The tests ranged from oral informational tests in some trades to actual performance in others. Before being used the tests were tested for diagnostic efficiency by applying them to groups of men known to possess various known degrees of skill in the particular trades. One of the most ingenious applications of psychology to the problems of individual differences in the army is the officer's rating scale.

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THE PSYCHOLOGY OF LANGUAGE

BY ELLSWORTH FARIS

State University of Iowa

Delacroix (2) in a comprehensive paper written as a chapter of a book, the publication of which was interrupted by the war, writes on Nature and Convention, Phonetic Laws, Development of Language, Expression of Thought, Changes of Meaning, and Special Languages. The author is largely indebted to Wundt, to whom he makes frequent reference and whose view of speech as vocal gesture he adopts. The problem of origin is declared to be insoluble. The two questions, How does the natural expression of emotion become a symbol, and How does man select the sounds

for speech, are both declared to be beyond the reach of scientific method. Concerning phonetic laws, there are two classes of phenomena involved: the modifications due to the conformation of the organs of articulation, and the reactions which depend on the reactions of the elements of the phrase. Neither the ancient Greek view that modifications are guided by an esthetic motive (euphony), nor the Hindu theory that it is a logical concern can be accepted. Every such change has a definite explanation in physiology, analogy and borrowing being extensions of habits formed in the musculature. For example, in the second group of changes, if a movement in a group of words is repeated twice, the second of the movements tends to be omitted in speech. With regard to the development of speech in the infant, the rôle of imitation has been overstated, many of the cases being really adult adaptations to the infant's capacity. With regard to the psychology of the judgment, it is recognized that the sentence is the element and that the word has no separate existence. There are five grammatical categories corresponding to the four psychological—verbs, nouns, adjectives, morphemes and particles. Semantics can always be characterized by this psychological fact or process. The concept is a complex representation of which we accentuate one character which in its turn attracts the attention and becomes the focus of another generalization. The influence of the social life is also recognized. And each special calling and occupation produces variant forms, even monstrosities.

Meillet (3) has made a contribution in discussing the convergence of linguistic development. The problem is how to account for the spontaneous activity which results in uniformity of speech over a considerable area. While this problem is not yet solved, the argument shows that the conditions of human behavior and of social life tend to produce the same changes in widely separated communities. "The convergences observed lead us to conclude that in linguistic changes the innovations are general rather than generalized, and that the identity or equality of conditions where the speaking subjects are found is the essential fact, and that imitation is a secondary consideration." The individual creations in language are confined to vocabulary and to phrases which are in their turn generalized, but these are the phenomena which show no tendency to convergence. Two closely related dialects will show the widest divergence in vocabulary. Inflection tends to hide the unity of the word, it also tends to lose its expressiveness and to

require some special method to denote emphasis, and in the third place the inflections vary according to the classes of words, conjugations for example. "It is hardly an exaggeration to say that the history of Indo-European languages may be comprised in the statement that it is an effort to pass from the word-form with multiple inflections to the word existing isolated and always invariable in form."

The article of Brandenburg (1) is the report of an experimental investigation of the relation of vocabulary to general intelligence. Subsidiary problems are illuminated, including the relation of the extent of vocabulary to scholastic attainments, the relation of accuracy and precision in the knowledge and use of words to vocabulary range, and the probable effect of the enforced silence of the school room on the development of the child. The method was to take a list of two hundred words, one for each 140 in Webster's *Academic Dictionary*, selected at equal intervals throughout the dictionary, and having submitted the printed list of words to the pupil, consider that word familiar which was used with even approximate correctness in a sentence. The vocabulary was assumed to include one hundred and forty times as many words as were used in the test. The average ranged from 4,000 in Grade II to 15,340 in Grade X. A correlation between vocabulary range and language ability was worked out and found to be .76, and about the same relation was found to exist in the case of excellence in oral expression. When compared to scholarship the coefficient ranges from .39 to .85 with an average of .56. From these facts this conclusion is drawn: "The opinion that there are certain individuals who have a large fund of words at their command and are very proficient in the use of words generally but are mentally weak and inefficient, is by no means well founded." The manual training grades were compared and it was found that linguistic ability and motor ability did not tend strongly to coincide. The tests in arithmetic, reading, spelling, and mental ability were then applied and the conclusion reached that school grades are, after all, a very good indication of general intelligence. The final conclusion is that the repression of the modern school room is carried too far, producing timidity and even dread.

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RELIGION AND EDUCATION

BY E. S. AMES

University of Chicago

There is real need for a social psychology based upon the newer objective psychology. W. Trotter has shown that the social, moral and religious tendencies of man are truly instinctive. He emphasizes the herd-instinct, or gregariousness, in man. It is in reality an instinct-complex, or mechanism, involving suggestibility, approval, shame, etc. How does gregariousness, or any instinct, become the source or origin of morality? By the development of associations, as in the transfer of tendency from one stimulus to another, and in the conditional reflex. The latter is illustrated by ringing a bell when feeding a hungry dog and thus causing, after repetition, a flow of saliva by the ringing of the bell alone. Perhaps a thorough scientific inquiry would show that moral ideals and sentiments of custom, convention and fashion are conditional reflexes built largely upon the original tendencies of the herd-control complex.

In applying these principles to moral education Folsom (1) urges that it is important to direct attention less to motives and more to external results. Murder of an individual horrifies us but we overlook the horrors of food adulteration, and exploitation of workers. While morality tends to be measured in terms of social welfare, there are many errors in the application of this view. Mutation and natural selection have not yet had a chance to adapt man's instincts to his present environment. Moral exhortations, as in sermons and scolding, are relatively ineffective. New methods of child training are necessary, especially in city life. Conduct must be viewed in terms of cause and effect and not merely in terms of an accepted moral code. Man must learn to worry more about his ignorance than his badness of motives.

The medieval saint was a specialist with social functions as definite as those of king, knight, butcher or baker, writes Mecklin (5); he cannot be democratized. He must be mystical and subjective. His virtues belong to the passive type. The saint flourishes only in a simple society. The complexities of modern life are inimical to him. As these are felt more and more to be the carriers of moral and spiritual values the saint loses his significance and leadership. "It is our Lincolns, our Florence Nightingales, our

Booker T. Washingtons, that seem after all to have caught and interpreted the universal values of the age."

In "Sociology as Ethics," Hayes (3) expresses his faith in the social sciences. Ethics has rested on legalistic religion, on divine law enforced by rewards and punishments. This foundation has been shaken. The result is for many a sense of license, of emancipation from moral restraints. Will the next generation have an ethics? The only science that can equip us with an ethics is the scientific study of human life. "There already is promise that investigation of the special problems of ethics by the sociological method will prove to be reconstructive of a modified world-view not less adapted to afford guidance, motive, and worth to life, and having the incalculable advantage over the old world-view of being impregnable to any attacks by incongruous facts, and requiring no blinking of the clear eyes of intellectual honesty."

"The most effectively divine power or agency in the world to-day is" according to Geiger (2) the social consciousness of a genuinely democratic community. It is the social consciousness as the ideal embodiment of the hard-won values of mankind that is effecting whatever of good there is in our present-day life and civilization." The function of religion today is to find the sources of religious satisfaction in the empirical and practical values "constituting the divine as it exists to-day," and make them the instruments of moral control. Conventional religion does neither, either for the conservative or the progressive man. A new type of religious experience is needed with new symbols and new imagery.

In "A Return To God in Education" Carl Holliday (4) remarks that in spite of universal intellectual training Germany reverted to a war of barbarism, and that in spite of the artistic spirit in France and of uplift for the masses in England, these nations have manifested the hatred and fury of savagery. Have we put too much faith in *art* and *culture* and *invention*? What is needed to achieve real civilization is a development of the moral emotions, and education of the soul; in short, a return to some form of religious training. Lincoln attained a civilized state of mind,—a profound emotional response to moral ideals and to real religion.

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SPECIAL REVIEWS

A Social Theory of Education. G. A. COE. New York: Scribners, 1917. Pp. xii + 361.

This work presents a wide field of religious problems organized around the educational task. First of all is the social theory of religion. In his *Psychology of Religion* the author has elaborated this view, showing that religion is fundamentally an experience of personality and of relations between persons. The first concern of education is therefore "the persons with whom the pupil is in contact." The school introduces the pupil to community life and gives him real functions in it. This conception of education, set forth particularly by Professor Dewey, is applied to religious education by Professor Coe in a thorough fashion.

Since the aim of religion is conceived as the establishment of a "democracy of God," it becomes the aim of religious education to fit the individual to take his part in this democracy. "The only test for the Christian education of the will lies in increase of the social efficiency of the pupils." This efficiency is measured in terms of health, food, laws, ballot-boxes, homes, streets, schools, happy children, and happy husbands and wives (p. 56). Devotion to social welfare, social justice, and a world society is the concrete expression of devotion to God. To know about these things is to know about God. To work for them is to work for God. To be socially minded and socially efficient is to be religious.

The materials for religious education are therefore to be found in the social process itself. The Biblical material has value in so far as it reflects and promotes this process, but no farther. The grading of a curriculum should have reference to the development of the pupil in appreciation and participation in social living, rather than in his acquaintance with Hebrew history and literature. Much of the Biblical material is unusable because it refers to so different an age and is couched in autocratic and ethically outgrown terms.

The religious training of the child consists in leading him to an intelligent and creative participation in complex human relation-

ships and values. It cannot be done by routine or memoriter methods, but only by living, growing experience, for which the child becomes increasingly responsible and efficient. The curriculum is transformed into "a graded series of experiments in social living." Family life, play life, school life, civic life, occupation, marriage, present a widening process of experience and growth which is natural and is prescribed by the very conditions of living in this world. These interests are organically interrelated and flow on from one to another. They grow through play and work and friendship.

These natural group relations afford the basis for the organization of the system of education in every respect. The family is the first and most impressive center for the child. The home needs to be democratic in order to be religious. Equality of the sexes, participation of all the members in deliberations over practical problems, regular duties for all members, real responsibility in some spheres, common pleasures and a vital sense of relation to other social groups are among the educative possibilities of the family. Training for married life and parenthood should also be included.

Constructive criticism of the Church School is offered and an interesting account is given of the relation of Church and State in America. "The interest of a socialized religious education in the public schools is not that they should teach religion in addition to reading, writing and arithmetic, but that they should teach democracy, and that they should do it thoroughly." On this principle denominational instruction as such is overcome and all bodies reach a common ground. This applies also to college training and to the equipment of professional and religious workers. It makes the social ideal a new means of interdenominational coöperation.

A survey of existing tendencies in religious education reveals in striking contrast the conceptions of different traditions.

It is difficult to bring one's self to criticize a work of such fine spirit and of so much constructive merit. In a sense the discussion of the precise nature of the instinctive basis of the social consciousness cannot lessen the force of the fact that religion is an expression of that social consciousness. But there are important psychological questions here. Has Professor Coe established his contention for the central importance of the parental instinct in religious experience? Has he sufficiently dealt with the possibility of accounting for the phenomena which he ascribes to this instinct by referring them to the instincts of pity, sympathy, fondling, imitativeness,

etc.? Would it be any less consistent to account for certain social attitudes in childhood by referring them to rudimentary manifestations of the sex instinct than it is to assign them to the parental instinct? The latter certainly can scarcely be said to reach maturity earlier than the sex instinct to which it is surely vitally related!

In his emphasis upon the social significance of adolescence (pp. 157, 159), the author appears to labor under the difficulty of giving sufficient recognition to the sex instinct without reducing somewhat his claims for the parental instinct. While it is undoubtedly true that adolescence may develop in ways which are prejudicial to the larger social interests, it is also evident that the parental instinct is not always manifested in ideal expressions. Too much parental care "spoils" children, weakens them, and defeats them. Certainly intelligence and training are just as necessary to the best forms of parental behavior as to any other form of action dependent upon the basic instincts.

The discussion of "anti-social" instincts (pp. 129 ff.) raises two questions. First, is the term instinct used with sufficient discrimination? Second, are not the attitudes described capable of socialization, for example, acquisitiveness, rivalry, mastery, anger, pugnacity? Is not the "pursuit" of truth a sublimation of the hunting process? Some instincts are undoubtedly social, some are non-social, but it is a fair question whether any instincts are anti-social, though anti-social habits may be developed from them.

This work opens an entirely new perspective for the problems which it treats. The tone of the discussion is reverent and not infrequently employs familiar phrases of piety. The effect which it will produce upon religious education is likely to be more revolutionary than the first reading indicates, which is also one among its numerous merits.

E. S. AMES

UNIVERSITY OF CHICAGO

Theories of Social Progress. A. J. TODD. New York: Macmillan, 1918. Pp. 579.

The philosophy of education is being reconstructed from the sociological standpoint; and no book has appeared recently that is a more significant contribution to the new educational theory. It is unfortunate that the title of Professor Todd's book does not reveal its educational bearing. Educators should recognize it as a profound treatise on the function of education in a democracy; it

was recognized from the first as a distinct contribution to sociology (see Professor Small's review in the *Amer. J. of Sociol.* for May, 1918).

"Social advance depends upon the extent to which knowledge is diffused and the freedom with which it pervades all classes of society" (p. 471). This is the keynote of the book. The chapters in Part III treat the various theories of progress that have been current from time to time. Some of the titles are: Geographic Determinists, The Technicians or Inventionists, The Economic Interpretation of History, The Eugenists, The Militarists, Government, Public Opinion, Great Men, Heroes and Elite, Religion, The Idealists, etc. In every chapter Todd shows that education is the ultimate determinant.

Professor Todd reiterates the message that was proclaimed twenty-five years ago by Professor Ward—whom educators have so little read; only Todd proclaims it with more scientific and exhaustive scholarship, if with less genius. The message is prophetic, especially in the present reconstruction crises. "Genius exists in nearly everyone" (p. 269). Large "social waste" results from "unguided personal ability" due to grossly inadequate education (pp. 271, 533). Along with the individual power of initiating changes there must be "a social aggregate capable of appreciating them." Ideas such as these occur with increasing emphasis. The outline of an educational system adequate to the needs of our developing democracy constitutes the climax of the work.

It is of the greatest importance that educators acquire the point of view set forth in this book.

ROSS L. FINNEY

UNIVERSITY OF MINNESOTA.

An Introduction to Educational Sociology. W. R. SMITH. Boston: Houghton Mifflin, 1917. Pp. 412.

Sociology has as much contribution to make to education as psychology. That fact is slowly becoming obvious. Educational theory is being gradually readjusted to this new insight, courses in educational sociology are being offered in normal schools and colleges, and a substantial literature is appearing. Dr. Smith's contribution to this literature has attracted wide attention.

The book is in two parts: The first deals with Sociological Foundations, the second with Educational Applications. Dr. Smith's sociological analysis in the first part shows the influence of

Professor Cooley. In Chapter II he reviews Cooley's theory of the relation between the individual and the social order, pointing out certain educational implications. Cooley's primary groups, the family, the play group, and the community, occupy the reader's attention in the next two chapters. The informal educational function of these groups, the importance of coöperation between them and the school, and the school's responsibility to train for participation therein, are, however, none too plainly implied. Smith very happily uses the term intermediate groups to denote institutions less closely related to the individual, and devotes a chapter (VII) to them. Chapter VIII, *The State and Education*, contains a discussion of educational aims: vocational, social, cultural and political. In the last two chapters of Part I he discusses the rise of democracy, its influence upon the growth of education, and education's function therein.

Such practical problems as administration, discipline, the curriculum, vocational education, the fine arts, and educational methods are discussed in Part II, from a distinctly sociological point of view. An urgent plea is made for the social survey as a method of securing data for the guidance of school administration.

Dr. Smith intends his book as a textbook to be used in normal schools and colleges, and for that purpose it is of much value, and perhaps as teachable as any book in the field. He is more overtly sociological than Robbins, but not more so than Betts, while the latter's insight is more penetrating. He unaccountably ignores Dewey's *Democracy and Education*, which, in intention at least, is profoundly sociological. Bobbitt's *The Curriculum*, and Todd's *Theories of Social Progress* have both appeared since. The former is sociological, and the latter educational, without announcing themselves as such. They both supplement Smith's point of view.

There are some notable omissions from this book. The problem of individualism versus institutionalism is not discussed. The historic perspective is short; social evolution and the social heritage are not sufficiently virile concepts; the writer's optimism respecting current changes, social and educational, is too easy. He does not sufficiently discern the necessity for directing educational development, nor appreciate the need for extensive educational expansion and readjustment. There is too much localism, and not enough nationalism or internationalism in his program. He does not attack the curriculum problem with sufficient vigor, nor expound the function of the high school profoundly. He has little to say about the

distribution of wealth, and the bearing of popular education thereon; nor does he discern with prophetic insight what must be the spiritual foundations of the new social order if it is to be successful. To be sure, he wrote before the reconstruction; but from the standpoint of history and social evolution it might have been foreseen.

ROSS L. FINNEY.

UNIVERSITY OF MINNESOTA.

The Psychology of Conviction. J. JASTROW. Boston: Houghton Mifflin, 1918. Pp. xix + 387.

Eight of the essays which make up this volume are collected from the magazines in which they had appeared separately. They include the title essay, *The Psychology of Conviction*, related papers on *Belief and Credulity* and *The Will to Believe in the Supernatural*, and a series dealing with illustrative cases, *The Case of Paladino*, *The Antecedents of the Study of Character and Temperament* (an historical survey of fanciful interpretations before the rise of modern scientific psychology), *Fact and Fable in Animal Psychology* ("Der kluge Hans," etc.), "Malicious Animal Magnetism" (Mrs. Eddy's obsession), and *The Democratic Suspicion of Education*. The three new essays are on *The Psychology of Indulgence: Alcohol and Tobacco*, *The Feminine Mind*, and *Militarism and Pacifism*. The variety of topics is at first sight perplexing, for the title of the volume suggests a unity, *The Psychology of Conviction*, and not that *and other essays*. The unity, in fact, is to be found in the purpose. The book has a single theme, the interplay of logic and psychology in the formation and operation of beliefs, but the author does not seek to develop it systematically, but to exhibit it in a number of illustrative instances. The field for selection is here limitless, so that, had the author chosen to do so, he might have included in the volume essays on Bolshevism, the League of Nations, Vivisection and Vaccination (both of which he does indeed refer to incidentally), the Composition of the Hexateuch, and any of the innumerable subjects of controversy present and past in which decisions so frequently depend on prejudice and "passion." He has chosen such instances as specially interested him and as he doubtless deemed would interest his readers. The cases chosen, moreover, represent a variety of types exhibiting the factors in operation in different patterns, with varying emphasis. For the psychology of conviction cannot be reduced to a single formula; it belongs to the most complex of the mental processes and

varies with the varying types. Hence the advantage of the "case" method of treatment with the opportunity it affords for special analysis illustrating the specific working of the diverse factors in play in the concrete.

Among the essays of greatest interest in the volume are those dealing with belief in the supernatural. Under this term is included, apparently, all that conflicts, or that seems to conflict, with orthodox science. The conflict here, as the author views it, is between the spirit of science seeking to establish systematic relationships by logic and evidence and the other motives of our nature which seek their satisfaction in an unorganized region not subject to ordinary scientific criteria. He does not withhold appreciation of what has been accomplished by other than scientific methods in the past, and he is too good a psychologist to suppose that logic alone will ever of itself be able to meet the needs and supply the motives of human living. But he demands that the spirit of science shall at least enter into the domain of belief for guidance and control. And this he thinks is far from being the case with belief in the occult. Evidence here plays a subsidiary rôle. People believe in the super-physical causes of the phenomena chiefly because of their prepossessions and their inability critically to sift the evidence. The evidence, when critically examined, is flimsy. The "case" of Paladino is in this reference taken as typical. Eminently respectable investigators, including some well-known men of science, testified to the genuineness of her phenomena; yet she was caught tricking in the Cambridge (Eng.) séances in 1895, dramatically exposed in New York in 1910 and on several other occasions both suspected and discovered to be a fraud. To be sure, a lingering doubt still hangs in some minds over her case, for in the experiments conducted at Naples in 1908 by Fielding, Carrington and Baggally the conditions as reported appear to have been fairly rigid. But she undoubtedly did frequently resort to trickery and may have done so always. *Passe (-passe) pour Paladino*. But can we generalize? Professor Jastrow thinks that we may. What is true of the super-physical facts of mediums may be accepted, he says, as typical of the whole range of evidence. The evidence reduces to this: on such and such occasions the facts have been satisfactorily accounted for as more or less clever utilizations of plain everyday physical forces, and on such and such other occasions the observers have been unable to discover how what seemed to them to occur was really accomplished. The inference suggested is that in all cases

the phenomena are probably explicable by physical or other recognized causes. "The step from fact to explanation is taken not as a logical inference, but as a psychological inclination" (p. 97).

The conclusion seems sound for the majority of believers, but the primary question relates not to explanation, but to fact. Here there is room for the benevolent sceptic. No incomplete enumeration of instances can conclusively prove a universal. There are, moreover, in science as in common life varying degrees of evidence. One may have little or no inclination to believe in "spirits" and yet recognize in the alleged phenomena of "psychical research" a *prima facie* ground for enquiry. As Professor Jastrow himself says, we have not yet boxed the compass of knowledge, and one of the men to whom he dedicates his book is, significantly, William James. But, he complains, in phenomena of the Paladino type, the conditions of investigation are unsatisfactory; they are not set by the enquirer, but by the medium, who yields to the enquiry only within the limits of the trick. "It cannot be too strongly emphasized that if those who profess to influence physical objects without contact were willing to submit to the experimental rules of the laboratory, the investigation would be a matter of minutes and not of years" (p. 113). One would like to know more precisely what the rules are that would here apply. The experimenter must adapt himself to the conditions of the phenomena as well as impose conditions on the phenomena. It is objected that the phenomena produced by the mediums occur usually only in darkness or semi-darkness. This is, of course, suspicious, and the will not to believe, which is just as potent in its way as the will to believe, refuses to accept the given explanation. But there are plenty of phenomena in nature to which the absence of light is essential, as *e.g.*, the growth of the child in the womb, of the seed in the soil, certain chemical reactions made use of in coast lighting, and no objection is interposed to their investigation. Surely, if a minimum of light is required for the production of certain mediumistic phenomena, or for their production on certain occasions, it should not pass the wit of man to discover the fact, although the discovery might take years and not minutes. Yet after all Professor Jastrow is right in emphasizing the negative considerations in the interest of sanity and as a bulwark against popular superstition. Only let it be remembered that the psychologist, like every other expert, has the bias of his profession.

Of the three new essays that on indulgence in alcohol and to-

bacco is of timely interest in view of the recent action of our legislatures in voting for national prohibition. If all who so voted had read and duly weighed what the psychologist had to say on the relation of indulgence to vital needs and on the dangers of repression, the result might have been different, although they would also have received his acknowledgment of the force of other considerations, economic and moral. His breadth of view and the reasonableness of his contentions should at least have operated against a bigoted fanaticism which by emphasizing one phase or certain phases of the evil of intemperance disturbs the diagnosis and, as he says, makes for unreason. The essay on the feminine mind is equally timely in its relation to the whole contemporary feminist movement. Taking as a guiding principle that like minds in unlike bodies are a contradiction for physiological psychology and supporting the contention by observation and argument, the author concludes that women do "possess a distinctive type of mentality . . . with distinctive differences of manner and composition and effect; and all this by reason of the different composite of their supporting qualities and their setting in the total feminine nature" (p. 313). This may not determine the question of suffrage, but it has an important bearing on occupations, for there are some employments in which small differences are highly significant. The last essay, written while the war was still in progress, deals in part with the exaggerations on both sides of the controversy between militarism and pacificism due to the state of public feeling and the ambiguities of the terms. Its main trend is indicated in the closing paragraph in words peculiarly pertinent to the present situation, appealing for a higher than national patriotism and demanding "the sacrifice of the unlimited sovereignty of one's own nation for the cause of the unlimited sovereignty of humanity."

The volume taken as a whole is a good example of the service which psychology is able to render to the development of sentiments and the clarification of ideas. It is popular, but in the best sense. It does not altogether avoid technicalities, it appeals to the intelligence, but it deals interestingly with matters in which intelligent people are largely interested. Professor Jastrow wields the pen of a ready writer and the style might be improved by a little pruning. But he is not troubled by paucity of ideas, his discussions are illuminating, broad-minded, temperate, and his conclusions arresting and, if not always acceptable, commendable in the cause of sobriety and common-sense.

H. N. GARDINER

Social Process. C. H. COOLEY. New York: Scribner, 1918.
Pp. vi + 430.

The psychological and sociological public have learned to expect a high degree of sanity in all that Professor Cooley produces, and they will not be disappointed in this his latest work. He emphasizes at the outset the organic, balanced view of social reality, as against all forms of "particularism." What this organic view is can perhaps best be stated in Professor Cooley's own words: "A form of particularism that until recently was quite general is one that regards the personal wills of individual men as the originative factor in life from which all else comes. . . . In contrast to particularistic views of this sort we have others which find the originative impulse in external conditions of life, such as climate, soil, flora, and fauna; and regard intellectual and social activities merely as the result of the physiological needs of men seeking gratification under these conditions. A doctrine of the latter character having wide acceptance at the present time is 'economic determinism,' which looks upon the production of wealth and the competition for it as the process of which everything else is the result. . . . To treat the human mind as the primary factor in life, gradually unfolding its innate tendencies under the moulding power of conditions, is no less and no more plausible than to begin with the material. Why should originative tendencies be ascribed to things rather than to mind? I see no warrant in observed fact for giving preference to either" (Chapter V).

From this point of view Professor Cooley discusses personal aspects of the social process, degeneration, social factors in biological survival, group conflict, valuation, and the social functioning of intelligence. Perhaps the most valuable of these is his discussion of the human-nature and institutional factors in social and economic values.

The book is unsystematic, a series of essays rather than a closely reasoned and logically arranged scientific text. But it is stimulating and suggestive in every chapter.

CHARLES A. ELLWOOD

The New State. Group Organization the Solution of Popular Government. M. P. FOLLETT. New York: Longmans, Green, 1918. Pp. vii + 373.

The Value of Money. B. M. ANDERSON. New York: Macmillan, 1917. Pp. xxviii + 610.

The special social sciences are destined to be rewritten as social psychology develops. These two books indicate that the process has already begun. Miss Follett's book is one of the first to attempt frankly the recasting of political theory upon the basis of the new social psychology. She shows the significance of primary groups, especially the neighborhood group, for political life; and that political reconstruction, if we are to realize democracy, must begin with a revitalization of neighborhood group organization. The book is, however, more than a work in political science. Part I is taken up with a presentation of the results of "group psychology"; and perhaps nowhere else can be found a clearer brief presentation of the modern psychological theory of group behavior. Hence the book is indispensable to all who wish a brief summary of the results of psychological sociology.

Dr. Anderson's book on *The Value of Money* is quite as notable for a section of economic theory as Miss Follett's for political theory. Following Cooley, Dr. Anderson finds that economic values, like all prevalent social values, are essentially creations of the social mind. Upon this basis he proceeds to criticize various economic doctrines concerning the value of money, especially the quantity theory, and then constructs a theory of the financial operations of modern business which seems to accord remarkably well with the facts. Chapters I, XXI, and XXII are of especial value to the social psychologist, though the book in general exhibits a wealth of data which social psychologists would do well to consider.

CHARLES A. ELLWOOD.

Essentials of Social Psychology. E. S. BOGARDUS. Los Angeles: Univ. of S. Calif., 1918. Pp. 159.

Social psychology has at length arrived at the "primer" stage of development. Professor Bogardus has done the science a service by putting some of its main conclusions into simple language and very brief compass, so as to make them accessible practically to everyone. The book is suitable for high schools and perhaps for some college courses where only a few weeks can be given to the subject. It discusses in an elementary way instinct, habit, indi-

vidual consciousness, the social self, language, suggestion, imitation, group psychology, invention, leadership, social control, and social progress. It omits problems of social change except as these are brought under one of the preceding heads. A static rather than a dynamic view of the psychic life of social groups is the result; but this is perhaps unavoidable in a brief elementary text.

CHARLES A. ELLWOOD

The Mulatto in the United States. E. B. REUTER. Boston: Badger, 1918. Pp. 417.

This is an indispensable book for the study of race psychology. It discusses very fully the result of the intermixture of the Negroes and the whites in the United States and of other races throughout the world, giving a wealth of facts. The result is that it proves up to the hilt the superiority of the mulatto to the Negro, if not to the white. "The chances of the mulatto child developing into a leader of the race," the author finds, "are thirty-four times as great as the chances of a black child." "The assumption that the Negro people in America have produced as many superior individuals of pure Negro blood as superior individuals of mixed blood . . . is unsupported by the slightest basis of fact." The important social and political consequences of this fact are discussed very fully by the author.

CHARLES A. ELLWOOD

The Educational Theory of Social Progress. C. A. ELLWOOD. *Sci. Mo.*, 1917, 5, 439-450.

This timely paper calls renewed attention to the essential educational nature of social progress. Society has been in the past and remains for the future dependent for its advancement upon the accumulation of knowledge, standards and values, and the imparting of these in order to control habit and character. Upon education, therefore, our main reliance must be placed. "Those who put faith in other means of social progress, such as revolutions, are destined to be grievously disappointed. Revolutions have swept away obstacles to social progress, but they have never succeeded in effecting permanent progress except as they have been preceded or followed by processes of education." If the schools are to form habits and character in the individual in order to fit him to participate efficiently in the social life, they should be thoroughly "socialized," *i.e.*, they should aim at the production of efficient

social units. "The measure of socialization is how far an individual's ideas, habits and character contribute to the increased harmony, efficiency and happiness of mankind as a whole; and an individual development in any other direction than this will surely not profit either the individual or his group permanently." The article closes with a number of practical suggestions for the improvement of our educational institutions.

JAMES H. LEUBA

The Philosophy of Christianity. B. GRAHAM. Columbia, S. C.: R. L. Bryan Co., 1917. Pp. ix + 144.

The Conversion of Hamilton Wheeler. A Novelette of Religion and Love, Introducing Studies in Religious Psychology and Pathology. A Voluntary Contribution to the National Mental Hygiene Movement. P. LOCKE. Bloomington, Illinois: Pandect Pub. Co., 1917. Pp. 285.

The psychology of religion has become sufficiently celebrated of late to become the victim of amateur exploitation. Mr. Graham sets forth as the basis of his system of Christian philosophy, under the caption of "Human Psychology" a strange sort of dialectic, possibly intended to be imitative of Hegel. He reveals no knowledge of modern psychology, as the term is understood by professional psychologists of this generation. He says much of the psychology of Adam, who for him is apparently an historical personage. The pseudonymous author of the second book will win from psychologists approval of his main purpose, the exposure in a popular form of the evils of revivalism. He cites a number of standard authorities (p. 26), but not always intelligently. Criticisms of revivalism that are both scientific and popular are needed; and if this author, who shows some promise as a popular writer, will acquire more thorough training in the science of psychology, he may be able in the future to make contributions that will deserve commendation.

WILLIAM KELLEY WRIGHT

DARTMOUTH COLLEGE

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE SELF IN RECENT PSYCHOLOGY: A CRITICAL SUMMARY¹

BY MARY WHITON CALKINS

Wellesley College

I. The word self does not loom large² in recent psychological literature² but none the less, according to the observation of the writer, psychology, however defined, is more and more often treated neither as the study of mental states, contents, or processes, nor yet as the science of psychic functions, but as the science of selves, or persons. Three causes have of late contributed to this result: the vigorous onslaught of the behaviorists on the exclusively "structural" conception of psychology, the development of social psychology, and the heightened attention, during the time of the war, to problems of personnel, of morale, and of mental reconstruction.

1. It would, of course, be preposterous to claim the out-and-out behaviorist as a self-psychologist; in truth, his rejection of introspection as a psychological method proves that he is really

¹ This is the third in a series of "general reviews" of which the first was printed in the BULLETIN of January, 1912, and the second in the BULLETIN of January, 1916.

² The present writer uses the word "self" in sense *a* of the Psychological Association's "Definitions and Delimitations of Psychological Terms" (9. Cf. definition 20, *a*. Cf. also definition 4, comment 2, and definition 23, comment 2 to indicate "a conscious individual [or unique being], characterized by persistence and by change"). She agrees with Laird (16) that the term "self" is best "used by any one who desires an unaccented reading of the problem" (p. 7²); yet she is entirely willing to accept as synonym, either "person" or "mind" if the former term is not limited in its application to the complex or the developed self only, and if the word "mind," as synonym for "self," is scrupulously distinguished from "mind," in the sense either of "soul" or of "totality of mental phenomena."

no psychologist at all but a biologist concentrating his attention on human behavior.¹ The strength of his appeal lies in what Kantor (15) calls his "splendid attack upon the mechanics of mental states" (p. 6), his protest against the recognition of that pale abstraction, the mental process or state of consciousness, as the unit of psychology. But, by this attack on the exclusively structural form of psychology, the behaviorist, however unwittingly, is taking the side of the self-psychologist, though the concretely real being by which he seeks to replace the "mental state" is biological, not psychic—the body, not the self. There is, however, no inherent reason why the term behavior should not be used as well to designate the response of self, as to designate the response of body, to environment. Mrs. De Laguna's protest (10) against "Dualism in Animal Psychology," though written in a behaviorist vein and, doubtless, with no self-psychological prepossession, is hardly comprehensible except on the supposition that she conceives her "pleasurably excited dog" and her "angry nurse" each as a conscious self (pp. 619 ff.). And Miss Preble tells us (20) that her attempt to conceive psychology as "science of the conduct of living creatures" always involves, "even in the case of the lower animals," an attempt to answer the "the question, 'How does he feel as a whole?' 'What does he think of his experience?'" (p. 259¹). Bawden (2) more explicitly states that the behaviorist should take account of the self. So far from rejecting introspection he believes that "all data of science are data of individual inspection in a sense." And he bases his analysis of the concept of behavior on the observation that "we behave not merely as things and as organisms but as persons" (p. 174⁴), regarding "the acts of persons as a distinct type of behavior." This position closely resembles that of Kantor (15) who writes from the point of view of the "functional" psychologist. To Kantor, also, psychology is the science of conscious behavior (p. 7, with note). And though he incidentally refers to the "mental function" (p. 2) and the "psychophysical attitude" (p. 3), he virtually yields to the "conscious being" (p. 3¹), the individual (pp. 4³, 10²), the central position in psychology.

2. It is scarcely necessary to argue that social psychology, explicitly or implicitly, is conceived as the science of grouped or

¹ Perhaps the most telling recent criticism of this extreme form of behaviorism is contained in an untechnical paper by Fite (14). It is devoutly to be hoped that Fite's indiscriminating and mainly unjustified polemic against experimental psychology may not blind the psychological reader to the pertinence of his protest against biology camouflaged as psychology.

associated selves or persons. Thus Ellwood (12) contrasts social psychology with sociology precisely on the ground that it "aims at explaining the psychological nature of the individual," not that of the group (p. 59²); and, in his more recent text (13) says briefly that "the social psychologist studies the psychical interactions of individuals" (p. 9). Bentley's treatment (3) of the problems of social psychology is particularly noteworthy not only because of the genuine contribution which it makes, but because Professor Bentley approaches problems of social psychology with the equipment of an introspective psychologist highly trained in the structuralist's methods. The diverse "tasks of social psychology . . . all rest finally," Bentley points out, "upon social interaction—upon the fact that individuals tend to believe and to think, to feel and to resolve, to speak and to act, to labor and to create, in mutual dependence" (p. 1). "It is possible," he continues, "to look upon the individual . . . as the *unit in social interaction*. When so regarded the individual usually becomes the 'self' and society the congregation or hierarchy of selves" (p. 2²). This conception of the socially interacting self in a society of selves in fact underlies Bentley's brief but illuminating treatment of the problems of social psychology. Especially significant from our point of view are (a) the distinction (which Bentley finds necessary to his comparison of the "congregate" with the "assemblage") between the "more passive" and the "more active" relation of myself to other people (p. 8); and (b) the doctrine of the "social object" (pp. 13 ff.) whose "meaning . . . implies more than one observer." He stresses two related points, significant in view of frequent criticisms of self-psychology, first, that "the 'implication of observers' is not a logical implication," that rather "the plurality of observers is a part of the object's meaning," and, second, that "the observer, whether myself or another, is not a logical abstraction" but "a part of the concrete meaning which constitutes the object" (p. 14²). "As social meanings grow," Bentley continues, "the observers of an object or an event assume more and more the character of partakers." He distinguishes this experience in which "the observers *share* the object" from the "beginnings of social reference" which are, he says, "probably to be found among mammalian forms below man—and possibly among certain of the insects." Here, "the object is already apprehended as the common junction of observations," but "communication is apparently not yet established among the observers for the reason that the *partaking* reference is still wanting" (p. 15¹).

It is to be regretted that in the fourth section of his paper Professor Bentley, while protesting ably against the tendency of sociologists to conceive suggestion and domination as abstract semi-mythical forces (p. 12²), expresses the opinion that, unlike "the sober, and authenticated facts" of physical stimulus and neural disposition, "the mind of my neighbor" is not to be conceived "as a condition of my mental processes" (p. 11). This seems to run counter to the whole trend not only of Bentley's discussion but of the supplementary papers (in *Psychological Monograph* 92) by Helen Clark on "The Crowd" and by C. H. Woolbert on "The Audience." These papers, all three, throughout treat the psychic individual, the self, as if he were to the full as sober and empirical a fact as any stimulus or disposition though, of course, a fact of another order.

Several writers have discussed the nature of the self's awareness of other selves. Laird (16) believes that we have "a direct acquaintance with the experiences of other minds" (p. 24²). It is, he admits, "too fragmentary and ambiguous to be the sure foundation of a theory." But he adds that "to deny it *in toto* is equally unjustifiable" (p. 27). He supports this view (against the common belief that we infer the existence of other selves from their bodily gestures) by the observation that men "know their own experiences better than the physical expression of them while they can describe minutely . . . the expressive behavior of others" (p. 27). This is essentially the position of Mrs. De Laguna (10), that we directly know, and do not infer, the experience of animal or human companion, that for example "the child . . . perceives his nurse's anger as immediately as he does her position between the chair and the table" (p. 621²). In this connection, it is interesting to contrast with Kantor's conception of the "individual" as a psychophysical being (15, pp. 3ff.) Laird's distinction of the body as an object "peculiar to a single percipient" from other external objects which are "common to many percipients" (p. 56); and his conviction that the body "is not the self" and is not "part of" self, but rather "belongs to" self (pp. 47, 75, 79). The relation of body to self and the nature of the communication between selves are discussed also, by the writer of this notice, in a paper, mainly philosophical in outlook, on the personalistic conception of nature (7, pp. 133ff.).

3. The recent literature of intelligence tests tends more and more to use the language of self-psychology, to describe the testing not

of imagery or memory or psychic function but of a given man's ability to imagine, remember, resolve. "The subject," Terman says, (21) "is . . . given tests of memory, of language comprehension . . . , of ability to follow directions. . . . The average of a large number of performances thus gives a kind of composite picture of the subject's general intelligence" (p. 163). In a word, the unit of the intelligence test has come to be the conscious self. And even more unambiguously psychology confronting problems of personal efficiency deals with the self, not with the "content" or the "function." The very title of Lough's useful little volume (17) confirms this statement; and Dodge explicitly makes "the difference between a person and a thing" (p. 137) the basis of his outline study (11) of the "conditions of effective human action."

II. In turning from the incidental to the specific discussion of the self, we shall find it convenient to make our start from the vantage ground of the critics. The most important attack on the conception of psychology as science of self is that of MacDougall (18). His position, resembling that of Natorp, Dürr, and Dunlap¹ is the following: Far from denying the existence of selves, he asserts that "every mental fact is the experience of some self" (p. 9¹), again that "of facts not given to a subject we know nothing" (p. 8³), and that "the sense of self accompanies and grounds all experience" (p. 9²); finally, and even more impressively, that "all psychology is the psychology of self" (p. 29²). None the less, he insists that the conception of self has "merely regulative value" in psychology (p. 11²). And he bases this conclusion, which in face of the admissions just quoted is little less than astounding, on two main considerations, closely related: (1) "Self-consciousness," he urges, is not "a fact among facts"; it is not "a constituent of experience as is sensation . . . or affection" (p. 9³). (2) The self, in the second place, is not a proper object for scientific description: it "nowhere becomes the object of descriptive treatment" (p. 29²). And "the barren reassertion in connection with each fact discussed that it is the experience of a self adds nothing to its treatment" (p. 10²).

The first of these criticisms is again brought forward by Creighton (8) who argues against the view that "the 'self' is actually a 'perceived' fact, a particular datum of introspection" (p. 166³) by pointing out that "the self is no 'psychological state,' no 'specific self-content'" (p. 167²). In the opinion of the present writer

¹ Summarized in this BULLETIN of January, 1916, pp. 13, 22-23.

both Creighton and MacDougall unjustifiably identify the obvious truth that the self is unlike all other observed facts with the assertion that the self is not an object of observation. Assuredly the self is not a "fact among facts" of psychology, for it is basal to these other facts; it is not a "content" or a "psychological state," for the contents and the states are its own. On the other hand, as both MacDougall (already quoted) and Creighton (for example, p. 168³) admit, one does directly know oneself as subject of perceiving, thinking, feeling and willing; and this is sufficient to constitute the self the fact or object of the psychologist's study. Among recent writers, Laird (p. 24²) affirms this direct introspective awareness of self; and Parker (19) insists (chapter 2) on the "fact" or "experience of personal identity" which he carefully distinguishes from the "concept" of personal identity.

The second of MacDougall's criticisms finds a certain justification in the lazy contentment of many self-psychologists with traditional structural categories or with unassimilated, behavioristic descriptions, supplemented by the truly "barren assertion" that psychic facts belong to the self. Angell for example, in the last chapter of his *Introduction to Psychology* (1) seems to regard the book as an analysis of the "experiences" of the "personal self" (p. 263) but nowhere analyzes and describes and groups these experiences as essentially related to the self, as intrinsically personal experiences. Yet, it has over and over again been shown not only that all psychic phenomena may be described as experiences of a self but that many of them are inadequately and equivocally described without this reference to conscious self or selves. Thus, sympathy and jealousy are indistinguishable from other forms of feeling except when described as consciousness of oneself in relation to other selves; the awareness of the persisting self is the core of recognition (cf. Kantor, 15, pp. 10 ff.); and realized self-activity is the essence of volition.¹ The greatest need of psychology to-day, in the opinion of the writer, is the thorough, experimentally guided working out by many minds of the specific categories of self-psychology. Without this systematic and scientific detail-study of self-psychology we seem doomed to vibrate between the abstractions of structural psychology and the rule-of-thumb procedure, or else the wild eclecticism of most mental testers and applied psychologists.

¹ Cf. Pfänder, *Einführung in die Psychologie*, summarized in this BULLETIN, January, 1916, 13, 25; and the writer's *Introduction to Psychology* (1901), Chapters XIV-XXI, and *A First Book in Psychology*, Chapters II, VIII-XIII.

Indications of such analytic study are not entirely lacking. In particular, Laird, in his *Problems of the Self* already referred to—a book written with primarily philosophical purpose but based upon genuinely psychological analysis—resembles Michotte¹ in his distinction of the “adynamic” cognitive attitude of the self alike from the “passive” emotional and the “active” willing attitude (pp. 35 ff.). Important also are the chapters (IV–VIII) in which Laird protests against the conception of the self as exclusively emotional or affective. At most he yields that “feelings are the most intimately personal of our experiences” (p. 87²). But he points to esthetic feeling as witness that “feeling . . . is not intrinsically more obviously ‘ours’ than other experiences” (p. 91²). And “how,” he persists, “can we say that feeling knows and feeling wills, . . . how can we avoid saying that the self knows and the self wills?”

The criticism of self-psychology contained in Titchener’s latest volume (22) runs along the accustomed grooves. Self according to Titchener reduces either to the mythical “soul” of the animists, the “mannikin-mind which was assigned variously to heart, liver, eye, brain, blood” (p. 10) or else it is a common-sense, ethical affair, which cannot lend itself to scientific treatment. Against the first of these conceptions, the identification of the “self” of the psychologist with the “soul” of the metaphysician, the writer of this review has protested in several papers (4, 5, 6), all aiming to free the self from entangling alliance with the soul, whether this be conceived as *Körperseele* or as empty substance or as “entelechy” intruding unaccountably in the series of vital phenomena. (Such a protest might, by the way, with great advantage, be directed against the extraordinary *volte face* of Laird’s last chapters, which virtually identify “self” with “substance.”) In comment, finally, upon Titchener’s steadfast refusal to admit the possibility of a scientific study of the self the following statements may be made: Titchener is of course abundantly justified in the conviction that the self is often treated in moralizing, unscientific, “every-day” fashion. But this does not preclude the possibility, and indeed the psychological necessity, of dealing with the self scientifically, as well. Observation of the straits to which Titchener is driven in his attempt, without recourse to the self, to distinguish psychology from physical science constitutes a sort of negative argument for self psychology. “Psychology,” according to Titchener, is “the

¹ *Arch. de Psychol.*, 1911, 10, 195³.

result" of the "endeavour . . . to describe *the world as it is in man's experience*, as it appears with man left in" (p. 9¹); and it is contrasted with physical science which sets out "to describe the world as it would be with man left out" (p. 8³). When, however, challenged by his own definition, Titchener undertakes to tell us what he means by "man," he has only this to say, that "the *man left in* . . . reduces to a nervous system" (p. 10). But it is perfectly evident that a nervous system is one of the objects of the world of physical science and thus incapable of serving as distinguishing mark of the psychological from the physical. On the other hand one has only to interpret "man" as "self" and Titchener's definition of psychology becomes luminously clear.

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VISION—GENERAL PHENOMENA

BY LEONARD THOMPSON TROLAND

Harvard University

The year 1918 witnessed the death of Ewald Hering, the veteran psychophysicologist, at the advanced age of eighty-four years. The importance of Hering's contributions to the science of vision are too well known to the readers of this review to require any new emphasis. It is a striking fact that while Hering claimed primarily to be a physiologist rather than a psychologist the lasting part of his contribution to visual problems will probably be found on the psychological rather than on the physiological side, since modern physiological studies do not tend to corroborate his doctrines concerning the metabolism of response. We cannot overestimate, however, the importance of the emphasis which Hering permanently placed on the purely psychological aspects of light and color. Garten (20) commemorates Hering's work in an article which outlines his biography and his essential contributions to science and other fields of human endeavor. It is a great misfortune that Hering was not able to complete his *Grundzüge der Lehre vom Lichtsinn*. Carl Hering (26) also comments briefly on Ewald Hering's contributions to physiological optics.

The two related problems of the visibility of radiation and the merits of different methods of heterochromatic photometry continue to occupy the attention of a considerable number of investigators, mostly American. The important papers of Coblentz and Emerson (8, 9) were reviewed last year on the basis of advance publications. These studies on visibility were made by the flicker method. Further measurements by this same method are reported by Reeves (63, 64, 65), in which thirteen observers were used, the wave-lengths ranging between 490 and 640 $\mu\mu$. The maximum of the average curve was found to be at 553 $\mu\mu$, which is closer to that

found by Ives than that by Nutting, and the total curve is slightly less broad than that found by either of the last mentioned investigators. The energy calculations were based upon improved data.

Hartman (22, 23, 24) reports some very careful work on the visibility of radiation in the blue end of the spectrum, which is needed to strengthen existing measurements for these wave-lengths. Instead of flicker a direct comparison method was employed which utilized a photometric field similar to that of the Holborn-Kurlbaum optical pyrometer. The range of wave-lengths covered was from 410 to 500 $\mu\mu$, and the energy values were calculated from the known radiation laws of the tungsten filament. Twenty observers took part. The results agree fairly well with the visibility curve of Nutting but are considerably lower than those obtained by Co-blentz and Emerson. For the extreme blue-violet they are lower than those found in either of the last named investigations. Relative visibilities at 410 and 500 $\mu\mu$ are 1.7 and 905, respectively.

Hyde, Cady and Forsythe (32, 33) have thought it worth while to supplement this work by determining the visibility curve anew between 500 and 660 $\mu\mu$ by a direct comparison method, since they feel that the flicker method assigns too great a weight to the red end of the spectrum to be accepted without further criticism as the standard method of heterochromatic photometry. Results obtained by the flicker method may differ by 2.5 per cent. from those obtained by direct comparison, and the general form of the visibility curve seems to be different for the two methods. The present measurements were made under conditions identical with those of ordinary photometry, and a constant brightness of 0.003 candles per square centimeter, with an artificial pupil, was maintained. The comparison between wave-lengths was established by the "cascade" method, the spectrum being stepped off 10 μ at a time so that a barely noticeable color difference existed in any given comparison. Energy estimates were based on the laws of radiation for tungsten. Twenty-nine observers took part and their average visibility curve was found to be narrower and relatively lower in the red end of the spectrum than that obtained by the flicker method. Since the agreement between different observers was satisfactory the new curve is recommended as a standard in place of that obtained by flicker. Supplementary investigations were made using Hartman's "pyrometer method" in the middle of the spectrum, and the curve was found to be somewhat flatter than that obtained by the cascade procedure, although it agreed with

the latter better than with the flicker curve. Finally a table of weighted visibility values for the entire spectrum based upon direct comparison is presented.

Ferree and Rand (18) (1917) have made careful measurements of visibility curves at a number of different intensity levels and find that the form of the curve varies radically with intensity, even for intensity levels similar to those utilized in previous elaborate investigations by others. The change in the form of the curve is of the sort well recognized as constituting the Purkinje phenomenon. The changes in visibility for certain wave-lengths due to intensity amount to many hundred per cent. Unfortunately the writers do not specify the size of the field employed, so that one cannot feel certain that strictly foveal stimulation was secured. Energy values were obtained by direct radiometry in accordance with methods already exhaustively presented by the authors.

Priest (56) discusses a further development of the fact previously pointed out by the writer of the present review that if the empirical visibility curve is corrected for the selective absorption of the ocular media the resulting retinal visibility curve is almost perfectly symmetrical. It appears that this symmetry is more perfect when the corrected values are plotted with respect to frequency—which is theoretically the most promising method—than with respect to wave-length. Coblentz and Emerson's visibility data when thus corrected and plotted are symmetrical about a maximum at 541 vibrations per trillionth of a second. The symmetry is startlingly precise between frequencies corresponding to wave-lengths of 490 and 690 $\mu\mu$, that is, in a region where we are reasonably sure that no adventitious influences, such as retinal fluorescence, etc., are at work. The curve is accurately representable by a simple probability equation.

A number of studies relate to the principles and practical methods of heterochromatic photometry. Stenholm (67) describes what purports to be a new method in this field. The method of comparison, however, does not appear to differ in principle from that of the familiar Rumford shadow photometer, although he claims for it a considerable precision when applied to lights of different colors. Ives (37) presents a revised formula for his so-called "luminosity curve solution" for "physical photometry." This solution has a spectral transmission corresponding with the latest visibility curve results. Revised formulæ are also offered for solutions of two different colors which should appear to have equal light transmissions for the normal eye and a "4-watt lamp."

Crittenden and Richtmyer (13) describe statistical investigations with 115 observers in which the above mentioned Ives-Kingsbury test solutions were employed in order to establish a reliable criterion for the "normal eye" as regards visibility. They find that for accurate heterochromatic measurements a careful choice of observers is essential, although by the use of the test solutions it is possible not only to choose normal observers but to correct the results obtained by an observer deviating from the normal. In the same paper an investigation is reported of the difference between results obtained by the flicker and the direct comparison methods of photometry for compared lights differing in color to the extent exhibited by the range of common illuminants. They find that the two methods may differ as much as 3 per cent. for these relatively small color differences. The work reported in this paper was done a number of years ago.

Troland (69, 70) reports measurements of the differential threshold for brightness between all possible paired combinations of eight spectral colors. The colors selected were the so-called psychological primaries and their intermediaries. The results show that the threshold increases to a maximum of from five to ten times that for zero color difference when the color difference is a maximum. The law connecting this relative increase with hue scale difference is the equation of an ellipse. Theoretical studies are presented of the magnitude of the heterochromatic threshold between various characteristic pairs of colors, such as antagonistic and non-antagonistic primaries, etc. It is found that on the average the threshold is greater for antagonistic pairs than for non-antagonistic ones and greater for pairs of warm with cold colors than for warm with warm or cold with cold. A general psychological theory is outlined to explain the influence of color difference upon luminosity discrimination and the relation of this theory with the color pyramid is discussed.

Hols and de Visser (28) report a new determination of the brightness of the black body at 1,336 degrees finding it to be 0.119 hefner candles per square centimeter. This determination permits them to calculate the mechanical equivalent of light to be 51.7 hefner candles per watt.

A number of papers deal with the practical application of the principles of vision.

Ferree and Rand (16, 17) report further experimental investigations on the power of the eye to sustain clear seeing under different

conditions of illumination. The problem which they attack in the present papers is the much debated one of the relative merits of different common illuminants. By means of their familiar test the authors demonstrate a considerable difference between the various types of tungsten lamps, the carbon lamp and the kerosene flame. The ordinary "nitrogen" lamp appears to be most conducive to efficient seeing, while the semi-daylight lamp is least conducive, the kerosene flame lying somewhere between these. The results are given in detail.

Luckiesh contributes two papers in the applied field. The first (45) deals with the artistic possibilities of artificially colored illuminants. He discusses the problem of the emotional correlations of the various colors, the recent advances which have been made in the standardization of color and the technique of producing various colors. In the other paper (43) Luckiesh touches on some of the visual principles involved in camouflage. Mention may be made here of the same writer's very interesting volume "on the language of color," which considers in a semi-fanciful vein the rôle which color has played in literature.

Miss Irwin (34) also discusses the value of color in illumination. She classifies colors according to their emotional effect and applies the principles thus developed to the practical purposes of "utility, beauty and hygiene."

Troland (71) presents certain psychological considerations bearing on the applications of color to problems of illuminating engineering, pointing out some undesirable confusions which exist in the present usage of the term "color" and the importance of regarding color at all times as a psychological factor. The problem of the subjective reproduction of "daylight" vision by artificial illuminants is discussed from a psycho-physiological point of view and the thesis is advanced that both adaptation and association act in consciousness in such a way as to add blue to all of the perceptions of evening vision. The problem of the definition of "white light" is considered in conjunction with that of the color of sunlight. Among other theoretical points discussed are those of the nature of the physiological process in the visual nervous system, the definition of primary colors, the significance of Hering's psychological color system, and the evolutionary basis of color vision.

Troland also reviews the important experimental work of Pressey on the influence of color upon mental and motor efficiency. Even the very elaborate experiments made by this investigator, who used

a variety of "mental tests" upon subjects subjected to illumination of various colors, failed to demonstrate any appreciable effect of color upon mental performance. Brightness, however, was found somewhat to enhance the efficiency of performance.

The committee on automobile headlight lamps of the Illuminating Engineering Society considers in some detail (10) the application to their particular problem of the laws of visual sensibility developed by Nutting and others. New data on reduction of sensibility by oblique glare at various angles and on other relationships relevant to the headlight problem are presented. The threshold sensibility is found to increase with the size of the stimulus spot for low but not for middle or high intensities. Contrast sensibility, as shown by the measurements of Reeves, also increases rapidly with increase in the size of the test field. The effects of rates of adaptation, temporary glare, and "veiling glare" are also considered, and the brightness distribution needed for the best seeing is specified. Similar problems are discussed by Bayliss (3) in a paper presented to the British illuminating engineers. A contrast of 100 to 1 is suggested as the maximum desirable in any field of view. The effect of color on clearness of seeing, and conditions of eye-strain are also considered in relation to the theory of vision.

The work of Reeves adverted to above is presented by that investigator himself in a number of quantitative articles dealing with the effect of stimulus size on the absolute and differential brightness thresholds. One of the investigations (59, 60) (1917, 1918) provides us with measures of the differential threshold for angular sizes of the test field ranging between 0.33 and 4.92 degrees and times of adaptation between zero and 60 seconds. For angles greater than one degree, the logarithm of the absolute brightness required to render a given contrast visible is reciprocally proportional to the visual angle, but the variation is much less than for smaller angles. The time required to detect a fixed contrast with various field sizes and brightnesses is also determined. Comprehensive tables and graphs are included, and these must be studied to obtain a thorough appreciation of the results.

The other investigation (58) is concerned with the energy and brightness required for absolute threshold stimulation with stimulus fields of various angular sizes and shapes. The conditions were those of fairly complete dark adaptation. The threshold in terms of total energy entering the eye increases from 17.1×10^{-10} to 564×10^{-10} ergs per second in passing from a square field one milli-

meter on the side, viewed at a distance of three meters to one twelve centimeters on the side, viewed at a distance of thirty-five centimeters. His measurements were made in brightness units and transformed into energy units by means of the mechanical equivalent of light. The threshold brightness for the smallest field was .00720 millilamberts and for the largest .000000175 millilamberts. The average time required to perceive a just noticeable stimulus was found to be 2.2 seconds.

Another elaborate series of investigations from the Eastman laboratory is reported by Blanchard (6). Some of this worker's investigations on visual sensibilities of various types have already been published by Nutting. He finds that the instantaneous absolute brightness threshold after adaptation of the eye to different levels of brightness is an exponential function of the latter brightness, the form of the equation being $T/F = (F/F_0)^{-n}$, in which T is the threshold, F the field brightness, F_0 the absolute threshold, and n a constant. Upper and lower deviations from this law analogous to those exhibited by Fechner's law are demonstrable. A change in the value of n for light of different colors is found, which appears to depend upon the same mechanism which underlies the Purkinje phenomenon, the test spot in these experiments having an angular size of approximately 5 degrees. Measurements are also reported on the differential threshold or contrast sensibility immediately following adaptation to various brightness levels. A number of different physically fixed contrasts were employed, and the brightness behind these was varied until the contrast could just be noticed after each specific adaptation. The time allowed for detection of a given contrast was also controlled. Curves are given showing the relation between the adaptation field brightness and the relative differential threshold for various times allowed for discrimination to occur. The threshold rapidly sinks to an asymptote with increased field brightness. A third question considered is the value of the unit of brightness employed by König in his classical investigations on the differential threshold for brightness. By a comparison of the form of the curves obtained by König with those obtained by himself Blanchard concludes that the unit in question was .0040 millilamberts. A fourth problem is that of the brightness which is just glaring after adaptation to a variable level of brightness. The equation expressing this relationship has the form $G = cB^n$, where G is the glaring brightness, B the adaptation brightness, and c and n are constants. The range within which

sensibility to glare changes with adaptation is much less than that characterizing the absolute threshold or contrast sensibilities.

Another series of measurements was concerned with the rate of adaptation, the absolute threshold being determined as a function of the time after adaptation of the eye to fields of varying brightness and color. Curves are presented showing the relationships between the various factors in this situation. The color of the field appears to have an effect in harmony with that predictable on the basis of the Purkinje phenomena.

Still another problem treated in this extremely comprehensive paper is that of the diameter of the pupil for different field brightnesses both for monocular and binocular exposures. Curves are given showing the relationship between brightness and pupillary diameter for each of these conditions, the ratio of maximal to minimal diameter being 16. On the basis of these results the flux density of light on the retina is calculated for various stimulus field brightnesses varying from 7×10^{-12} lumens per square meter for the threshold brightness to 1.1×10^{-4} for a brightness of 2,000 millilamberts. As is evident from the above incomplete summary, this paper represents a very large amount of quantitative work of the highest type, although it was apparently carried out with only a few subjects.

Best (5) (1917) has carried out measurements of the adaptation process for both central and peripheral vision, using "radiolite" screens of various brightnesses as test objects. The sensitivity in the periphery doubles in a few seconds at the beginning of dark adaptation and after forty-five minutes has increased by a factor of twelve. Central adaptation is soon finished, although adaptation to red continues after that to violet is complete. The relative apparent brightnesses of lights of different colors in the dark-adapted central and peripheral fields are discussed, and the facts appear to be consistent with the recognized theory of relative rod and cone sensitivities, for various parts of the spectrum. Other papers touching on the "duplicity theory" are those of Rochon-Duvigneaud (66) (1917), Polack (54) and Koeppé (41). The first bases arguments with regard to the functions of the rods and cones on a demonstration that nocturnal saurians are equipped only with rods, whereas diurnal ones have cones alone. Polack finds that in congenital day-blindness a reverse Purkinje phenomenon exists, no exception to this rule being noted in five cases which were studied. There is no photochromatic interval in such cases, except for green

light. Koeppé attributes night blindness to opacity of the lens rather than to disease of the rods.

Lumière (47) reports as a new observation what is in reality only another instance of the principle of which the familiar "fluttering heart" illusion is an example. If a luminous watch dial is moved back and forth in the red light of a photographic dark-room, the figures appear to oscillate upon the dial. Other experiments illustrating the same fundamentals are described and deductions are drawn regarding the rates of rise and decay of different color excitations in the retina.

Some very interesting observations of a similar effect are described by Ives (36). He finds that if a compound strip of light, the upper portion of which is red, the middle purple, and the lower blue, is moved through the visual field at the right speed the blue not only lags behind the red but the purple breaks up into red and blue components. A similar effect is found with a yellow composed of red and green lights, although it is quite absent with a monochromatic yellow. The general law governing these phenomena therefore seems very similar to that of optical dispersion, although the true explanation is probably that the excitations set up by the different wave-lengths in the retina are propagated to the brain at different rates, a view already clearly expressed in the author's theory of "visual diffusivity." The phenomena, however, are observable only at low intensities, and their *chromatic* character does not appear to be very convincing, both of which considerations cause one to wonder if they may not, after all, be referable to the well-known lag of rod excitation behind that of the retinal cones. It is to be regretted, at any rate, that neither Ives nor Lumière make any reference to the literature which deals with the Purkinje after-image or with Fechner's colors. Baumann (2) finds that the latter phenomenon is not observable in bright sunlight, and is interfered with by flicker.

Perhaps the most impressive monograph of the year is that of Hartridge (25), who has attacked anew the problem of the chromatic aberration and resolving power of the eye, with super-Helmholtzian acumen. He first examines critically the various hypotheses which have been offered to explain the substantial absence of effects of ocular chromatic aberration in ordinary vision. Helmholtz's well-known explanation appears to be the best, but requires correction as regards the assumed dispersion by the ocular media and the particular wave-length which the eye selects to focus sharply

upon the retina. Hartridge finds this latter to be $580\ \mu\mu$ (the yellow) instead of $500\ \mu\mu$ (the green), assumed by Helmholtz. This experimentally established result harmonizes with the fact that the focusing of yellow provides a maximal concentration of all of the light emitted by a single point of the object. The distributions of light intensity at the borders of retinal images of various shapes and sizes are calculated, and it is shown that in the case of a point source and a 0.9 mm. pupil 76 per cent. of all of the light can fall on a single retinal cone, while the outlying cones receive only 3 per cent. apiece.

The color-mixture effects which are present in the chromatic aberration disks of retinal images are analyzed theoretically, and the conclusions reached are tested experimentally. The eye apparently differentiates between white and yellow points of light by means of the blue ring which surrounds the former but not the latter—since the nuclei of both must be yellow—but this ring is not experienced directly. Eleven factors which tend to reduce the effects of chromatic aberration in the eye are discussed in detail, and the modifications of the aberration in night vision are considered. Chromatic difference in magnification, chromatic stereoscopy, and “chromatic focal instability” resulting from chromatic aberration in the vision of colored objects are other topics which are very carefully analyzed. The optimum resolving power of the eye is about $0.0031\ \text{mm.}$, obtained with a pupil not less than 2.8 mm. diameter. Hartridge has apparently not seen the important papers of Nutting on his chosen subject. It is to be hoped, however, that he will extend his very valuable original investigations to other optical problems of the eye, the solution of which is a prerequisite of an accurate analysis of many general visual problems.

Another excellent experimental study of ocular processes is that reported by Reeves in a number of papers (61, 62), on the rate of pupillary dilation and contraction. The range of intensities lying between complete darkness and the brightness of white paper illuminated by direct sunlight was divided into eight levels to be studied separately. Eight subjects took part. The rate of contraction was recorded by motion pictures, and the rate of dilation by single flash-light pictures taken at different times after removal of the stimulus in as many separate tests. The average pupil closes in less than five seconds, but requires three to ten minutes to open to its maximal diameter. Curves showing the rate of closing, after adaptation to darkness, for various levels of bright-

ness, and of opening in darkness after adaptation to these several levels, are given. There are also valuable tables of pupillary diameters for a wide range of fixed brightnesses. Both binocular and monocular stimulation were tried. Other articles dealing with the pupil are those of Barrie (1) who discusses pupillary inequality and finds that it frequently occurs in association with myopia, and Cutting (14) (1917) who describes, somewhat naïvely, experiments showing that the response of the pupil to colored lights is proportional to their luminous intensity, and independent of hue or wave-length as such.

Thomsen (68), after biographical commentary on the work of Purkinje, presents new experimental and theoretical analyses of certain of the entoptic phenomena first described by that classical investigator. The entoptic figures which are produced by intermittent illumination of the closed eyes are divided into the primary and the secondary, the former being referred to the displacement of pigment in the pigmentary epithelium and the latter to the motion of the blood in the retinal vessels. The patterns which are visible are catalogued and described. Figures produced by pressure and by the electric current are also described. An increasing current along the optic axis yields a violet, while a decreasing one gives yellow. The idio-retinal streamings and flashes of light which can often be seen on a strongly illuminated white surface are discussed. A whole section is devoted to the *Aderfigure*. The visibility of the blood corpuscles is attributed to mechanical stimulation, and their increased visibility with blue light as compared with red is explained by a supposed sensitizing action of the former!

Klein (40) reports a case of migraine in which during the onset of the disease a hexagonal network was visible over the entire visual field. He attributes this appearance to chemical substances emitted by the pigmentary epithelium and acting upon the retina. Carter (7) (1917) describes a circular color spectrum which he began in his eighty-ninth year to see surrounding any bright light. The circle is a large one and is quite clear of the light itself. He considers it to be due to some change in the refractive elements of the lens.

Macht, Isaacs and Greenberg (49) (1917) find that opiates, such as morphine and pantopon, have a slight contracting effect upon the visual field, while antipyretics, such as acetanilid and aspirin, show some tendency to expand the field.

William (73) describes preliminary observations on a supposedly unusual case of partial color-blindness. The customary tests with yarns, Nagel cards, etc., indicate the subject, a male, to belong to the familiar deuteranopic class. Perimetric measurements show his color fields to be contracted to a marked degree. His photopic and scotopic luminosity curves for a standard light source were determined in comparison with those of normal observers, both the direct comparison and flicker methods of equation being employed. By the direct comparison method he shows a marked depression of sensibility in the neighborhood of $560\text{ }\mu\mu$, which is approximately the location of his "neutral band," but this effect is absent in the curves obtained by flicker. His response at the red end of the spectrum and his scotopic curves are similar to those of the normal observer, his spectral limits being approximately 400 to $750\text{ }\mu\mu$. Careful hue discrimination tests were made throughout the spectrum, which showed an exceedingly small number of "hue steps," these lying for the most part between 530 to $580\text{ }\mu\mu$. Color equations between mixtures of two homogeneous spectral lights and a single spectral light were made. His neutral band lies at 576.5 .

Ishihara (35) describes a modification of Stilling's test for color-blindness, which consists of sixteen plates with intersecting circles so arranged as to give one salient pattern for the normal eye but quite a different pattern for the color-blind eye.

Houstoun (30) has attempted a "statistical study" of color vision, the purpose of which was to determine whether or not a biometric frequency curve for some property of color vision has more than one mode. The property selected was, unfortunately, the response of the subjects, of whom there were 41, to the so-called Edridge-Greene test for color normality, which consists in determining the number of "monochromatic" regions which the subject can discern in the spectrum. However, the results are undoubtedly of some significance and indicate so far as they go that there is only one *type* of color vision, the "scatter" of the normal frequency curve being sufficient to include the color-blind cases. This is a very laudable type of work, but it is to be wondered whether the conclusion reached would be corroborated by analogous determinations using a more reliable criterion.

Houstoun appears to take Edridge-Greene's test rather seriously, since he devotes another article (31) (1917) to the problem as to whether Sir Isaac Newton was a "heptachromic" in Edridge-

Greene's sense, as Newton regarded the "indigo" region of the spectrum as a characteristic one, while the majority of observers do not so regard it.

Malling (50) has studied twenty-five cases of abnormal color vision using five color equations between different parts of the spectrum, determining the length of the spectrum and the location of the neutral band whenever the latter was present. His results, like those of Houstoun, indicate a continuous series of variations from the normal to the color-blind individual. The neutral zones vary in position but are usually between 500 to 550 $\mu\mu$. Only an abstract of this work is available, but it appears to be of considerable value.

A number of articles deal with the theory of visual sensation. Houstoun's theory, already reviewed, has been republished (39) and is worthy of careful consideration. Bayliss (3) contributes an interesting paper on the physiology of the retina, although it is largely a summary of well-known facts. The minimum retinal energy threshold is asserted to correspond to one "light quantum" of the Plank theory of radiation. Temporal laws of retinal excitation are considered by means of electrical response curves for a number of different organisms.

Berry (4) (1917) in a Bowman lecture has analyzed the problem of color vision very carefully, and arrives at the following conclusions, among others. It is improbable that there are any fundamental color sensations, so that the transition from trichromatic to dichromatic vision is not to be explained by the loss of one fundamental sensation. Special cortical processes which are independent in their nature of the retinal ones must be assumed. Chromatic and achromatic sensations have separable mechanisms, the rods and visual purple having no connection with color sensation.

Gibson (21) offers a popular but accurate account of the nature of light on the modern electron theory and points out the probable relation between this theory and the facts of color vision. He believes that there are three types of resonating electron systems in each retinal cone corresponding with the three fundamental sensations of the Young-Helmholtz theory, and that dichromatic color-blindness is due to the absence of the red-sensitive system. This latter belief is substantiated by demonstrations showing that normal observers make the same errors in color choice when working in a "minus red" illumination that the color-blind make in ordinary illumination. The red and green responses are supposed to combine to produce a new form of "chemical disturbance," as are also

the red, green and blue, thus accounting for yellow and white respectively. The transmission of color quality to the brain is supposed to be accomplished by means of some characteristic "interruption of the local nerve current."

Dawson (15) (1917) supplements his paper previously reviewed with one on the theoretical side of the question of binocular color mixture. The present paper is a very careful historical, as well as logical, analysis of the problem and contains much food for thought. The facts indicate that binocular color mixture is possible and that like other phases of binocular fusion it is difficult to explain as a result of the combination of the two ocular impulses in a single cortical field. Binocular rivalry, the opposite of binocular fusion, appears to be most satisfactorily explicable as a phenomenon of attention, since its governing conditions seem to be the same. This view is substantiated by a careful analysis of the conditions in question, such factors as contour, local fatigue, volition, involuntary fluctuation, and interest being considered. The theoretical implications of the phenomena of luster, transparency, and Fechner's paradox are considered.

Zeeman (74) (1917) asserts that there is no trace of binocular summation of brightness either for a light or dark adaptation of the eye, although the threshold is lower for binocular than for monocular vision. This is to be attributed to an increased sharpness of perception of the outlines of the object in binocular vision.

Pikler (53) has devoted a number of chapters in his recent book to problems of binocular vision. He regards sensation as conditioned by a process of adaptation (*Anpassung*), a view somewhat resembling that of Hering. The single effect of vision with two eyes is explained according to the view that a single process is released by either eye, no further release being accomplished by the two eyes acting in unison.

Luckiesh (46) describes some very interesting experiments on phenomena of chromatic stereoscopy. Red and blue letters were observed in a dark room and the observer was required to move the former until the two appear to be the same distance from the eye. For seven observers the red had to be placed considerably farther away than the blue, although the opposite was the case with two other observers. The effect of different distance value is absent when small artificial pupils are employed concentrically to the optic axes or when only one eye is used. However, it is present when the pupils are placed eccentrically, and can be reversed by

reversing the eccentricity. On the basis of these observations a theory is advanced which explains the effect by a combination of the chromatic aberration of the eye with the disparation principle of ordinary stereoscopic vision. The author is apparently unfamiliar with the literature on this subject, in which similar explanations are already to be found. This literature is reviewed critically by Hartridge (25).

There are a number of valuable contributions dealing with methods and apparatus. The Annual Report of the Committee on Nomenclature and Standards of the Illuminating Engineering Society should be in the hands of all workers on vision. Besides summarizing the established conceptions related to light and radiation, this report offers revised definitions of brightness and the lambert, the unit of brightness. A standard table of visibility values in steps of $10\ \mu\mu$ between 400 and $760\ \mu\mu$ is given, both relative and absolute (lumens per watt) values being tabulated.

Priest (57) gives an outline of the work being undertaken by the National Bureau of Standards on the establishment of color standards and methods of color specification. This work includes "development of instruments and methods for general fundamental work, determination of fundamental data and establishment of working standards, application of spectral photometric and colorimetric methods to specific technical purposes and routine tests." "The fundamental basis of color specification is spectrophotometry." Coöperation and discussion with outside experts is sincerely desired. Reference is made in this paper to a method more thoroughly described in a further publication (55) by the same author for a production of accurate "artificial daylight." This method utilizes the rotary dispersion of a quartz plate inserted between two crossed Nicol prisms. Reproduction of the distribution curve of solar radiation between 520 and $690\ \mu\mu$ can be secured by means of this principle with an accuracy of 2 per cent. or better.

MacDougal and Spoehr (48) (1917) enumerate the various physiological effects of light, discuss the relative merits of gelatine and liquid filters, the properties of various selectively transmitting glasses, and recommend the use of a photo-electric cell for measuring radiation intensities.

Laurens and Hooker (42) (1917) describe an apparatus for producing spectral lights and equating them in energy. This equation is accomplished by means of a thermopile and galvanometer and the conditions necessary to accomplish the result are

carefully tabulated. The writers are at present working on the relative stimulating values of these equated lights for various organisms, as well as their values in chlorophyll metabolism.

Karrer (38, 39) describes a new neutral tint or variable tint screen, which consists of a number of small glass bars with a very thin layer of black opaque or colored material between them. Alteration in the angle between the screen and the incident beam of light permits continuous variation in the intensity amount of the latter which is transmitted. The screen has a very high maximal transmission.

Gaehr (19) describes class-room methods of demonstrating the Purkinje phenomenon and the persistence of vision.

Some interesting studies in the comparative field are reported. Hess (27) gives an account of experiments which prove that bees have no color vision, since they are unable to distinguish yellow and blue from each other or from a gray when these are of equal luminosity for the color-blind human eye. The temporal laws and circumstances of adaptation in the bee appear to be similar to those for man, but there is no Purkinje phenomenon in the former instance. Hess shows that the experiments of Von Frisch, which the latter experimenter regarded as demonstrating color vision in the bee, in reality prove the absence of such color vision.

Wasmann (72) reports experiments which show that the ordinary house-fly (*Homalomyia cunicularis* L.) is insensible to the light transmitted by a ruby glass.

Mottram and Edridge-Greene (51, 52) discuss "animal coloration from the point of view of color vision." They believe that "sexual differences in color in birds and insects can be entirely accounted for on the basis of a difference in conspicuousness." In general, red tends to produce conspicuousness at low illuminations while blue has the same result at high illuminations. The enemies of insects cannot discriminate between a green and a brown, and since a brown pigment is most readily produced by these animals they employ it to render themselves invisible against a foliage background. A detailed examination of many specific cases is given.

The Committee on Progress of the Illuminating Engineering Society (12) reviews and abstracts the work on the physiology of vision during 1917-18, so far as it bears upon their field.

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VISION—COLOR DEFECTS

BY SAMUEL P. HAYES

Mount Holyoke College

Among the limited number of articles which have appeared since the last review of color defects in 1916, the following wide range of topics is discussed,—color tests, the frequency of color-blindness, the relation of color defect to visual acuity, unusual cases, the classification of color defects, and color therapy.

Collins (3) presents the results of the examination of 1,000 persons with the Edridge-Green color lantern, a task undertaken as a part of an illumination survey of the Federal department buildings in Washington, "with a view to determining both the value of the lantern in testing color-blindness, and the effect, if any, of refractive conditions, lesions, and anomalies of the eye, and also the effect of sex upon different degrees of color perception." Collins gives a sympathetic presentation of the Edridge-Green theory as a preliminary to the explanation of the construction and use of the color lantern. The Holmgren wool test is also explained and criticized and a special study of Jennings's recently devised self-recording worsted test described. Four tables are printed showing the frequency of ocular defects in the 1,000 persons examined, and the relations of ocular defects to color defects. The author summarizes his results as follows: Color blindness is best detected by testing with colored

lights of known spectral composition. It is of great importance to divide the color blind into the dangerously color blind and the harmlessly color blind. Among the former the author would include: (a) Those possessing a color perception containing three or less units; (b) those possessing a greater number of units than three who have the red end of the spectrum so shortened as to prevent the recognition of a red light at a distance of two miles; and (c) those with a central scotoma for red and green. These dangerously color blind may be satisfactorily and expeditiously discovered with the Edridge-Green lantern after gaining an understanding of the principles of the test employed. The Jennings test, on the other hand, results in the rejection of a large percentage of subjects who should be accepted, especially among the more intelligent, but it possesses certain practical features which render it superior to other tests in certain lines of examination where great accuracy and classification of color defects are not essential. It should not be used for testing sailors and trainmen.

Among the 1,000 individuals tested, Collins finds about 8.6 per cent. of men and 2.2 per cent. of women color blind, though the defect is of a degree which would be dangerous in occupations requiring recognition of colored lights in only about 3.1 per cent. of men and 0.7 per cent. of women. Color blindness occurs less frequently in eyes apparently without demonstrable refractive error; it occurs most frequently in eyes showing mixed astigmatism.

Barrett (1) reports as a result of experiments upon himself and extensive tests on others, that form vision below 6/12 is dangerous in dull light and because it makes small colored spots unrecognizable. Köllner (8) claims that errors of refraction up to 20D have no effect on color mixture, though brightness is less well judged as the defect becomes more grave.

Bell (2) describes a spectral apparatus by means of which he attempts to classify color defects into 26 different types. His chief test is in principle the converse of Rayleigh's and consists in matching a synthetic yellow and a synthetic blue-green, of the same hues as the spectral colors corresponding to the red-yellow and blue-green junctions for the normal eyes, by shifting a pure spectrum which occupies the lower half of a slit in the focal plane of the eyepiece while the synthetic color occupies the upper half. The synthetic yellow is produced by the use of a filter made of opposed wedges of cobalt and selenium glass. The patient is asked to match the synthetic yellow by rotating a prism mounted on a turn table.

A very slight degree of red blindness causes him to match the synthetic yellow with a green, while a plus red or a minus green color- abnormality will produce a reddish match. Next the experimenter substitutes the synthetic blue-green filter, produced by cobalt chloride in acetone solution combined with a uranine filter, and the test is repeated. Here a green-blind observer would match with blue and a blue-blind case with green. This blue-green junction supplements the other in the diagnosis. Finally, for further evidence of plus or minus red or blue sensation, the red and violet end points are determined, after resting the eye. Of the 26 possible abnormal types of congenital color vision, the author claims to have found 16 fairly represented in his own work or in the cases reported by Burch, Abney, Watson and Edridge-Green. Seven of the remaining ten are types having two sensations plus and thus varying from a simple deficit of the remaining sensation only in the degree of luminosity of the other two. The best method of differentiation here seems to be by a careful study of the end points and the use of fatigue tests such as Burch describes.

As a remedial measure, Bell suggests the use of colored lenses to regain the proper balance of colors, as has already been done in artificial illumination to secure daylight values. An ordinary gas flame, for example, is in effect partially blue-blind and the normal eye will see colored objects under such a light very much as the partially blue blind would see them in daylight. The necessary correction has been found to be the interposition of absorbing media which reduce the green and red elements in the same degree as the deficit of the blue element in the source. The penalty of doing this is the loss of considerable luminosity. Those in whom one sensation is nearly or quite absent are of course quite beyond help, since balance would require an almost complete obscuration of the remaining sensations.

Nature (10) reports an interesting newspaper case of a soldier who saw everything green for some time after being shot in the forehead, the bullet passing out of the back of the head without killing or even stunning him and Hilbert (6) briefly describes a case of red vision after poisoning, a girl of eight years who ate some of the berries of the nightshade and reported that everything she looked at was as red as the berries she ate; Johnson (7) describes an interesting case of unilateral acquired total color blindness following a form of creeping paralysis which gradually affected the limbs of that side; Meyer (9) reports a case in which blue and green

are seen as one color, red and yellow another, thus having the neutral zone displaced into the yellow-green region; Williams (12) reports the results of extensive experiments upon a puzzling case which the author does not attempt to classify, preliminary tests with colored wools, papers, cards and glasses in the Iowa Psychological Laboratory being supplemented by careful spectral measurements in the Nela Research Laboratory; Von Kries (11) describes the results of the use of a number of familiar tests and some adaptations of old ones upon a subject whom he classifies as a deuteranomalous trichromate, the especial interest in the case arising from the fact that the defect is limited to one eye and may thus be expected to add to our information as to just how colors appear to subjects of this class.

Ferree and Rand (4) report the discovery of areas blind to different colors in the peripheral retinas of normal subjects, giving maps of these areas for two observers. These peripheral retina spots, while similar in a general way to the case described by Schumann, present the following points of difference. (a) There is no detectable weakening of the sensitivity to the complementary or antagonistic color in the areas in question. And (b) no more of the color to which the area was blind was required to combine to produce grey with the antagonistic or complementary color than was needed on the normal areas of the retina immediately adjacent. As these blind areas are not deficient in the after-image and complementary or cancelling reactions the authors suggest the possibility of explanation by appeal to the conception of different functional levels in the cerebro-retinal structure.

Goldschmidt (5) reports the results of a successful attempt to increase by systematic exercise the color discrimination of a subject classed as an anomalous trichromate. The author first attempted to give his subject confidence by assigning simple tasks with colored wools, and correcting and explaining mistakes; acquaintance with color names was developed by daily practice with pictures and colored objects; actual color discrimination was increased by the use of spectacles of different colors which were worn daily, two hours at a time. Tables of results of tests at different periods in the treatment are printed which seem to show decided improvement in color discrimination. The author especially recommends the treatment with colored glasses.

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HEARING

BY R. M. OGDEN

Cornell University

Rich's experimental study of tonal attributes (9) was made with tones of three regions of vibrational frequency, 275, 550, and 1,100. The sounds were obtained from three Stern variators and communicated to the observer through interference tubes appropriately adjusted to eliminate all higher partials. The method of the experiment was one of paired comparisons, the observer being instructed to judge differences in two successive sounds (varying in vibrational frequency) with respect to the attribute under consideration. Vocality is not accorded a place among the attributes since no sharp turning point was found in the three regions appropriate to the vowels *u*, *o* and *a* respectively. "The judgments of vowel-quality seem rather to be judgments of perceptions, perceptions which we found ready-made in some observers, and built up in others. A long series of studies in the theory of vowels has shown

that a given vowel-sound always contains a predominating tone or tones in a certain region of the scale, and that the regions are approximately an octave apart. These predominating tones form the core of the perception of vowels. If, as in our experiment, the core is presented to an observer who is instructed to hear the vowel, the remaining elements are supplied in some individual fashion, and the vocal judgment is rendered."

Pitch appeared to be clearly attributive, though the limens varied among the seven observers. It was uniformly higher at 1,100 than at 275 and 550 vibrations. Disregarding the results of two exceptional cases, the limen varied from about one third to one vibration at the two slower frequencies. In respect to volume the author's earlier results are substantiated, which indicated that judgments of volume are made upon an attributive basis, and that the volume-limen tends to follow Weber's law. In this connection it is pointed out that Watt's assumption that the volume of a tone decreases by halves as the tone becomes an octave higher is not in accordance with these results which tend rather to show that volume-differences remain approximately constant for the same interval at any point of the scale.

Judgments of brightness appear to be attributive but the results point to the conclusion that this is an aspect of pitch; with respect to nomenclature "pitch-brightness" is suggested. The results on tonality were few but suggest the possibility of such an attribute and it is accorded tentative acceptance.

Ogden (7) advocates the acceptance of five attributes of sound: pitch, volume, intensity, duration and, in a tentative way, brightness; while tonality, vocality, and noisiness are explained as perceptual phenomena.

Schole (10) records the results of a variety of ingenious experiments upon vocality which support the Helmholtzian theory that vocalic sounds are due to partial vibrations rather than to a certain resonance of the buccal cavity, as advocated by Hermann (the formant theory). The regions of sound which characterize the vowels *u*, *o* and *a* were found to be those established by Köhler, but Schole regards the octave-intervals between vowels as fortuitous in high German vocalization. He differentiates three *a* sounds—grave, medium, and acute, as distinct features of definite non-overlapping regions of pitch. While Schole attributes vocality to the pure tones of these different regions of pitch, he regards the vowel-sound as a perceptual combination of harmonic partials.

His results are especially interesting in their demonstrations of the necessary presence of the characteristic pitch of a vowel when it is sung at different levels of the scale. The vowel-tone is for the most part intensified by resonance of the mouth cavity which changes its pitch as the tone is altered; when, however, the vowel is of a lower pitch than that of the mouth resonance, the latter is neglected and adjacent partials are damped to approximate the pitch which the particular vowel requires.

Abraham (1) determined the pitch of the mouth-tones or resonance when the different vowels were uttered, and found an ascending series comparable to that of Köhler, though the *u* tone was higher and the *i* tone lower, as Miller found them to be (cf. the BULL., 1917, 14, 186-7). These tones were fairly constant for men, women, and children. Brightness was found to vary with vocality, but the pitch of the mouth-resonance appeared to be less significant; overtones that correspond with the resonance of the mouth were intensified and thus rendered more noticeable, but they were more tonal than vocalic—the vowel being less clear at the points of resonance than elsewhere.

With a specially constructed apparatus which produces high tones of great purity and a variable intensity, Gildemeister (3) explored the upper region of hearing in fifty-one persons varying in age from 6 to 47 years. The tones were conducted by means of a telephone, both through the ear-passages and through the skull. With air-conduction and a fairly constant intensity, the limit of hearing was attained at about 20,000 vibrations for children; at the end of the adolescent period the limit had been lowered by about 1,000 vibrations; in the middle thirties it had decreased to about 15,000 vibrations, and it continued slowly to decrease until at age 47 it was fixed at about 13,000 vibrations. With bone-conduction the limit was a few hundred vibrations lower than with air-conduction. Increase of intensity increased the height at which tones could still be heard; but only by an interval of about a semitone, or some 1,100 vibrations, after the intensity had been increased 25 times. In a second paper Gildemeister (2) considers Wien's paradox that the amplitude of the higher resonating partials in a clang is not reduced sufficiently to cause them to become subliminal even when the fundamental has ceased to be heard, although in reality they are not heard under such conditions. The question is raised whether the limit of hearing is sudden and decisive or whether it is indefinite, and attributable to the increasing difficulty of arousing the higher

receptors. It has been suggested that a section of the basilar membrane must be agitated to produce the fundamental and when the intensity of stimulation is insufficient no sound is heard. If there be a definite limit to sound-perception this would mean that when a certain region is approached the possibilities of its resonance are insufficient to produce a tone, but if there is no such definite limit we ought to hear the corresponding high sounds when the intensity is sufficient for their production. It is also suggested that in regions of high pitch the hair-cells vibrate with the same amplitude and phase as does the *tectorius*; consequently no contacts are made to produce a sound, however intensive the agitation may be.

A new and promising theory of the mechanism of the inner ear is advanced by Wrightson (14), and supported by the detailed anatomical studies of Keith. This work is treated in a special review (cf. the BULL.,). Keith's anatomical discovery that the hairs from the nerve-cells of the organ of Corti are embedded in the tissue of the *tectorius* is substantiated by the independent discoveries of Wittmaack (13) who shows that faulty preparation of the organs has led to the false notion that the *tectorial* membrane is free. Wittmaack also questions the notion that the auditory nerve-terminals may properly be called "hair-cells," and speaks rather of a continuity of the organ of Corti and the *tectorius*—with nerve-fibers passing from the former into the latter structure.

Parker (8) gives a critical review of the investigations upon the sense of hearing in fishes; the results favoring the idea that fishes hear in varying degrees, some only loud noises, others apprehending sounds more in the nature of tones. Fishes lack the cochlear organ and experiments after nerve-sectioning and extirpation indicate that their organ of sound is the *sacculus*, since removal or destruction of the *utricle* or the *canals* occasions interference with equilibrium, but not with response to sound.

Young (15) describes the construction of a tunable metallic bar which has certain advantages over the ordinary tuning-fork in experimentation on sounds. The bar is supported on stretched strings at its two nodes and the sound is heard with the aid of a *stethoscope*. The tone may be varied by a single load at one end, which can be calibrated with respect to adjustments of load, or the load can be varied in amount; in either case the resultant variations of pitch may be used in testing differential sensitivity. The sound of the vibrating bar is said to be free of variation in timbre

and intensity; it gives a loud, distinct tone which outlasts the resonated tone of a fork. Though the middle and the ends of the bar are in opposite phase (180 degrees), there is no interaural interference when one ear hears the vibration of the end, and the other ear that of the center. Differences of intensity can be secured by varying the position of the stethoscope from the node to the center, or to an end. Alteration of apparent localization of the sound follows a shifting of the tubes, starting with one at the end of the bar, which gives full intensity in one ear, and the other at the node, which gives no sound in the other ear. Keeping the distance constant, a shift in position varies the intensity in the two ears and tends to localize the sound in the direction of the ear which hears it most loudly. Stewart and Hovda (12) find that the ratios of intensities of a pure tone when conducted separately to the two ears must vary as much as one to ten in order to produce an apparent displacement of 45 degrees in localization. So great a difference never occurs in ordinary binaural experience, indicating to the authors that the intensity-factor alone is relatively unimportant, whereas they regard a difference of phase as the most significant factor. The angular displacement (θ) can be expressed in terms of right-ear and left-ear intensities (I_r and I_l) by the equation $\theta = K \log (I_r/I_l)$ with K a constant. This reminds one of Weber's law, but with an interesting difference inasmuch as the response indicated by the constructive angular displacement is proportional to the logarithm of the *ratio* of the two stimuli.

Klemm (4) has made an analytic study of the factors entering into the binaural localization of sound with the aid of a device which collects the sound-waves of a single source in two microphones, separated by the normal distance of the two ears, and conducts them separately to the two ears of the observer who is placed in another room. He finds that the intensity of the tone as heard in both ears is about four times that of the intensity for one ear alone. The two ears hear the same tone with somewhat varying intensity as well as with a variable pitch; as a rule the ears being one or two vibrations apart. The exactness of localization is found to be greater than would be warranted by a simple difference of intensity and it is finer when the ear is directly exposed to the sound than when the sound is conducted separately to the two ears through the microphones; although discrimination of intensity was not found to be affected by the different modes of conduction. Experiments were made in which the sound at the right was conducted

to the left ear, and *vice versa*. With the sounding bodies in view of the observer, a correction could be made so as to judge the source properly, but the observer did not become adapted to this shift, as Stratton did in his experiments with an inverted field of vision, for as soon as the normal connections were restored the observer made normal judgments. When the sound reaches one ear by 5 to 10 sigma in advance of the other, it is localized in the ear that hears it first. By direct hearing the observer could tell the difference in a sound located at 50 cm. distance, from one at 100 cm. distance, although the intensities of both had been made equal; this again indicates that a single source of sound is differently, and in some way more finely, apprehended than when the sound is separately conducted to the two ears.

Lantier (5) offers a report which places a high value upon the methods of Marage in diagnosing and treating cases of deafness incident to the war. From a study of cases in the field Lantier finds the method of measuring auditory acuity, previously referred to in these summaries (cf. the BULL., 1918, 15, 83) to be fully reliable in differentiating actual and simulated cases of deafness; he likewise testifies to the value of auditory reëducation conducted by means of the *vowel-siren*. Marage (6) answers the criticism that war deafness in time will cure itself by referring to the absurdity of such a notion in the 75 per cent. of patients whose disturbance is attributable to lesions of the middle and inner ear. Among the remaining 25 per cent. of functional disturbances, some make rapid recovery under treatment while the hearing of others is permanently impaired.

Sizes (11) maintains that the Hindoo scale of 22 intervals is not an equal-interval scale, but the chromatic scale of Pythagoras; and that Arabian music, with its 18 intervals, is not a third-tone scale, but the same as the Hindoo scale after four flatted notes have been omitted.

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SYNESTHESIA

BY HERBERT SIDNEY LANGFELD

Harvard University

Alford (1), after briefly reviewing some of the previous work upon synesthesia, describes an experiment he performed upon male twins, twenty-seven years of age, who associated colors with the names of persons and, as became evident during the course of the experiment, also with letters, numbers, days, months, and with a few of the cities. The twins were very much alike mentally. They also had the same likes and dislikes and had had a similar education, so that they seemed to the author to offer an excellent opportunity of discovering whether the phenomenon is due to some peculiar mental characteristics, to suggestion or to some merely accidental cause. Both of the men had a very good college record and were above the average in memory ability.

A list of 150 names, chiefly Christian names, was read to each and they noted the colors which were aroused. The color seemed as distinct to them as if it was "a colored object" and was not projected, but "seen in the mind." The reason for association could be discovered in the case of only a few of the colors such as Sue, blue; Flora, red, etc.

Of the 80 words which produced satisfactory responses there was an approximate agreement between the twins in the case of 54. One subject was tested again after three months and he made only two distinctly different reactions. In the second trial, however, he failed to respond to 19 words as against 7 words in the first trial. The author concludes that although there was 70 per cent. agreement, this agreement should have been much higher considering the small number of colors used in the associations and the numerous opportunities the twins had for similar experiences, and that, therefore, neither suggestion nor similarity of mental make-up can be considered the cause of synesthesia. He adds that if a more exact determination of the quality of the associations had been made there would have been even less agreement.

Peabody (2) sent a questionnaire to the members of the American Anthropological Association and of the American Folk-Lore Society and to several institutions, asking the following questions: (1) Whether in thinking of the numbers from 1 to 50 they arranged them in any definite shape or in a straight line; (2) whether they thought of the hours, days and months in a straight line, curve, circle or any other form; (3) whether they arranged the letters of the alphabet in their mind in any form. They were requested to illustrate if possible the arrangement they were accustomed to make. He received a hundred and sixty answers which he could use.

As was to be expected numbers and letters were most frequently arranged in straight lines either horizontally from left to right or perpendicularly from top to bottom of the page. It was not so clear to the author why the days were arranged more frequently in lines than the months.

48 per cent. of the subjects arranged the hours in a circle, clockwise, which left 52 per cent. who "resisted or escaped such an obvious stimulus to the imagination." Approximately 32 per cent. of the months, 21 per cent. of the numbers, 20 per cent. of the days, 13 per cent. of the letters, and 11 per cent. of the hours were arranged in some form or shape other than straight or broken lines. This ranking is in agreement with the results obtained both by Calkins and by Phillips. In the tabulation according to the more striking visualizations the months ranked first, followed by the hours, days, numbers and letters. Of the 160 answers 46 per cent. contained some sort of form. As many did not send in answers the author, on the basis of the results obtained, calculates that about 25 per cent. of all individuals possess some form of visualization of

one or more of the ideas investigated, although this may be somewhat too high. Many who had no form under one title possessed several under another. A number of illustrations of the forms reported are presented in the article.

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THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

TROPISMS AND INSTINCTIVE ACTIVITIES

BY WALLACE CRAIG

University of Maine

1. *Tropisms and the Lower Forms of Behavior*.—Loeb's book (18) will be given a special review elsewhere in the BULLETIN. It is a brief and somewhat popular presentation of the tropism theory. The word tropism is not precisely defined, but its meaning is explained in the same way as in the author's previous writings. The author dissents from the "Aristotelian" view, which "still prevails to some extent in biology," that an animal moves always for a purpose. He dissents also from the views that animal behavior is determined by "trial and error" or "selection of random movements" or "vague 'physiological states.'" Nowhere in this book does he admit that any of these phenomena really exist. He devotes himself to the tropism theory because it enables us to describe behavior in the language of the physicist and the chemist, and to predict behavior quantitatively (p. 93). He does not claim that all activities are tropisms, but mentions certain non-tropic phenomena, such as reflexes, shock movements, avoiding reactions, restlessness and associative memory. Reflexes are stated to be reactions of isolated segments, whereas tropisms are reactions of the organism as a whole. Shock movements are caused by rapid changes in intensity of the stimulus, for example, of an electric current, or of light (as when a shadow passes over). Avoiding reactions are admitted to exist, although Loeb does not like the name, it sounds too teleological; he prefers to say that the organisms are "entrapped" in the medium in which they stay, instead of saying that they "avoid" the contrasting medium. Restlessness is

mentioned, in the case of an inverted starfish (p. 134), and in starved animals (p. 162). The author states that Jennings's account of negative reactions, and consequently non-tropic movements, is in certain cases probably correct. Loeb even points out that some movements formerly regarded as tropisms are now known not to be such; for example, the "rheotropic" movements of fish are now known to be reactions to images moving across the retina. It seems in some passages as if Loeb regarded even these reactions to moving images as tropisms—but how they can be tropisms is not made clear. Finally, associative memory is admitted, but only in vertebrates, arthropods and cephalopods. These forms are said to have memory images.

Abbott (1) finds that land isopods are negatively phototactic. Their difference from their aquatic relatives in this respect is due to the fact that, living on land, they must seek dark, damp places in order to keep their gills moist. The author believes that their orientation is direct, not due to trial and error, but he says (p. 205): "While the direction of locomotion was usually determined by the light, there were many turns and circles, the causes of which were not so easily analyzed."

Several investigators report studies on the reversal of tropisms. Allee and Stein (3), treating may-fly nymphs with various reagents, find that all nymphs that reversed their phototaxis were either stimulated or depressed. They investigated the question whether stimulation and depression produce opposite effects in the reversal of tropisms, but in this regard the effects of different reagents were found to be contradictory. Kanda (15), studying the reversibility of heliotropism from positive to negative in *Arenicola* larvæ, used very young larvæ, finding them much more susceptible than older ones. He found a close parallelism between the efficiency of various chemicals in reversing the heliotropism of *Arenicola* larvæ and their efficiency in producing artificial parthenogenesis in sea-urchin and other eggs as described by Loeb. The only exception was that strong acids, as HCl, H₂SO₄, were found highly effective in reversing heliotropism but not effective in Loeb's experiments. Apparently many of the chemicals cause increased permeability of the cell membranes. This is indicated in some cases by the diffusing out of a yellow pigment from the cells; and in other cases by the fact that when treated larvæ are returned to normal sea water they then become negative, indicating that there has been a change in permeability. But this change in the cell membranes cannot be

the sole cause of the reversal, for the former occurs far more slowly than the latter. "As to the way in which the behavior of organisms is modified by electrolytes, we are as yet in the dark." The relative efficiencies of the several cat-ions vary as other environmental conditions are varied. "It is little wonder therefore that the order of ionic actions obtained by different investigators is not always uniform." Mast (19) studied reversal of light reaction in the flagellate protozoan *Spondylomorum*. He finds that reduction in the concentration of hydroxyl ions, increase in anesthetics or increase in temperature cause reversal from negative to positive. This reversal may occur also without any change in the environment. It is therefore probably due to some specific change in the physiological process in the organism, which may be induced by a number of different factors.

Shelford (26) finds that the minnow *Pimephales* is at first negative to alcohol, but becomes positive after a half-hour of habituation. Goldfish are positive, even from the first contact, to cocaine, alcohol, morphine, naphthalene.

Hecht (12) finds that *Ciona* reacts to light only if exposed to the stimulus for a certain length of time, the "sensitization period." This period varies inversely as the strength of the stimulating light, thus conforming to the Bunsen-Roscoe law. Placed in the dark, *Ciona* becomes dark-adapted; *i.e.*, the sensitization period decreases, but at a diminishing rate, following a logarithmic curve, and finally becoming constant. If now the animal be kept in the dark, but stimulated by light at a frequent interval (1 minute), it becomes light-adapted, the sensitization period increasing, again by a logarithmic curve.

Kjerskog-Agersborg (17) treats in general the natural history of the Twenty-rayed Starfish, showing especially that in this species one side is definitely anterior, always forward in locomotion. In righting reactions almost always the anterior end takes the initiative and the turning is toward that end.

Kepner and Rich (16) studied autoamputation of the proboscis in *Planaria*. They believe autoamputation may be brought on partly by severance of the proboscis from the nervous system, partly by disturbance of the thigmotactic relation of this organ to its sheath. The freed proboscis swims about and ingests objects, but fails to distinguish between food and non-food.

2. *Instincts and the Higher Forms of Behavior.*—The sea snail *Onchidium* is found by Arey and Crozier (4) to live in "nests,"

cavities containing a number of individuals. Those from different nests may mingle in their wanderings, but each returns to its own nest. How do they find their way home? Vision, heliotropism, wind influence, the retracing of paths, may all be excluded. If removed and placed above high-water level, where the snail never goes naturally, in at least half the trials it finds its way home. The authors are led to the provisional opinion that *Onchidium* returns to its nest by virtue of some internal condition akin to memory of the position of this nest in terms of its surroundings, but independently of guidance by mechanically directive features of the environment.

Hermit crabs deprived of their shells were presented by Goldsmith (II) with prepared sets of objects as possible new dwellings. She measured the crab's preference for an object by the amount of time spent in exploring it. Among objects of several different shapes, the crabs showed little preference. Size was found more important than form. Rough surface was preferred to smooth surface.

Some new studies of ants, especially of the larvæ, are presented by Wheeler (33). Hitherto, investigators have confined their attention too narrowly to adult ants, neglecting the larvæ. Wheeler says that like many other students of ants he formerly regarded the care bestowed by the workers upon the larvæ as evidence of affection, but these recent studies have thrown a new light upon the relationship. In many ants the worker brings solid food and places it on a certain part of the larva; the larva then pours forth a copious fluid, which digests the food extra-intestinally, and which is eagerly lapped up by the worker. The feeding of worker and larva is thus mutual. Evidence is given (p. 315) that in various larvæ there are three sources of liquid agreeable to the workers; namely, the salivary glands, the fat-body, and special exudatory organs. Mutual feeding is named trophallaxis (p. 322). The author believes that trophallaxis is a very ancient and fundamental form of behavior, and that in the course of evolution it formed the starting point for other trophic relations of ants, such as the relation to their guests, to ants of other species, and even to plants. Trophallaxis is found in many different ants, in wasps, in some other hymenoptera and in termites. But (p. 322) trophallaxis cannot be the aboriginal method of feeding; it must have been preceded, in some forms at least, by a state in which the mother fed the young without compensation.

Birds are the subjects of the six following papers. Coward

(7) tells that the Palm Swift makes a slight nest by cementing feathers on the back of a palm leaf. The eggs are cemented to the back of the nest. "The incubating parent grasps the back feathers of the nest with its claws, and presses itself against the eggs."

Craig (8) finds that the instinctive behavior of birds is characterized by a restlessness and persistency with varied effort until a certain end is reached. Such behavior is named appetite (appetite) or aversion according as the end is positive or negative, the attainment of an appetited stimulus or the removal of a disturbing stimulus. The use of the word "appetite" in the title has misled some readers into thinking that a "bodily" appetite is meant; but it was not so intended, for the birds show appetite for companion, young, nest, roost, and many other objects and situations which have nothing to do with the so-called "bodily" appetites.

Dixon (9) gives some careful observations on the little-known nesting activities of the spoon-billed sandpiper. He finds that incubation is performed chiefly by the male.

Ingraham (14) gives observations, gathered from hundreds of airmen, as to the height at which birds fly. As the airman ascends, birds mostly disappear at a few hundred feet elevation. But many statements were made as to birds seen at 1,500 to 8,000 feet and more, the maximum being 15,000 feet.

Nichols (23) presents some interesting ideas in regard to bird migration. He says that these "may be of interest to the student of fluctuating population and political complications arising therefrom as well as to the student of bird migration. The fact seems to be that in nature a species adjusted to maintain its numbers constant even though comparatively small, is in a more advantageous position than one in which there is a rapid increase of numbers necessitating migrations beyond the capabilities of the individuals." He believes that some species, for example, the red-breasted nuthatch, are subject to occasional pressure of population which is relieved by centrifugal migration from which few if any individuals return.

In another paper (24), dealing with the genus *Dendroica*, Nichols writes: "What advantage to the race can there be in the evolution of so many species of similar habits? Probably . . . a careful comparative study of the species will show that sufficient difference of habit accompanies each to make it fit a slightly dif-

ferent niche in the environment. I mention a single phase, the construction of the nest." Each of the many species of *Dendroica* builds its own type of nest and uses characteristic nest material.

The paper by Swindle (32) should perhaps be classed as philosophy rather than psychology, and in philosophy it would be placed under neo-realism. It is an essay toward a mathematical analysis of instincts into component simple reactions.

3. *Nervous System*.—Donaldson (10) finds that the rat lives 30 times as fast as man. This figure is the basis for the construction of a table of equivalent ages for rat and man. As to the brain, this table is subject to a correction of 5 days, because the rat's brain is less mature at birth than that of man. Curves drawn on the basis of this table show close correspondence between the growth of the nervous system in the rat and in man, in five prime measurements: namely, (1) increase in total weight; (2) decrease in the percentage of water; (3) accumulation of myelin; (4) maturing of the cerebellum; (5) the attainment of the mature thickness of the cerebral cortex.

Stewart (29) finds that rats starved from the time of birth show marked relative increase in certain organs, including the spinal cord, brain, hypophysis and eyeballs. He finds, however, (30) that the changes in relative size of the several organs in starved animals are closely parallel to the changes in relative size of the organs in normal growing individuals. He shows this especially for the several parts of the brain. Thus, in both starved and normal rats "the cerebellum manifests the strongest growth power," the cerebrum less and the brain-stem least.

Stout (31) using the method of brain stimulation, maps in detail the distribution of motor functions in the cerebral cortex of the cat. Stimulation of the extra-motor cortex produces some movements as perfect functionally as those produced by stimulation of the motor area, but the stimulus must be stronger or of longer duration. Subcortical stimulation usually results in activity of practically the same groups of muscles as does stimulation of the superjacent cortical point.

4. *Miscellaneous*.—The discussion on rhythmic synchronism, which has been reviewed the past two years, is continued a third year (5, 6, 13, 21, 22, 28), but without much profit.

Mast, in his address (20), begins with an historical sketch giving the erroneous impression that no good work on behavior was done in the eighteenth century. He discusses the questions whether ani-

mals have consciousness and whether they feel pleasure and pain. On the question of vitalism *vs.* mechanism he maintains and defends an agnostic position. He argues for free-will and against determinism.

Shelford (25) discusses the "threshold of development" of animals and their eggs. "There is a threshold of development for most species as regards temperature, moisture, light, oxygen, quantity and quality of food, and probably other factors."

In another paper (27), Shelford presents graphs showing reactions of *Paramæcium*, earthworm, tiger-beetle, fish, toad, horned lizard and mouse to gradients of environmental factors. Each of these animals, after an incursion into the most unfavorable environment, shows heightened sensitiveness by turning back from a lesser degree of the unfavorable factor. But this acquired sensitiveness differs greatly in duration; in the lowest animals it is soon lost, the animal again wanders into the unfavorable environment, is again rendered sensitive, and so on in rhythmic repetition.

When an ecologist sketches evolution he paints on a ten-league canvas with a brush of comet's hair. Thus, Adams (2) emphasizes that the geologic age in which we live is one in which the lands and mountains are high and the seas are deep (p. 64). These are conditions of extreme contrasts, steep gradients, rapid changes, and consequent activities and adjustments. Our swift streams are a response to the steep slopes of the land, and have kept fishes and other animals busy moving up-stream for millions of years (p. 66). With cycles of climatic changes and cycles of crustal movements of the earth, habitats move both vertically and horizontally, and animals are led about by the migrations of their habitats (p. 70-71). Evolution is a continuous activity, involving continuous interaction between organism and environment. The study of evolution should be a study of the whole process of living, including the changes in the environment as well as those in the organism.

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SENSORY PHYSIOLOGY OF ANIMALS

BY K. S. LASHLEY AND J. D. DODSON

University of Minnesota

Delays in the distribution of foreign periodicals have made it impossible to review all the material which has been published in the field of sensory physiology during the past two years. That which is accessible is included here, with the hope that the literature may be brought completely up to date in the next review.

General Studies.—Day (7) compared the normal sensitivity to contact, chemicals, and light on different areas of the bodies of tunicates to that of the same areas after removal of the nerve ganglion, and to that of the amputated siphons. The ganglion controls the coordination of movement between the siphons and its removal reduces the general excitability of the animals. There is evidence that the distance to which excitation is conducted through the nerve network is proportional to the intensity of stimulation. Similar phenomena have been reported for other organisms and should be considered in relation to the "all or none" law of conduction.

Shelford (22) describes his method of producing chemical gradients and summarizes the work done upon a number of representative species, emphasizing the application of the method to the study of modification of behavior by past experience.

The sensory functions of the posterior tentacles of marine snails, to which olfactory function has been ascribed, was investigated by Arey (3). The rhinophore is sensitive chiefly to tactile and chemical stimulation, though not certainly more so than other parts of the body surface.

Kepner and Rich (11) find that the amputated proboscis of planarians retains the power of coördinated movement and can ingest food, but in the absence of connection with the adjacent nerve ganglion it fails to distinguish between food and inedible substances.

Tactile Sensitivity.—Salkind (20) describes two types of sense organs in the claw of the common crab, *Carcinus mænas*, which, from their structure, are judged to have tactile function.

Sensitivity to Chemicals.—Orwin (14) tested the threshold of stimulation of the earthworm for a variety of salts. Stimulation by nitrates, acetates, sulphates, and chlorides is proportional to the concentration of cations. With citrates and tartrates reaction occurs when the number of free cations is too small to account for stimulation. Olmsted (13) made analyses of a large number of substances such as minced earthworms, to which catfishes give olfactory reactions and tested the reactions of the fishës to the products obtained by various methods of reduction in an effort to identify the stimulating substances. It was not possible to isolate these, but the results indicate that they are probably proteins, present in such small quantities as not to be detectable by ordinary qualitative methods. Arey (3) objects to the division of the receptors of marine invertebrates into olfactory and gustatory and points out that the evidence shows only a quantitative difference in sensitivity. He would discard the terms "smell and taste" and use only "general chemical sensitivity."

McIndoo (12) describes two types of olfactory organs present in the larvæ of the beetle, *Allorhina*. The data are wholly anatomical.

Thermal Sensitivity.—Brooks (5) records the behavior of frogs in water of different temperatures. At five degrees centigrade the animals are inactive. There is an increase in activity with rising temperature up to twenty degrees. From twenty to thirty degrees the activity is variable with no definite reaction to temperature. Above thirty degrees activity is decreased. No attempt was made to differentiate between the effects of sensory stimulation and the direct action of the temperatures upon metabolism.

Static and Auditory Sensitivity.—A relation between the functions of the otic labyrinth and the motor cerebral cortex is demonstrated by Aronevitch and Pike (4). After destruction of one labyrinth extirpation of the motor cortex on the same side causes

a reduction in the torsion of the body following the first operation. Destruction of the cortex of the opposite side causes, on the contrary, an increase in the torsion. Reymond (19) observed that fish were completely insensitive to the vibrations of a large metal plate immersed in water and driven magnetically at 1,000 d.v. per second. The vibrations were heard as sounds by the human ear under water and were also felt as internal vibration within the hollow viscera when the body was submerged.

Sensitivity to Light.—Crozier and Arey (6) describe the reactions of *Chiton* to light. The smallest specimens are negative, the largest photopositive; intermediate forms are negative or positive, depending upon the intensity of the light. In younger specimens a sudden shading is followed by a depression of the girdle. In older animals a similar depression follows an increase in the intensity of illumination, provided that it reaches the intensity of direct sunlight. These reactions are the same, whether the animals are positive or negative to light, and are the sole reaction to change of light intensity. The mechanism of orientation is thus independent of this differential sensitivity.

The whip-tail scorpion, according to Patten (15), has three sets of photo-receptors functional in orientation. These are the lateral and median eyes and a pair of sensitive cutaneous areas on the cephalothorax. Elimination of these singly and in combination indicates that all are used in orientation, that the cutaneous areas are most effective, the lateral eyes next, and the median least in producing orientation. The muscle-tonus theory of orientation is followed. Abbott (1) finds that land isopods are more definitely negative to light than are fresh-water forms. Orientation to light is direct. Wasmann (24), in a dark room illuminated by a red developing lamp, was able to move his hand very near to flies (*Homalomyia*) without stimulating them, whereas, if a faint white light was admitted to the room, the flies reacted quickly to the moving object. Allee and Stein (2) find that the rate of metabolism of the Mayfly nymph, as measured by carbon dioxide production and resistance to potassium cyanide, is reduced when the positive reactions of the insects to light are reversed by treatment with alcohol, calcium chloride, low temperature, and other agents.

Goldsmith (8) trained *Octopus vulgaris* to distinguish between colored papers or forceps. Associations of this sort were readily established and with no control tests for the influence of light intensity the results are offered as evidence for color vision. Directly

opposite conclusions are drawn by Polimanti (16) from even less evidence. *Octopus* breathes most rapidly in blue or violet light, less rapidly in red, green, or diffuse white lights. The region of greatest stimulating value lies in the shorter wave-lengths as in color-blind men; the animals are therefore color blind.

An attempt at analysis of the mechanism of photic stimulation in a tunicate has been made by Hecht (9, 10). The organs sensitive to light are located near the intersiphonal ganglion. For stimulation the light must be applied for a time which varies inversely with its intensity. This time is called the sensitization period. Following sensitization, there occurs a delay in reaction which is nearly constant for all light intensities, the reaction time. Darkness adaptation requires about two hours and is accompanied by reduced reaction time. The author attempts to explain these and other phenomena upon the assumption that light initiates a reversible chemical reaction.

Polimanti (17) compared the respiratory rate of fishes in different monochromatic lights and found that all showed increased respiration in red light, many in red and white light. These have the most disturbing effect because they are unfamiliar to the animals which live in a green or greenish medium. Polimanti further concludes that his observations show that the fishes are color blind, but the reviewers have been unable to follow the logic of this conclusion. White (25) trained mud minnows and sticklebacks to leap from the water for food when colored papers or filters were displayed above the aquarium. The minnows learned to discriminate between all colors presented; the sticklebacks discriminated between red and green but not between yellow and blue. The experimental methods were so crude as to make it doubtful whether the results have any bearing upon the existence of color vision in the fish.

Redfield (18) reports in full the studies of the melanophores of the horned toad, a preliminary account of which has been reviewed. Direct action of light produces expansion of pigment, its absence contraction. High temperature produces contraction, low expansion. Light effects dominate at mean temperatures while heat dominates at extreme temperatures. A dark substratum produces expansion, a light contraction. Injurious stimuli produce contraction and this is correlated with the activities of the adrenal glands.

Slonaker (23) gives a very extensive and careful description of

the anatomy and histology of the eye of the English sparrow, with physiological deductions. Accommodation results from contraction of the striated ciliary muscles which reduce the equatorial diameter of the eye ball. The resultant pressure forces the lens and cornea forward, increasing the length of the eye and focusing near objects. Experiments were carried out to determine the possibility of binocular vision. The birds respond to bright light coming from directly in front. Diffuse light from white cardboard produces reactions only when 24 to 26 degrees from the median plane. The eye seems capable of rotation through 40 degrees. These observations are only incidental to the anatomical part of the work; the paper lays a firm foundation for later physiological studies and should serve as an inspiration to further investigations of vision in birds.

Sheard and McPeck (21) find that with exposure to monochromatic light continued for several seconds the excised eye of the dog shows gradual alterations in electrical potential. The longer wave lengths produce increase in positive electromotive force, the shorter negative. The authors construct from rather inadequate data curves showing reversible chemical action corresponding to the requirements of the Hering theory of color vision. Since the best evidence that we have indicates that the dog is almost, if not completely, color blind, this agreement with the expectations of the Hering theory is rather surprising.

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HABIT FORMATION AND HIGHER MENTAL CAPACITIES IN ANIMALS

BY JOHN F. SHEPARD

University of Michigan

One sometimes wonders what animal would make comparative psychology possible if the rat did not exist. In earlier work, such

as that of Thorndyke, the cat held its place; but in the present review, of sixteen reports concerned in one way or another with learning, thirteen, including all but one of the major articles, make use of the rat.

Peterson publishes two reports (14, 15), both based upon the same work with rats, and attempting to analyze the processes concerned in learning the maze. In this work, two pairs of mazes were used. The two members of the easier pair were alike except that all blind alleys in the one member were relatively shortened compared with the other. The two members of the more difficult pair were alike except that in the one a part of the blinds were relatively shortened, in the other the remaining blinds were relatively shortened. The rats were divided into groups, and each group learned one member of each pair of mazes, so that each maze was learned by a previously untrained group and also by a group that had learned one of the other pair. Peterson tabulates the results in a way to bring out several uniformities. As learning progressed, there was a rapid decrease in the proportion of returns to forward runs (toward the food box) upon emergence from a blind alley. In cases of shortened alleys which are eliminated more rapidly than the longer ones, returns are eliminated still more rapidly. Any given alley is eliminated more easily when shortened than when used full length. In the process of elimination of a cul de sac, one finds a transition from complete entrances to only partial entrances and then only starts into the ally or hesitations. Blinds near the beginning were entered more frequently and were more difficult to eliminate than those nearer the food box; the percentage rate of elimination was greater in the latter. The percentage of returns to total entrances in the first two trials was greater in alleys at the beginning than in those at the end. Returns as well as entrances persisted longest in the case of alleys farthest from the food box. In the larger maze, returns from shortened alleys in the first two trials were the same as from the longer alleys; in the smaller maze returns were distinctly less from the shortened alleys. Returns by untrained rats in the first two trials in the larger maze were about 40 per cent. of the entrances. There is probably an equal chance of return or forward run at first, but learning soon modifies the matter. Rats that had been trained in one of the other pair of mazes made less returns. In training, an animal rapidly gains the ability to avoid returns and carries this over to other mazes.

Peterson thinks the laws of frequency and recency are entirely

inadequate to explain several of these facts. In his second article, he tabulates entrances to blinds, returns, etc., as though determined by flipping coins, on the basis of pure chance. This shows why we find more entrances and more returns near the beginning than near the end. On the basis of chance, the number of times an animal will pass a given blind, with or without entrance, in a forward direction will exceed the number of times he will enter it from both directions combined and will still more exceed the times he will pass in a return direction. The difference, or excess, is absolute, and therefore, greater relatively in the case of the alleys near the food box. Peterson believes this explains the learning progressively backwards from the food box. The explanation is limited however by the fact that frequency alone would tend to stereotype the first acts in the maze, and by the fact that his rats did not follow expectations based on frequency and recency in their learning. Other factors are necessary to account for the selection that makes learning possible. Here Peterson brings in his principle of completeness of response. The animal as a unitary organism is reacting to a whole situation. The organism is under the influence of a great number of stimuli from inner organic processes and its own responses and from external conditions. These occur in series, but there are cumulative effects which hold over into the final results, and all acting together are supposed in some way to control the associations formed, to direct the energy of the animal into the "most consistent channels," so that the "consistent acts" survive in time over all others. Visceral factors are thought to play a prominent part in this process of selection. The holdover impulse to take the other path on passing any junction, making the activity incomplete and hesitant is another specific factor emphasized.

Carr, in a series of three articles (2, 3, 4), reports the results of experiments concerning the dependence of maze habits on a variety of sensory conditions. Most of the mazes used were of the usual type, almost watertight and covered by closely fitting glass. In some experiments, a small enclosure made of several thicknesses of canvas was used over the maze. The canvas was stretched over the top and hung loose at the sides, so that any side could be raised at will. An electric light was suspended at the top for illumination, or, in other cases, only the daylight passing through the canvas was used.

Carrying the rats by a variable route from the cage to the maze produced no effect on either normal or blind animals. The same

was true of variations in the method of handling, introducing conditions of dizziness, etc. After the maze was learned, the cage was moved to a different position in the laboratory, but without changing its original cardinal orientation. Normal rats, blind rats and anosmic rats were all more or less affected. Covering the living cage with canvas, on the other hand produced no effect. The cage was rotated with reference to the cardinal directions but kept in the same location. Normal rats were considerably disturbed in runs of the maze if both maze and cage were uncovered; the effect was doubtful if either cage or maze was covered. Blind animals were more affected than the normal, anosmic animals were less affected than normal. The degree of hunger affected all rats. Cleansing the maze after it had been learned disturbed normal and blind animals, but not the anosmic. After the maze had been learned, the canvas enclosure was placed over it; there was no effect. Two other groups learned the maze with the canvas enclosure over it. In the first place, the enclosure was partly open, giving poor daylight illumination. Removal of the canvas then caused no change in behavior. In the second place, the electric light was used for illumination during learning. Removal of the enclosure then affected part of the rats. Blind animals were not disturbed. If the maze was learned with the canvas covering in place and with only the reduced daylight illumination, the normal rats were then disturbed by turning on the electric light. Another group learned an uncovered maze placed next to an open window. The window was then covered. Most animals (normal) were disturbed. If the experimenter maintained a constant position with reference to the maze during learning and then changed position to the opposite side of the maze after a rat was put into the maze, normal animals were disturbed in greater or less degree, blinds were not. The maze was learned with the canvas covering in place, and illuminated by the electric light. Rotation of the enclosure alone then produced no effect. When both maze and enclosure were rotated, however, the animals were somewhat disturbed, and did not adapt sufficiently to prevent similar disturbances in successive rotations. Blind rats showed more effect in this test than the normals. If the maze was learned with the canvas covering open on one side, and without the electric light, and if the open side was then closed and another side opened, all rats, normal, anosmic, and blind were moderately disturbed. Similar disturbance was caused to normals by moving the uncovered maze, after it had been learned, to a new

position in the laboratory, but without changing its relations to cardinal directions. This test had no effect upon the blind animals. The maze without canvas covering was learned and then rotated. All normals were markedly confused, but were able to adapt to successive rotations and finally to eliminate the disturbance. If the room was darkened by means of window shades, there was less disturbance. Blind animals were also confused, but to a less degree than the normals; they did not adapt so well as normals. A sideless maze was learned by normals and then rotated and the confusion was much greater than with the standard maze. There was even disturbance when a maze without culs de sac was learned and then rotated. Rotation of a standard maze from day to day during learning interfered seriously with learning by normals, but had less effect with blinds. A heterogeneous environment was better than a uniform environment for learning in normals.

The effects of these various tests on different animals were not at all uniform. In nearly every case some animals were immune to the altered conditions. A given animal might be affected in one trial and not in another, or disturbed by one test and not by another. Blind rats were individually more variable than normal, and, when affected by the alterations, were liable to be more confused than normal; they were also less liable to adapt to the alterations than normal. Vision, on the whole, aided in learning the stationary maze. The blinds were not so much affected by rotating the maze from day to day during learning as the normals. The normal rats were susceptible to the alterations in a greater per cent. of the cases than the blind; they were more sensitive. Carr thinks this was due to a distractive effect of visual changes rather than to any directive force of vision in the maze habits. He explains the advantages of vision in the rat as due to its tonic and stimulative effect upon organic processes, and consequent promotion of learning ability, together with a deleterious effect of the operation in case of the blind.

Carr also reports an experiment on the habit of simple alternation in rats (1). In his apparatus, two alleys led from in front of the animal to a food box and the exit from either to the food box could be blocked. The entrances to the alleys were six inches apart and, as the animal approached them, first in one trial the right, in the next trial the left was the one with open exit to the food. The animal's problem was then to learn to go to the alley entrances alternately in successive trials. All animals used were able to form the habit. Variations were introduced to determine

what cues the animals used in controlling the successive reactions. They were placed in the starting-box in different positions, even in positions the reverse of that usually used in the training, and they were handled at times by a different operator. Reversing the positions and handling by another operator disturbed part of the rats; but these novel conditions were quickly adapted to and on the whole the animals continued to make progress in spite of the variations. Making the correct initial choice of each day's work was the most difficult matter, and this should not be true if the cue were given by position in the starting box. All these facts indicate that the rats were not reacting to the way they were handled. The normal time between trials during learning was 16.5 seconds. After learning, this time could be increased to about 60 seconds before the habit began to fail. If, after a few seconds to eat, the animals were taken out of the food box and placed on the table under novel conditions so that their motor attitude was lost, then replaced in the starting box after 50 seconds, they still made about 70 per cent. correct reactions. We conclude that the rats are controlled in part by sensations from the preceding act, in part by the distinctive motor attitude which was normally held during delay. The rat may then form an association between a sensory stimulus and an act, which are separated by an interval of 16.5 seconds, and, after learning, this interval may be lengthened to about 60 seconds before the habit fails. (The reviewer would suggest that the learning may be assisted, so far as the evidence shows, by the motor attitude which bridges the gap.) The evidence indicates that some animals depend more on the motor attitude, others more on the sensory results of the preceding act.

A most interesting paper is that by Thompson on learning in the snail (16). The snails were tamed before the experiments began, so that they could be moved from dish to dish and worked upon without retracting and expelling the air from the lung. When food is applied to the mouth parts of such a snail, one obtains a response consisting of a series of movements which may be counted and timed. This response probably only occurs, at least for practical purposes, as a result of external stimulation. The normal frequency and range of response were first determined. An apparatus was then constructed by means of which a uniform pressure could be applied to the foot at the same time the food stimulus was applied to the mouth parts. Tests by the pressure alone showed that it brought out no responses. When the pressure and food

stimuli were applied simultaneously, there was at first an inhibition of the normal responses to the food. There was then a gradual rise of the response curve, though, on the whole, the average percentage of responses and the average number of reactions (movements) per response was less than in the normal food series. The individual reaction was accelerated. After this training, the pressure stimulus, which formerly had given no response, was applied alone and responses were obtained and continued to be given in trials extending over a period of 96 hours after learning; then suddenly ceased. Training was then renewed and responses obtained with food and pressure approximately equal to the normal with food stimulus alone. The experiments show definitely that the animal can adapt (becoming tame, disappearance of inhibitory effect of pressure stimulus) and can form simple associations between the pressure and the food stimulus—response reflex. The snails also formed an associative connection between a tactile stimulus and an electric shock which was given soon after the tactile stimulus unless the animal turned and took the alternative path in response to the stimulus. The tactile stimulus alone did not lead to turning, but the animals learned to turn in response to it in a large part of the cases. They did not succeed, however, in learning a simple labyrinth including one choice with a reward for the successful choice. Also they did not form a connection between a weak tactual stimulus and a much delayed shock, but the effectiveness of the tactual stimulus as such was doubtful in this case.

Two papers are concerned specifically with the transfer of training. The first is by Wylie (21) and deals with transfer in a relatively simple situation. He wishes to keep the response constant and vary the stimulus under proper control. A stimulus, which had been shown to be the dominant one controlling a given response, was removed, and another, which had not been present, was substituted for the first so that the second became dominant instead of the first. Rats were used in the experiments. The first part of the experiment was not successful for the purpose, probably on account of inaccurate localization of sounds under the conditions, and need not be described in detail. We may note, however, that the rats could learn to use movements of the experimenter, probably sensed visually, as cues to control acts. In the apparatus used in the second part of the experiment, two alleys were open to the animal and led to a food box, but the exit from either to the food could be closed. Lights were placed at conspicuous places in

each alley and could be separately controlled. Electric sounders were similarly used, and metal strips on the bottom made it possible to give electric shocks whenever desired. The animal was released and allowed to enter either alley. In part of the trials he was then given a stimulus (light, sound, or shock as the case might be) in response to which he was required to turn back in order to obtain food through the other alley. In the remainder of the trials, he was allowed to proceed to the food through the first alley. Rats learned the act in response to one stimulus (for instance, light) and were then transferred to the use of one of the other stimuli (for instance, sound or shock) with or without an intervening period in which the first and second stimuli are given together. The original learning curves in the case of each stimulus showed usually a period of no learning followed by a sudden jump to practically perfect response. The period of non-learning might be due to lack of attention to the stimulus (probably true with sound and light) or to emotional disturbance (as in shock). The non-learning period was longer and the curve was more irregular in the case of sound than with the other stimuli. The greater difficulty in controlling sound from external sources probably contributed to this. The writer thinks these learning curves are the first animal curves of this nature to be reported. The reviewer can see no essential difference between them and some of Thorndyke's curves from monkeys except that the conditions with the monkeys were more difficult. In all cases, after the response had been learned in connection with one stimulus, it could be relatively easily transferred to connection with either of the other stimuli; and this process was nearly always helped by putting in an intervening period in which the first and second stimuli were used together.

The second transfer article is by Webb (19) and is concerned with transfer in a relatively complex situation, maze learning. Rats and humans were used. A series of the usual form of mazes were used with the rats; similar patterns of pencil mazes were used with the humans. In the first experiment, five groups of rats learned a maze *A*, following which one group learned *B*, another *C*, another *D*, another *E*, another *F*. Similarly, three groups of humans learned maze *A* and then each group learned one of *B*, *C*, or *D*. In the second experiment, five groups of rats learned *B*, *C*, *D*, *E*, and *F* respectively, and then all learned *A*; three groups of humans learned *B*, *C*, and *D* respectively, and then all learned *A*. Transfer effects were measured by trials, errors and time. It was found that

the transfer was positive in all cases. However, transfer may be complex, showing both positive and negative elements. Thus mazes *A* and *F* were so related in one portion that learning *A* interfered with *F* in that portion, though the total effect was positive. In the first experiment there was a positive correlation between the degree of transfer and the difficulty of the second maze as measured by learning of untrained animals. In the second experiment there was a positive correlation between degree of transfer and the difficulty of the first maze as measured by learning of untrained animals. But the reviewer wishes to insert that the differences of the compared mazes were greater where transfer was from the single maze to the compared mazes, than when transfer was from the compared mazes to a single common maze. There was a positive correlation between the amount of transfer and the similarity of the two mazes as rated by a number of individuals. Transfer effects were similar for the human and animal groups. There was a positive correlation between the results according to any two of the three criteria of measurement; it was highest between time and errors. The locus of transfer is on the average confined to the first five trials. Transfer on the whole exerts a somewhat greater effect upon the tendency to retrace than upon the tendency to enter blind alleys.

After learning maze *B* and then *A*, animals were required to learn *B* again. This second learning of *B* was compared with the results with a group which learned *B*, then waited during the interval the first group was used on *A*, then relearned *B*. Likewise *C—A—C* was compared with *C—C*, etc. Likewise *A—B—A*, *A—C—A*, etc., were compared with *A—A*. There was no correlation between learning and relearning records of different individuals. The maze which required the greater effort to master was retained longest. There was greater disintegration of the first maze habit where a second maze was interpolated than was due to a mere lapse of time. Some subjects were affected by the retroactive influence, others were not; humans were affected more than rats. The easier is the interpolated maze, the greater is the resulting negative retroaction. There is a negative correlation between positive transfer from the first to the second maze and the negative retroaction of the second upon the first. Such retroactive effects are explained on the basis of a transfer from the second to the third learning.

Dodson (7) studied the relative values of reward and punishment in forming habits. He used rats as subjects. In the appa-

tus, as the rat was placed in the entrance box, it faced a light and a darkened electric box. In one set of experiments, if the animal chose the light box, it could pass through and back to the nest; while if it chose the darkened box it was given an electric shock after entering and was forced to return through the entrance box and thence through the light box to the nest. In the other experiment (that with reward), if the subject chose the light box, it could pass through and to the food; while if it chose the darkened box, it found the door closed and had to return through the entrance box and thence through the light box. The usual precautions were taken against place associations. Four different strengths of shock, 60, 75, 115, and 150 units respectively were used; also four degrees of hunger produced by 24, 31, 41, and 48 hours respectively without food. With each stimulus there is a most favorable intensity: the stronger the stimulus, the more vigorous the activity and better the learning up to a certain point. If the strength of shock passes beyond this point, learning is interfered with by distracting excitement. If starvation is lengthened beyond the most favorable time, the animal probably has sensations of hunger but is not eager for food. The most favorable intensity of shock under the conditions was found to be 75 units. In the case of hunger, the most favorable period of starvation with animals 78 days of age was found to be between 41 and 48 hours. The shock, under the conditions of this experiment, was more favorable to learning the connection than was hunger.

Watson (18) wished to test the efficiency of satisfaction-dis-satisfaction as a selective agent in trial and error learning. He tried to find whether they work by a retroactive stamping-in or -out effect upon immediately preceding activities. He constructed a problem box in which a food receptacle was located and in which the animal (rat) was confined after he had succeeded in entering. The food receptacle was covered by a perforated lid which could be held in place or removed by the experimenter at will. One group of animals learned the box in the usual way, obtaining food immediately on entering. In the case of another group the lid was held on so that they did not get the food until 30 seconds after entering, during which interval, of course, the animal went through many and varied activities. In spite of this the curves of learning of the two groups were alike. Watson is inclined to conclude that the satisfaction of obtaining food was not a selective factor. Why, he asks, should not the later random movements made after the animal

entered the box be the activities to be benefited by the better condition of the organism?

Dunlap (8) suggests that possibly pleasure-displeasure are connected with changes in internal secretions, either from a gland or glands or from some tissue whose primary function is not secretion. He further suggests that an activity may leave some parts of the nervous arc in such a chemical condition that these secretions a little later may "fix" the arc: hence selection by results in trial-and-error learning.

Lashley (11) used rats as the subjects and the circular maze as the problem to study the effects of strychnine and of caffeine upon the rate of learning. The drugs were given by subcutaneous injections. Some animals received injections of water, some received strychnine sulphate, some received caffeine. Strychnine caused an acceleration of learning if given in large enough doses to cause observable alterations in muscular tonus, tremor, etc. Caffeine regularly interfered with learning. The movements of the strychninized rats were retarded, the movements of the caffeinized rats were accelerated compared with the normal. The caffeinized animals often seemed in a high state of excitement. After the habit had been perfected, strychnine increased and caffeine decreased the accuracy of performance. The advantageous effect of strychnine is probable correlated with reduction of synaptic resistance.

Lashley and Franz in two papers (9, 12) report the results of unusually valuable work on the relation of habit formation and cerebral (more especially cortical) functions in the rat. Two sorts of apparatus were used for the tests of habits: one was a simple maze with one choice; the other was a problem box which had to be opened by tilting an inclined plane on the top of the box, then entered through the door on the side. It was found that complete destruction of the cortex above and in front of the knee of the corpus callosum did not interfere with retention of the simple maze habit which had been learned before the operation. In fact this habit persisted even when, in addition to the frontal poles, a great part of the dorsal convexity was removed, and apparently no part of the cortex in front of the caudal end of the corpus callosum and above the level of the floors of the lateral ventricles is concerned with the retention of this habit. One animal with the frontal poles and nearly all the dorsal convexity (including all that is directly excitable and usually classed as motor) destroyed, and with the right corpus striatum and fornix degenerated with permanent

spasticity on the left side, still succeeded in learning the simple maze in a manner nearly normal. Another with "destruction of all the cortex above and in front of the corpus callosum and lateral to the left lateral ventricle with partial degeneration of the right and complete degeneration of the left caudate nuclei; destruction of the fornix and injury to the thalamus on the right" was unable to learn the maze but did form simple habits of stereotyped response. A simple habit may then be learned after destruction of all the frontal, temporal, parietal, and much of the orbital surface of the cortex, leaving only those portions usually said to be visual, auditory, or olfactory in function. In the case of the problem box, on the other hand, complete destruction of the frontal poles causes loss of the habit, though the temporal and parietal areas may be destroyed without injuring the habit. Some considerable portion of the frontal poles must be preserved, but it may be any given portion; no particular portion is necessary. It seems that such a habit is mediated not by a single chain of neurones, but by a whole set of arcs, using all parts of the frontal poles, and the preservation of any considerable part is sufficient to retain the habit. The problem box habit was reacquired by some animals, however, after nearly or quite complete destruction of the frontal poles.

Kempf (10), experimenting on six monkeys, found two which showed decided right-handedness, one which showed decided left-handedness, and three which showed less definite left-handedness. Each was trained by allowing it to reach for food and preventing it getting the food unless the hand opposite to the normal tendency was used. All learned the new habit, and all but one retained it after three or four months without intervening training in the test.

White (20) found fish able to form associations with color stimuli, jarring the tank, and movements of the investigator; but the animal was not able to learn to discriminate patterns. The associations of the fish, according to her results, are fairly permanent, but are simple, are not easily modified when once established, and do not allow fine discrimination.

Yoakum (22) describes similar cases of positive response to a lighted area by a cow and by a man. The response was entirely automatic. An emotional state was the result when the smooth response was interrupted by an avoidance reaction in the man.

Marshall (13) objects to Watson's behaviorism and thinks it simply abandons the study of psychology altogether. He also objects to Bode's treatment of consciousness. De Laguna (5, 6)

criticizes the dualistic position of Washburn's animal psychology with its attempt to use experimental facts to infer by analogy the presence or absence of peculiarly conscious states; though, fortunately, the treatment of actual scientific problems and results by the "dualist" and "behaviorist" differ for the most part only in the mode of formulation. Such mechanical behaviorists as Bethe are also criticised and the writer wishes for a proper recognition of the fruitfulness of introspective investigations without the extreme of dualism. Washburn replies (17), but such articles cannot well be presented in a review and those interested in the general theoretical aspects of the subject should read them.

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SPECIAL REVIEWS

Orthogenetic Evolution in Pigeons. Posthumous Works of C. O. Whitman. Vol. 3, *The Behavior of Pigeons.* (Ed. by HARVEY A. CARR.) Washington: Carnegie Institution of Washington, Pub. No. 257, 1919. Pp. 161.

The "Behavior of Pigeons" bring together Whitman's observations on the instincts and habits of these birds. The material is grouped into three main divisions: the reproductive cycle, homing and other instincts, and instinct and intelligence. The first division includes nine of the thirteen chapters in the monograph. This division includes a reprint from Whitman's Woods Hole lectures and also an excellent editorial summary. The nature and interrelationships of copulation, nesting, egg-laying, incubation and feeding the young are presented in detail. Of these the first three may be absent without inhibiting the last two. Feeding however does not occur without previous incubation. Egg-laying and possibly display are the only elements of the cycle that necessarily distinguish the behavior of the two sexes. Valuable data on the synchronization of behavior in the sexes are given.

Drs. Craig and Riddle offer a chapter summarizing the work on voice and instinct in pigeon hybridization. The chief conclusion is that the crossing of two species gives intermediate voice behavior. The chapter is admittedly fragmentary, yet even so note should have been taken of the possible effects of social influence during the rearing of the birds. The data do not extend beyond the F_1 generation.

The instinct of homing is regarded as an outgrowth of the social (gregarious) instinct and of the love of home possessed in some degree by all pigeons. Specific cases of return are explained by the visual landmarks theory. The behavior characteristic

that is inherited in the homer is "the way to learn" not the "want to find its way." Whitman and the editor deny a unique and single homing impulse. The latter regards homing as a series of negative responses to present environmental factors. "The bird reacts negatively to the present situation rather than positively to the home environment. The motivating stimulus is hunger not food; loneliness, not companionship; fear not satiety; etc." To admit this is not necessarily to deny a dominating impulse. All complex instinctive responses such as mating, nest building, incubating, and migration are composed of minor responses each having its own impulsive side, and yet the evidence indicates that the whole activity is held together by a dominating impulse, blind but effective, which will appear from time to time making the animal "restless" and finally leading to action. Nest building is not a negative response to a barren cote, nor is mating a negative response to celibacy. These are reactions dominated by impulses and carried out in ways modified by various minor external and internal conditions. So where the response consists in leaving a locality, nothing is gained for explanation by terming the behavior a negative or a positive response as opposed to behavior occasioned by an internal condition. No influence of the distant home (the absent external stimulus) need be assumed. The homing tendency would thus be of a kind with the migratory tendency (but probably less instinctive) dominated by a major "drive" and susceptible to minor variations and even to failure. Hunger and attachment to the nest might well aid the major tendency, but this would not disprove the existence of the latter. While the homing tendency is undoubtedly derived from forms of behavior common to all pigeons, it must be remembered that after all homing in the *homers*) has taken on a peculiar character. To the extent that it represents an integrated form of response it will be controlled by an impulse larger than the minor impulses correlated with the minor actions. So a hunting dog may respond in a manner that might be described as negative or positive to certain odors, but his whole behavior will be dominated by a major "drive" absent in other dogs.

Whitman regards intelligence as appearing with the *possibility of choice* in behavior rather than with the capacity to profit by experience.

The editorial work has been done with care and nice judgment. There is no confusion between the views and data of Whitman and

the comments by the editor. The scientific world may well applaud the labor which has made Whitman's observations available.

WALTER S. HUNTER

UNIVERSITY OF KANSAS

Forced Movements, Tropisms, and Animal Conduct. J. LOEB.
Philadelphia: Lippincott, 1918. Pp. 209.

The present book is volume I of a series of monographs on experimental biology edited by J. Loeb, T. H. Morgan, and W. V. Osterhout. It gives what is perhaps Loeb's best account of his well known views on animal behavior. An appendix lists 554 references representative of the field discussed. Nineteen chapters present a combination of fact and theory concerning the various tropisms, the Bunsen-Roscoe law as applied to heliotropism, instincts, and memory images. The account is neither so extended nor so adequate with reference to experimental facts as other available books.

Loeb's present account emphasizes the following important factors: symmetry relations on the surface of the body and in the nervous system; the non-purposeful character of behavior; the view that tropisms are reactions of the organism *as a whole and not cases of local action*; the necessary physico-chemical nature of explanatory theories; and finally the constant action of the stimulus. From the forced movements due to nerve lesions which change the tonus of symmetrical muscles, the author turns to similar phenomena in galvanotropism and heliotropism. Direct proof of the muscle tension theory of heliotropism is offered based upon Holmes' work on *Ranatra* and Garrey's work on the robber fly *Proctacanthus*. The latter experiments had indicated forced movements due to blackening various portions of the insect's eyes. In using Holmes' material the reviewer feels that Dr. Loeb has left unutilized some of Holmes's data that are less harmonious with the tropism theory. Further experimentation is quoted tending to show the validity of the Bunsen-Roscoe law and the consequent constant action of light; a heliotropic mechanical dog invented by J. H. Hammond, Jr., is described; and geotropism is explained on the basis of a change in chemical action due to the natural action of gravity upon the distribution of materials.

Loeb's strictures on those biologists and psychologists who do not accept his type of mechanical explanation are severe, but harmless. When, however, it is stated that the only method for studying

"associative memory" so far devised that meets the requirements of quantitative science is that of Pawlow, the psychologist can only deplore the fact that the writer's prestige may carry conviction in the non-psychological reader. A scientist usually errs and lays himself open to ridicule if he departs from his own field to criticize the work of others whose literature he has not taken the time to master. The physico-chemical aspect of Loeb's theory of animal reactions, as an ideal to be striven for, is acceptable to a great majority of biologists and psychologists. As yet only the experimental facts are wanting to complete the picture.

WALTER S. HUNTER

UNIVERSITY OF KANSAS

The Elementary Nervous System. G. H. PARKER. Philadelphia: Lippincott, 1919. Pp. 229.

In this number of the "Monographs on Experimental Biology" the nervous system is treated under three topics: Section I, the Effector Systems, four chapters; Section II, Receptor-Effector System, eight chapters; and Section III, Central Nervous Organs, to which the concluding chapter is given.

Professor Parker defines the elementary nervous system as "that type of nervous system in which the structural and functional elements present themselves in their simplest states." It is in reality the neuro-muscular mechanism that constitutes the subject matter of the book.

In sponges the author finds the common flesh contractile although the body of the sponge as a whole does not move in response to any form of stimulation and in the chief activity of the animal, namely, the production of currents of water, neuro-muscular action is not an active factor. The control of water currents is effected by the contraction of a sphincter of myocytes around the oscula, which can be stimulated in several ways, particularly by the movements of water over the body surface. To substantiate this interpretation extensive experiments are described. The closure of the oscula can be stimulated in running sea water containing small amounts of ether, chloroform, strychnine, cocaine, and in deoxygenated sea water, while changes in temperature affect the oscula somewhat. The primitive muscle cells which produce this response are regarded as independent effectors.

Since mechanical injury to a finger will stimulate a response at an appreciable distance, the author considers that there is in

sponges an elementary form of conduction or sluggish nerve transmission. This conduction which is similar to that which occurs in protozoa is not a sign of nervous tissue but may be considered the "germ from which nervous transmission has grown."

Owing to the imperfect transmission of stimuli, there is almost complete absence of coördination in the sponge. "Sponges may be said to have among their cell combinations effectors, but no receptors or adjustors. They mark the beginnings of the neuromuscular mechanism in that they possess the original and most ancient of its constituents, muscle, around which the remainder of the system is supposed subsequently to have been evolved."

Examples of independent effectors in higher animals are found, for instance, in the pupil of the eye, which contracts under bright light without nervous stimulation, and in the primitive heart beat of vertebrates and tunicates and in the amnion of the chick embryo. While in the former cases originally independent effectors become secondarily complicated with nervous function the muscle cells of the amnion must be regarded as purely independent effectors.

The question of neuroid transmission in higher animals is taken up in Chapter 5. Ciliary coördination can be explained only on the basis of such transmission. The structure and behavior of sea-anemones is reviewed extensively. The author holds that the actinian and vertebrate nervous systems have one striking similarity, namely, the reflex arc, in which a sensory neurone connects with the motor neurone, which in turn stimulates the muscle. The sea-anemones are far in advance of sponges in respect to their effector system, having mucous glands, ciliated epithelium, nematocysts and muscles. The mucous glands and cilia respond only to direct stimulation.

The nervous systems of jelly fishes is a nerve-net to which has been added receptors of increased sensitivity, the marginal bodies. "As a definite type of structure the nerve net has been recognized for only a few years." Its most striking features are its autonomy of response, as illustrated especially by the movements of the foot of sea anemones, and its diffuseness of transmission. In vertebrates the submucous and myenteric plexuses of the intestine are nerve nets made up of protoneurones, which are under the influence of the vagus and sympathetic. Beginnings of polarity occur in nerve-nets of both higher and lower forms but polarity is characteristic particularly of the synaptic nervous system.

The feeding responses of actinians, described at length, are

all strikingly local and do not emanate from a center of control. They "emphasize the relative independence of parts rather than the action of the organism as a whole." All other phases of behavior in actinians are in response chiefly to light and darkness and to water currents as opposed to the oxygen content of the water. Contrary to the view of Bohn rhythm in response does not persist for any perceptible period in the absence of external stimulation.

Although there is in sea anemones a perceptible modifiability in behavior this lasts for only a brief period and the behavior is determined almost wholly by the immediate environment. "To speak of the sea-anemones as having a psychology is to use this term in the very broadest sense."

As representative of the Hydroids *Coryomorpha palma* is reviewed in great detail with reference to both structure and behavior. The muscular system of this animal consists of the longitudinal muscles of the stalk, of the proboscis, of the proximal and distal tentacles, and the circular muscles of the stalk and of the proboscis. Experimental evidence is given at length to support the conclusion that all the circular muscles are independent effectors, although the circular muscles of the proboscis may be "under certain circumstances somewhat under nervous control," and that the four sets of longitudinal or ectodermic muscles are under the control of the nervous system, which consists of "ectodermic sense-cells and a nerve-net." Conduction in this system is "limited to the ectoderm and is diffuse, except that in the stalk longitudinal transmission predominates much over transverse." Although rather specific reflexes occur in response to comparatively localized stimulation "the neuromuscular organization of *Coryomorpha* is most diffuse and contains nothing that can be rightly looked upon as centralized."

In the last chapter, which is in fact the "conclusion" of the work, the author applies the principles of the "elementary nervous system" to the interpretation of "Central Nervous Organs," of which, he believes, the synapse is probably the "most general and definite criterion."

The author has given in detail the results of his own investigations and those of his students upon the problem of nervous functions and structures in lower animals, and has correlated this work in a helpful manner with the work of other authors. A useful bibliography is appended. The writer regrets, however, that the author did not extend his discussions, at least briefly, to

neuroid structures in protozoa and to physiological gradients in lower animals, which, to some biologists at least, appear to be fundamentally allied with the problem of the elementary nervous system.

G. E. COGHILL

UNIVERSITY OF KANSAS

The Fundus Oculi of Birds Especially as Viewed by the Ophthalmoscope: A study in comparative anatomy and physiology. C. A. WOOD. Chicago: Lakeside Press, 1917. Pp. 181.

The great variety of structures presented by the eyes of birds with the diverse functions indicated by the habits of their possessors, makes the study of vision in birds one of the most promising fields for the solution of the general problems of the physiological anatomy of the eye. Investigators in many other fields, also, may look to the study of avian vision for valuable material. The evolutionary theories of sexual selection and mimicry will stand or fall with the analysis of visual acuity of birds; an understanding of such instinctive activities as homing and, at the other extreme, of cerebral function in binocular vision would be greatly furthered by investigations of the powers of sight in birds. With such problems in mind I took up Dr. Wood's monograph on the ocular fundus of birds with the feeling that here was opportunity for a real advance in the science of avian vision. But after a careful reading of the volume I am left with much the same feeling of hunger that follows a boarding-house chicken dinner; the portion was large, but it contained surprisingly little meat.

After a brief introduction the author offers a summary of the literature on the anatomy and physiology of the avian eye. This is followed by chapters dealing with the collection of material and methods of making ophthalmological examinations of the eyes of living birds. Only methods of viewing and picturing the eye-ground are included, although this part occupies nearly one third of the volume. A chapter is devoted to the effects of domestication with the conclusion that "domestication or prolonged captivity brings about abnormal changes in the eye-ground of birds." This statement is of practical importance for the investigator of avian vision since our studies of visual reactions must be carried out with domesticated species or with animals that have been long enough in captivity to permit of taming. The evidence advanced in support of the statement, however, consists of a few isolated cases of

cataract, etc., in captive birds, and a general greater variability in the coloration of the retina in domesticated species.

The remaining portions of the book are devoted to descriptions of the ophthalmoscopic appearance of the fundus of the eyes of type species of most orders of birds. The descriptions include pigmentation, visible nerve fibers, the form and position of the pecten, and, sometimes, of the macula. The descriptions are illustrated by beautifully executed colored plates. As these seek to represent the exact appearance of the eye as viewed by the ophthalmoscope they lack the clearness of detail, especially in the pecten, which is evident in a good dissection. Further, as they are not drawn to scale and include only a small portion of the eye-ground it is impossible to determine proportions or the exact relative positions of the structures shown, although Dr. Wood maintains that the chief advantage of ophthalmoscopic examination over dissection lies in the possibility of accurate determination of proportions. A similar fault appears in a series of 47 diagrams of the position of the pecten and macula in different birds; a single outline is used for all, even such divergent eye-forms as those of the owl and swallow.

Dr. Wood seems to have given the application of ophthalmoscopic methods to the study of comparative anatomy a thorough test. The sole advantage of its use seems to be the observation of the true colors of the fundus. Whether or not these have any more functional significance than skin pigmentation is a matter for research.

K. S. LASHLEY

UNIVERSITY OF MINNESOTA

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THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

GENERAL PSYCHOPATHOLOGY

BY E. E. SOUTHARD

Massachusetts State Psychiatric Institute, Boston, Mass.

The reviews and summaries of this number of the BULLETIN have always in the past three years dealt with general or theoretical psychopathology, familiar to us in the portions of psychiatric books termed "general," for example, in that portion of Kraepelin's well-known textbook termed "Phenomena of Insanity."

The present number has been delayed through various contingencies, incidental to the war. I have determined to make this fourth year of reviews and summaries a consideration of Shell-shock, leaving for another year such accumulations of general psychopathological literature as may be available. I wish to consider Shell-shock not so much from the medical as from the psychological side. In the preparation of a case-history book entitled *Shell-Shock and other Neuropsychiatric Problems Presented in 589 Cases from the War Literature, 1914-18* I spent about 2,500 hours, and my colleague, Mr. Norman Fenton, as many more in the preparation of the bibliography. The resulting dictations and bibliography constitute the major portion of this book of approximately a thousand pages, which I am not here endeavoring to abstract so much as to consider from the special psychological point of view. Dr. Charles K. Mills in a long introduction to this Shell-shock book has analyzed it from the general medical standpoint.

My own purpose in compiling the book was not a psychological one primarily. The object was to produce a case collection after

the manner of the law case books, which should serve the neuropsychiatrists in their preparation for war work. In fact, the task was undertaken incidentally in my work as director of the Army Neuropsychiatric Training School (Boston unit), 1917-18.

It has always been the task of these reviews of general psychopathology to take out from the mass of the medical literature that which promised to be of most interest to the psychologist. Of course the physician working in this field has a weather eye to the interests of the premedical students, with whom the psychologists in their college work come in contact. I believe that the psychologists and the psychiatrists ought to come very close together in this matter, since, if the students in their premedical work do not get the right slant and encouragement, the task of recruiting psychiatrists for the new work of mental hygiene will be difficult or impossible. About three per cent. of the physicians in the Surgeon-General's Office are said to have been neuropsychiatrists or at least posed as neuropsychiatrists. Psychologists coming in contact with young men having this sort of interest ought to encourage them definitely to go into medicine and particularly to attend those medical schools where proper attention is paid to psychiatry. A definite propaganda to this end ought to be launched, possibly by the newly established Education Committee of the National Committee for Mental Hygiene (this Education Committee has amongst its members psychologists as well as physicians). But, if the psychiatrists wish to recruit their own ranks, they must strive to put their new ideas in such form as rapidly to get into the minds of the psychologists. It is on this account that I have chosen to write a sort of review of my own compilation. Essentially, however, it is not a review of anything I myself have written so much as a culling out of the articles in the medical literature which seemed to me, on rereading my own compilation, to be of especial interest to psychologists. There are, in the bibliography of this work, articles as follows: French, 895; British, 396; Italian, 77; Russian, 100; American, 253; Spanish, 5; Dutch, 5; Scandinavian, 5; and Austrian and German, 476. The bibliography is much more extensive than the articles from which the abstracted cases are drawn. The bibliography has been brought up to and partially includes 1919. The matters of psychological interest in these two thousand references can be got out by author in the bibliography itself and by subject in the index of the work under the heading *Bib.*

The whole work is divided into five sections, of which the fifth is an Epicrisis that contains practically every thing that the compiler himself has to say (and that very little) concerning the general nature of Shell-shock, general observations upon its treatment, and various problems of diagnosis, which latter need not concern the psychologist as such. In the body of the work, Section A deals with the psychoses incidental in war, that is, with psychoses not necessarily related with Shell-shock or very doubtfully related thereto. Thus, to give a few instances of these circumambient difficulties, one finds in the literature cases in which general paresis or kindred syphilitic disorders of the nervous system have been brought out by shell shock or, better, following shell explosion. Again, genuine epilepsy has been thus brought out. Again, we find various diseases of the body at large, even such diseases as tetanus and malaria, presenting phenomena that may at first blush be confused with the true Shell-shock. It is rather surprising that the disease which so fills our asylums, namely, dementia precox, is not especially well represented in the war literature. It is doubtful whether the phenomena of dementia precox have been brought out by Shell-shock or by any special war influences (all this aside from the fact that numerous cases of dementia precox come up for diagnosis both in the field, in camp, and in the draft or enlistment stages). It is particularly striking that so few cases of depression of the manic-depressive group are brought out by war stress.

The second section of the book (*B*) deals with the nature and causes of Shell-shock and begins with matters of medical interest, namely, with autopsied cases and with cases showing signs of organic disorder of the nervous system. The psychologist here may inquire what, after all, physicians feel concerning the organic nature of Shell-shock. The answer must be that, statistically speaking, the majority of cases of so-called Shell-shock are no doubt *functional* (whatever that word may mean) in exactly the same sense as the hysterias and other psychoneuroses made familiar to us by the work of Charcot, Weir Mitchell, Janet, Freud, and others. In short, although minute brain hemorrhages are no doubt found in certain cases of Shell-shock, the majority of the phenomena are of that reversible nature to which we give the term functional. Shell-shock, to put it briefly, is a traumatic neurosis, not a traumatic defect-psychosis. Perhaps the warning does not need to be made that this truth is a statistical truth and that cases are met

in which there is a combination of the functional with the organic element. Papers by Babinski and by Binswanger deal with many of these combinations of hysterical and more narrowly somatic disorders.

The combination of French and German authorship noted in the previous sentence may give point to the remark that the general results on both sides of the battle line were practically identical. For example, Nonne, the well-known neurosyphilographer of Hamburg, found himself in the war treating functional cases by functional methods, preferably in the case of this eminent neurologist by means of hypnotism, to which procedure he appears to have been converted during the war. But, aside from details of treatment, it is remarkable that Nonne should have proclaimed during the war that the results of war studies lent more support to the original contentions of Charcot concerning hysteria than to any other authority. It may be remembered how the original contentions of Charcot were by some regarded as those of a charlatan, simply because he was dealing with new material with which the ordinary practitioners had little contact. The result of the war work will be that a knowledge of hysteria and other psychoneuroses will become very much more widespread. There will be three or four men in the future familiar with the psychoneuroses to one man in the past. All of which augurs a far more brilliant immediate future for mental hygiene than one could have hoped.

If the psychologist asks whether we really know anything more about the fundamentals of hysteria and the other psychoneuroses than we did before, perhaps the answer should be no. Many authors have made the obvious point that at least the sexual portion of the Freudian doctrine is not upheld by the war experiences. Those who held to *fear* rather than *sex* as the more frequent cause of functional neuroses may regard themselves as supported by the war evidence. But, as is well known, the majority of the so-called Freudians are no longer pansexualistic. They are much wiser in clinging to the virtues of symbolism and to the values of dream analysis than to the doubtful universalities of the doctrine of pansexualism. There are a few cases in the compilation which are of interest from the psychoanalytic point of view, notably some cases from amongst those described by Eder in his book *War Shock*. Take, for example, case 359 of the compilation called (by the compiler) *A Horse in the Unconscious*. Or take case 529 *A Victoria Cross winner: Bayonet clutch contracture revealed by hypnosis*.

MacCurdy has also a number of cases well analyzed from the general standpoint of the Freudians, and reference should be made to his book which should be in every psychological library. Another author with psychoanalytic leanings is Rows. See especially cases 342 and 343 dealing with certain dreams. On the whole, however, as above mentioned, at least the pansexualistic part of the Freudian doctrine must be regarded as not well supported. A moderate statement in this direction is that of Elliot Smith and T. H. Pear in their book *Shell-shock*.

Many Freudian authors insist, however, that Freudian "mechanisms" are at work nevertheless and despite the lack of war evidence for the sex factor. Perhaps the compiler is stupid or prejudiced, but he has never been able to get clearly into his mind exactly what the term "mechanism" means as used by the Freudians. He has repeatedly replaced the term "mechanism" with the term "process" in writings of the Freudians, finding the resultant statements at times perfectly true, but far more obvious and everyday-seeming than when the aristocratic word "mechanism" is used. Section XI, the group of psychopathoses in the first division (*A*) of the work, may be referred to for cases to illustrate these "mechanisms." There is one most remarkable German case (Steiner) of a man who preferred going over a badly shelled area to a perfectly safe tunnel which had been provided for him, simply because he had developed a severe claustrophobia as the result of Shell-shock (Case 182).

Whereas the second section of the book deals with the general nature of Shell-shock, the third section deals with more special problems of diagnosis which do not especially concern the psychologist, save in the work of Babinski on the relation of certain reflexes to chloroform anesthesia, a matter which will be considered below more extensively. The fourth section of the book (*D*) deals with treatment, and this section is in some respects the most interesting to the lay reader and the professional reader interested in reconstruction. With this brief account of the general construction of the compilation, I will return to a more detailed consideration of that material which seems to me to be of the most psychological value.

Concerning feeble-mindedness, the cases presented in the group 35 to 52 of the psychoses incidental in the war must give a good deal of concern to the psychologist. Even when the psychiatrist is persuaded concerning feeble-mindedness, the regimental surgeon may fail to agree with him (Case 34). How could a good rifleman

be an imbecile, was a question raised (Case 45) by a certain German. Sundry superbrave imbeciles and imbeciles fit for barracks work, although decidedly unfit for war work of a more active nature, are given. One imbecile who stood his ground as a model of the brave soldier was finally captured by the Germans still shooting amidst a hail of bullets. However, nothing daunted, he escaped from his captors and swam back to the French lines across the Meuse (Case 36). There are cases in the compilation of the greatest interest from the standpoint of "rationalization." Case 51 seems to be a case of Shell-shock in a feeble-minded person following burial in an explosion. The victim was thus complicated enough to secure a Shell-shock in the sense of a functional neurosis, but hardly complex enough to rationalize his situation properly. As one might say, such a man is like a cat able to climb a tall tree, but unable to climb down—whereupon the entire fire-department of the cat's native village may be called out. As for the interesting process of "rationalization," the excellent work of the well-known psychologist Rivers may be quoted. Rivers' original work should be read carefully by the psychologist. Cases 506-510 are instances of the rationalization process as applied by Rivers. Case 510 is one in which there was no redeeming feature whatever, because Rivers could find no nucleus of rationalization on account of olfactory, gustatory, visual, and auditory elements that drove in the neurosis. But ordinarily Rivers was able to find some feature, however slight, in the neurosis-producing situation to which the mind of the victim could be attracted. Thus, if one's comrade had been blown to small bits by one's side, then the rationalizing point lodged in the very fact of the rapidity of his death: he could not have suffered at all, and that was at least one point of advantage. This philosophy of rationalization is of course entirely opposed to the ordinary "forget it" philosophy of some of the psychotherapists, notably of the Christian Science group.

One gets the impression, however, that these processes of rationalization of the psychoneuroses are far more fit for officers than for men. The general conclusion seems to be that these more elaborate neuroses are in the nature of the case more likely to occur in more complicated human beings and that by the same token the more complicated methods of treatment must be reserved for the more civilized patients. The part played by subnormality and even by morosity in all wars must now be regarded as an extensive one and the fact that a great quantity of these cases can be eli-

minated by simple psychometric methods must give the world a considerable ground for optimism in the future. Even should there be no more wars, these methods can well be applied to industry.

Where we are not dealing with feeble-mindedness, what must be regarded as the basis of Shell-shock? Hysteria used to be regarded as almost always hereditary. A great many cases with heredity have been found in the war time. Yet excellent neurologists are found to assert that they have had typical and well marked cases of Shell-shock under observation, whose histories have been studied elaborately and no hereditary or acquired psychopathic tendency has been found. Thus, a case (306) of Donath was published by the author with his explicit statement that here was a case of traumatic hysteria without heredity or acquired soil, and MacCurdy has a case (307) of mine explosion and burial with neurosis ensuing in a man regarded as a perfectly normal and very high type of soldier. On the whole, however, it must be said that war conditions are not very suitable to proper social service investigations, and eugenic investigations into the heredities of these cases in the majority of cases do show either hereditary taint or acquired soil.

Of great general psychological interest appeared to the compiler the great number of cases in which there had been *ante bellum* difficulties of the same sort as those shown in the war. Thus, a man whose leg was paralyzed after falling from a horse under fire was the same man who had had precisely the same disease after a fall from a horse in a sporting adventure years before (case 286 of Forsyth). The lamented Dejerine has shown that a subject who had always been weak in the legs developed especially marked weakness in the legs under the war conditions. There is one very striking case in which a soldier with hysterical chorea was found to have had a precisely similar attack years before the war: this *ante bellum* attack was reminiscent of a chorea in the man's mother, but the mother's chorea was an *organic* one (case of Dupouy 300). It would seem that there might be developed a general theory concerning weak places in the body to which symptoms might get attached. One of the most productive neurologists in the war, Tinel, has a case in which tremblings of the eyeball developed along with sundry other symptoms in a man who had been waked by the explosion of a shell. According to Tinel, this nystagmiform tremor was an "occupational reminiscence" in a cinema worker (case 315).

Of course the well-known logical situation is repeatedly found, namely, that there can be Shell-shock *without either shells or shocks*. In short, there may be diseases looking like Shell-shock but related with no acute phenomenon whatever. Thus, Wiltshire speaks of a man who heard a shell explosion, but did not develop symptoms until he had heard distant artillery twelve days later. Lattes and Gorla have a case (322) of a man who was jostled while he was carrying some explosives. He did not drop the nitroglycerine, but nevertheless fell into the state of unconsciousness and deaf mutism with later the so-called "*camptocormia*," a special rather new kind of hysterical "bent back" developed in this war. One Frenchman acquired the *croix de guerre* and his Shell-shock simultaneously. This man was another of those with "reminiscent" phenomena. He had a hallucinatory bell ringing which reminded him of the ringing of the bells outside of a Parisian moving picture show (case 314). These doctrines of the preëxistent "weak spot" and of the relation of certain Shell-shock phenomena to *ante bellum* experiences will no doubt give rise to many hypotheses concerning so-called "mechanisms."

The cases in the part of the book that deals with the nature and causes of Shell-shock are arranged for medical purposes from below upwards. Thus, the cases involving one foot or leg are followed by the cases involving both feet or legs, then by cases affecting one hand or arm, then by both hands or arms, and finally there is a sheaf of cases dealing with symptoms more related to the head. We here deal with mutism, deafness, blindness, and the various disorders of memory and personality. These latter cases, beginning perhaps with case 318 and running to case 370, are of special interest to the psychologist. These cases deal with the relation of emotion without shell explosion to the development of symptoms. The matter of tremors, of dreams, losses of consciousness, stupors, comes under consideration. There are three interesting cases of Milian (364-366) of somnambulism of many days duration (one case of twenty-seven days duration) with cure following a minor suggestion. Case 369 of Feiling is one of dissociation of personality. Beautiful war dreams may be developed by a man who has never seen any war service at all and has been hundreds of miles behind the battle line (Russian case of Gerver, 347).

Behaviorists ought to be especially interested in another case of Tinel, a case of what he calls "stupefaction" of a muscle (case 253). The biceps had here been contused and became as it were

stupefied, while the supinator longus still functioned. The following case (264) of Tubby also relates to the blockage of impulses to certain movements of the arm, and cases of the psychologist Myers are particularly to the point in the analysis of inhibition. That theorist who shall go very profoundly into the nature of Shell-shock will have to reckon not only with the "weak spot" and "*ante bellum* trend" hypotheses, but he must take account of the fact that the symptoms are so often on the same side as the explosion. In some cases it would seem as if the muscles on the side of the body where the explosion occurred were paralyzed (and the overlying skin rendered anesthetic), whereas the muscles on the other side of the body were thrown into contraction,—almost as if the part opposite to the explosion was trying to run away therefrom, while the parts near to the explosion were transfixed upon the spot. The behaviorist must gain a great deal to his purpose from this group of cases with asymmetrical symptoms on the two sides of the body. Especial attention should be given to the work of Babinski. Whatever the truth of his contention that the so-called reflex disorders are incurable by suggestion (other authors, notably Roussy, seem to have been able to cure by suggestion certain cases that Babinski calls "reflex"), nevertheless, the theoretical contribution of Babinski upon the nature of these so-called reflex disorders must certainly be conceded. According to Babinski, these ideas simply conform to points made years ago by Charcot and Vulpian, but neglected by later workers. Babinski's main point is that in certain stages of chloroform anesthesia unsuspected conditions of the nervous system can be brought out. Whereas it has been thought that anesthesia ought in general to reduce the reflexes and whereas this is in general true, nevertheless there is a phase whilst going under and coming out of chloroform anesthesia in which the reflexes may come out in excess. Let us suppose a patient whose knee jerks are perfectly equal in the waking life; let him be chloroformed, and one of the knee jerks early in the anesthetization becomes very much exaggerated or even polykinetic. How is this to be explained? No doubt, the anesthesia has removed the normal downstream of inhibitory influences which physiologists for many years have attributed to the brain. In short, Babinski by chloroform anesthesia is producing an effect not in any wise logically different from the exaggerated knee jerks produced after cutting through the spinal cord. In both instances the downstream of inhibitory influences from the cerebrum has been cut off. In this

way Babinski feels that he has shown the existence of functional differences on the two sides of the body which could not be demonstrated in normal life. The reviewer cannot here do justice to these contentions which ought to be read by the psychologist in the book by Babinski and Froment on *Hysteria*.

One of the most striking illustrations of the Babinski theory is to be found in an article by Monier-Vinard (see case 280). Monier-Vinard had to do with certain cases of tetanus, the victims of which had apparently entirely recovered after a period of some weeks. For certain reasons, it became desirable to operate upon these men for orthopedic defects. To the astonishment of the observer, under chloroform these men redeveloped tetanus and showed a degree of rigidity in anesthesia which was highly alarming. Upon removal of chloroform these rigidities disappeared, only to reappear upon further chloroforming. The only hypothesis ready to hand is that although these cases were clinically cured of their tetanus, nevertheless there was within their nervous systems a tendency to hypertonus. This tendency to hypertonus was counteracted, no doubt, by the normal downstream of inhibitory influences from the cerebrum, and it was this normal downstream that had been interfered with by the chloroform anesthesia. Here then, we have laid down for us the basis of an ingenious hypothesis concerning concealed functional disorders. Suppose we apply this hypothesis to the cerebral cortex itself: we can well get an image of what may be the basis of, let us say, so delicate a disease as the fixed idea. Far be it from the compiler to insist that this is the true account of the basis of a fixed idea or of any similar notion in the psychopathic field. It appears, however, as if a new weapon was in the hands of the psychopathologist. Let us suppose alcohol to work upon a man with certain inhibited tendencies (tendencies which Freudians might like to call repressed), the alcohol might work after the manner of the chloroform anesthesia in the Babinski cases, and the special tendency be released precisely like the exaggerated knee jerk under chloroform.

A word remains to be said concerning treatment. There is no "one best way" for the Shell-shock group. The compiler roughly threw the cases into three groups; a group of spontaneous cures, that is cures without medical credit attached thereto; secondly, a group of what might be termed "miracle cures"; and thirdly, the reëducative group of cures. The miracle cures are of several groups. According to Bernheim a suggestion is an *idea*

accepted. Although this definition is no doubt too broad, yet it has its advantage. Sometimes the suggestion is accepted through the means of pseudo-operations, such as the cure of blindness by an injection of salt solution in the temple or the cure of mutism by manipulations of the laryngoscopic mirror. Again, the suggestion is best put in by means of hypnosis, and a considerable group of such cases has been abstracted in the compilation. It appears that the French army authorities did not favor the use of hypnosis and that there were regulations enforced against it, at least in some parts of the army. But certain Englishmen and certain Germans used the method with great success. Probably the best known method is the so-called "psychoelectric" method, used to such advantage by Vincent in France, by Yealland in England, and by Kaufmann in Germany. This somewhat brutal method of treatment proved none the less successful, though one victim cured thereby carried his case high up amongst the French authorities and caused a great deal of trouble to his deliverer. Some of the most picturesque accounts of this method are to be found in the book of Yealland called *Hysterical Disorders of Warfare*.

When all is said and done, however, many cases remain outstanding in which all methods have failed and this despite the claim of 100 per cent. results by sundry authors. In almost all instances the cases of 100 per cent. claimants turned out to have been selected. Accordingly, a great deal of scope remains for reconstruction work and for reëducative methods of a slower nature. Herein no great advance seems to have been registered over the work of Weir Mitchell. But I am here entering more narrowly medical fields and thereby transgressing the scope of this review, which has been intended to bring out the main things which the compilation showed of value to psychologists. I am bound to say, on looking over the compilation, that a good deal of similar compiling work might well be done in the *ante bellum* literature, for our psychopathological and psychological literature has become too full of general statements concerning one or other hypothesis and too little provided with the actual case material in hand. It is to be hoped that some such complete analysis of the previous literature may before long be made. If so, we shall have side by side the precisely identical results obtained by physicians, ecclesiasts, charlatans, and others, the whole situation depending perhaps upon the idea of suggestion. The problem of suggestion then in its true nature remains the big problem of psychopathology and psychology.

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War Shock. M. D. EDER. Philadelphia: Blackistons, 1918.

This book appeared early in 1918 and was the result of a very praiseworthy effort of the author to give to the medical world the results of his observations and experiences with the psychoneurotic under war conditions, written, as he frankly states, "while on service, a condition which prevented any attempt at a critical study of the literature, in the hope that my experience may be useful to others." As the material for his book the author has taken the first one hundred consecutive cases of psychoneurosis which came under his care. He makes no claim to deal exhaustively with the "ultimate concepts of the psychoneuroses." He has had in mind two considerations: "to give so much of the psychology as to make the symptoms intelligible, and to show that soldiers suffering from war shock respond peculiarly well to psychotherapeutic treatment." He divides his cases generally into War Shock and non-War Shock, and then subdivides into conversion hysteria, anxiety hysteria, and psychasthenia. He finds no cases which can be classified as neurasthenia. He defines war shock as a psychoneurosis "produced by stress of external conditions acting on a mind which is but a degree or so more sensitive than the normal person's—a sensitiveness which should have involved no disability in normal life, rather the contrary, it might tend to success in a man's particular vocation."

In the 100 cases, he reports conversion hysteria, 77 cases; anxiety hysteria, 17; and psychasthenia, 6. His experience with this series leads him to believe that hysteria is rare among the wounded as the "psychical energy is sufficiently occupied with something very concrete and real." He makes a plea for the neurotic and feels that the stigma has been partially lifted from these individuals as a result of war experience, calling attention to the fact that "without the neurotic the mind of man would be stationary and that many of them are ethically in advance of their age."

Chapter 2 describes the clinical manifestations of conversion hysteria, citing a number of cases. Chapter 3 considers the psychological mechanisms of these phenomena, and in Chapter 4

some cases of anxiety hysteria are described and explained. Chapter 5 deals with psychasthenia in the same way. The last chapters deal with the general diagnosis and treatment of these disorders.

In the chapter on diagnosis the author describes methods of differentiating the functional from the organic lesions. He emphasizes the fact that no matter how self-evident the case may be no examination of a psychoneurotic is complete until a complete physical examination has been made, and further that the diagnosis must not be allowed to "rest upon negative evidence." "Positive evidence must be obtained by a psychological examination which should discover the mechanism and pathology of the symptoms." Under treatment he states that the "results of psychotherapy in cases of war shock establish its claim to be the chief method of treatment." Of secondary importance are rest and quiet, all sleep possible, and nourishing food. Of tertiary importance are hydrotherapy, electrotherapy, and massage. While he recognizes that "psychoanalysis is the only method for the radical treatment of the psychoneurotic, it is inapplicable and unnecessary for the treatment of war shock." In only six cases was psychoanalysis done and that very incompletely.

The author's method is to make a psychological examination of the individual, and from the information gained in this manner supplemented by information from the patient's dreams, he makes suggestion under hypnosis. He makes no attempts to analyze or explain the dreams to the patient, but simply uses the information gained to make suggestions which have thus come to him from the patient's unconscious. Out of 97 cases actually submitting to treatment 80 were entirely cured, 14 were improved, and 3 were unimproved. No case was under treatment more than four weeks, and the great majority less than two weeks. The author is unfortunately unable to give any information as to the after-results of his treatment, though he does say that many of them returned to duty. He feels quite certain that the somatic hysterical symptoms when once cured did not reappear in some other part of the body. While other methods than hypnosis have been found equally valuable in other hands, he distinctly favors its use as a war-time measure and on what he calls war-shock cases. The book is very readable, giving in an acceptable manner the psychological explanations for the various conditions met.

LOREN B. T. JOHNSON

WASHINGTON, D. C.

Shell Shock and Its Lessons. G. E. SMITH & T. H. PEAR. (2d Edit.) Manchester: Univ. Press, 1918. Pp. xi + 135. 3 s. 6 d.

When, as in the case of the present book, a professor of anatomy and a professional psychologist can coöperate on a problem involving mental disease, it is obvious that the importance of matters involving mental processes are being widely appreciated.

In consecutive chapters the authors discuss "The Nature of Shell-Shock," "Treatment," "Psychoanalysis and Reëducation," "Some General Considerations," and "Some Lessons of the War."

The term shell shock is used widely "as a popular but inadequate title for all those mental effects of war experience which are sufficient to incapacitate a man from the performance of his military duties." The accounts of cases differ in no essential respect from those contained in other books and articles dealing with this subject. Firmness and sympathy, isolation from the patient's family and from his usual environment, suggestion either in the waking life or under hypnosis, work, and "psychological analysis" which looks into the individual characters of the cases, are the methods of treatment. "Psychological analysis" is very much the same as "psychoanalysis," although the latter is spoken of as a *method* of psychological analysis. The objection to the use of the term psychoanalysis is that it is intimately bound up with certain theoretical conceptions which the authors want to avoid.

The lessons of the war as applied to psychopathological and psychiatric matters of importance to the state are (1) that the mental side of life must be more carefully evaluated, (2) that the medical profession must be more carefully trained and selected to care for mental cases, (3) that there must be provided better opportunities to care for the milder forms of mental disturbance and that in the care of these cases the general practitioner and psychiatrist must coöperate, and (4) that research must be stimulated in hospitals for the insane.

SHEPHERD IVORY FRANZ

War Neuroses. J. T. MACCURDY. (Pref. by W. H. R. Rivers.) Cambridge: Univ. Press, 1918. Pp. xi + 132. 7 s. 6 d.

The general view of MacCurdy's work is well given by Rivers in the preface, that "war neuroses depend essentially on the coming into play of the relatively simple instinct of self-preservation,

while the neuroses of civil life largely hinge upon factors connected with the far more complicated set of instincts associated with sex." The book has chapters devoted to a description of "Typical Cases," "Anxiety States," "Mental Make-Up," "Fatigue," "Concussion," "Treatment of Anxiety States," "Conversion Hysterias," "Heart Neuroses," "General Psychological Considerations," and "Prophylaxis."

The author points out that in any individual the conflict between the individualistic, or the personal, and the social, or herd, instincts depends upon the dominating effect of a present situation which acts as a stimulus to present action. In war, where the situation is one of national preservation the individual has his social instinct stimulated. He "becomes less of an individual and more an integral part of the society to which he owes allegiance," and thus he reverts to a condition in which he can "give vent to his primitive passions." The two factors that stand in the way of this are (a) the habit of the man's mind, and (b) the "degree of emotional unity he may possess . . . making him sensitive to the sufferings of those outside his group," namely, the enemies of his group. Fatigue and privations may, however, undermine his mental (and physical) group adaptations, and the personal element becomes predominant. The instinct of self-preservation comes to the front, and "the bonds uniting him to the common cause are definitely loosened." This leads then to the production of a neurosis or an anxiety state, or if the ground is suitable a conversion hysteria may sprout forth. The treatment for these conditions is "almost purely psychological." Whether or not physical means such as drugs and electricity are to be used, will depend upon the therapist. Their value is entirely dependent upon suggestion. Prophylaxis lies in the selection of those who will make the most satisfactory soldiers for those duties where fatigue, privation and concussion may occur. The careful selection of men and the application of means for reducing discomfort and fatigue will do much to prevent a great mass of the neuroses. But MacCurdy would not have all so-called potential neurotics excluded from active army work. Many are capable of withstanding the hardships and strains of bombardment and of horrible sights, and "there is in military discipline a powerful therapeutic agency" for the improvement of those who have shown psycho-neurotic disturbances in the past.

The book is written so as to be easily read by the laity, as well

as by physicians. It should do much to educate the public, both medical and lay, to the importance of the mental element in all diseases.

The lack of an index is the only defect that the reviewer deems important enough to call attention to, in the hope that a subsequent edition may be corrected in that particular.

SHEPHERD IVORY FRANZ

An Outline of Abnormal Psychology. J. W. BRIDGES. Columbus, O.: R. G. Adams & Co., 1919. Pp. 127.

This *Outline* presents, as remarked in the foreword, a "fairly complete list of the abnormal mental phenomena" to which is added a similar list of the phenomena as they occur in the psychoses (Kraepelinian classification) and in the psychoneuroses. To each chapter are appended references relating to the topics outlined therein. These references are not always well chosen, and in some cases older editions of books (which the author doubtless had at hand) are referred to with page references when more recent editions are more available for the general reader. For example, the edition of Church and Peterson's *Nervous and Mental Diseases* referred to is that of 1905, whereas later editions with thorough revisions and many additions have subsequently been published and are more likely to fall into the hands of the student.

Some of the topics of the *Outline* are of sufficient interest to psychologists to warrant criticism. The following have been selected to indicate the positiveness or the arbitrariness of the author, as well as some of his errors. He says that allochiria is a "sensation indefinitely localized, or localized contralaterally." The term actually and always means contralateral localization, and for an indefinite or generally wrong localization we have the perfectly good term "dyschiria." Color blindness is said to be "due to inherited *retinal* defect, occasionally acquired." The prefix *a* privitive is used by the author, following some inaccurate clinical writers, to include those defects which are not complete losses but only deficiencies, for which latter the prefix *hypo-* is both correct and distinctive, as well as instructive. Visual imperception is said to be due to "lesion or loss of function (through dissociation) in the *visuo-psychic*, the *secondary visual area* of the occipital lobe," a statement we would like to accept but for which there is no adequate proof. Narcissism and pederasty are not used in the senses described by the author except by some medical writers who use

terms in a very loose manner. Without qualifications the terms paraplegia and diplegia are given certain definitions, which will tend to lead a student to misconceptions because many medical authors use the terms in different ways, and perhaps more correctly. Although apraxia is defined as "the loss of ability to perform a skilled act in the absence of paralysis," motor apraxia is unqualifiedly said to be the condition in which "the patient knows what is to be done, but he cannot do it, although he may wish to." The hemiplegic patient also knows what is to be done but he cannot do it, and in his case also the lesion may be confined to the *motor area of cortex* to which Bridges refers the lesions producing motor aphasia. The author would not have confused matters with respect to praxia and apraxia if he had followed the teachings of Liepmann and von Monakow.

A more careful selection of definitions and authorities and the omission of the last 57 pages devoted to the catalogue of symptoms in the psychoses, would have made the book better. What is more needed than an outline is a running text dealing with the matters which constitute the present *Outline*, because the student has facilities for getting definitions from numerous medical dictionaries. The *Outline* as presented in the present work has usefulness for only two classes, the one who has had considerable first hand acquaintance with the abnormal, but who has not paid attention to much beyond the grouping of symptoms pertaining to the psychoses, the second is a class of students who are following lectures based upon the *Outline*.

SHEPHERD IVORY FRANZ

Les médications psychologiques. Etudes historiques, psychologiques et cliniques sur les méthodes de la psychothérapie. I. L'action morale, utilisation de l'automatisme. PIERRE JANET. Paris: Alcan, 1919. Pp. 346.

This volume is the first of three which will give Professor Janet's mature views on the important subject of psychotherapy in its different forms. The second of the series will deal with the psychological principles underlying psychotherapy, and the third volume will bring together a number of clinical studies bearing upon the matters dealt with in the first two volumes. Professor Janet's long experience and interest in psychotherapy has fitted him well to undertake this review of psychotherapeutic methods and results. Until the appearance of the completed work a critical review

would be premature, and at this time only a brief summary will be presented here.

The eight chapters deal respectively with Miraculous Cures; Philosophical Treatment; Mental Medicine; History of Suggestion and of Hypnotism; Definition of Suggestion; Problems of Hypnotism; and Appeal to Automatism.

"It has often been the fashion to laugh at miracles and to deny their existence," says Janet, but he affirms that "our existence depends solely upon miracles, and every science has begun by the study of miracles." Let it not be understood, however, that Janet means by a miracle what others may not mean. "There are facts that we cannot predict with precision, and moreover that we cannot produce with certainty by originating a definite antecedent. Such facts, when they are absolutely indifferent for us are called 'chance,' when they are harmful they become 'fate,' and when they are favorable they are called 'miracles.'" In miracles, however, man usually plays a part, "as magician or as priest, by ceremonies or by consecrated rites, or by efforts on the part of him who will benefit by the miracle." The miracles at the temple of Asclepeion at Epidaurus, the miracles of the early (and present) Christian church which were helped by the presence of pieces of the true cross or of bones of saints, the laying on of hands by rulers to cure the king's evil, the occultism of Japan are all one in kind. Talismen, sympathetic powders, red coral, and animal magnetism have their miraculous cures. In this group Janet also includes osteopathy as a method of treatment by so-called anatomical readjustment. The value of the miraculous treatments cannot be gainsaid. Miracles have cured hundreds, maybe thousands, but it is almost needless to state only because they acted mentally by suggestion or producing in the minds of the afflicted a proper mental attitude towards their ailments, real or supposed.

The main philosophical method that Janet considers is that of Mrs. Eddy, as exemplified by Christian Science in *Science and Health*. It is a negative treatment. It denies the real existence of pain and even of disease which are considered to be errors. The mind of the individual alone is to be dealt with, his ideas are to be controlled.

Allied to the philosophical method of Christain Science is the method advocated and followed by Dubois and others of his school. It differs from Christain Science in several particulars, mainly in that it makes a selection of patients (those that are called mental

cases) and they are dealt with by suggestion and by reason (persuasion), although Janet affirms that it lacks the scientific attitude in that it is not concerned much with diagnosis or the study of the symptoms with which it is supposed to deal. Here also belongs the Emmanuel Movement, which had its vogue fifteen years ago. Janet calls attention to the absurdities of Dubois and others in limiting their therapy to those who have no organic lesion and who are not insane, and he rightly points out that both of these negative limitations have no value as differential expressions. It is a "result of the ancient superstition which looks at a neuropath as a man in error."

In the second part of his book Janet deals with suggestion and hypnotism. In addition to a brief historical sketch he discusses the fundamental conceptions underlying its method. Suggestion here is a method more advanced, by its restricted use and by its utilization of psychological laws. "It has been the first precise psychological therapy," which prepared the way for all the subsequent, better systematized and psychologically better founded methods that will be dealt with in the second volume.

This work should be found in every psychological laboratory, and made available to all students of psychology.

SHEPHERD IVORY FRANZ

The Child's Unconscious Mind. The Relations of Psychoanalysis to Education. WILFRID LAY. New York: Dodd, Mead, 1919. Pp. 325. \$2.00.

The book is a somewhat mixed-up exposition of the discoveries of psychoanalysis and the author's ideas of how they should be applied to education, and is directed almost entirely to teachers, though there are occasional hints for parents.

Exclusive of the introduction, conclusion, and index there are seven chapters: The Unconscious Factor; Interplay of Conscious and Unconscious; The Partial Trends; The Mechanisms; The Aim of Education; Resistance and Transference; and Emotion.

After explaining the ever-present influence of the unconscious he makes a plea for courage to look into it and learn what we and other people really are. The preëminent purpose of academic education is "to enable each individual to take at will into consciousness as many and diverse thoughts as possible which the uneducated person is unable to face. For this aim, expressed in other words, is to enable the individual to face as much reality as possible."

Neurotic children should not be mercilessly squelched. Neurotics are the malcontents that stir up the sluggish norms to progress. Without them society would crystallize. "As the aim of education is the adaptation of the individual to the social environment, this includes also the possibility that the environment may be a changing one and not fixed. To bark at everything strange is the province of a dog, but not that of the thoughtful human."

The school has to transform the child's physical energy into mental energy, and sublimate it to forms which are valuable to society.

In accordance with Adler's theory of compensation for feelings of inferiority the author believes that the child's natural bent is towards his inferior faculty, "and if education is to do the best for the individual, it should help him develop his weak point, feeling assured that what he takes least interest in he has least to fear from." Every attempt should be made to put the school in touch with reality. In the future, in place of tiresome recitations of large classes there will be "a continual conference in private between the teacher and the pupils one at a time. The curriculum could be increased *ad infinitum*, and the pupil will go from the teacher's study to laboratory, library, gymnasium, or workshops and work with complete devotion, as soon as he understands the vitality of social relations." School work will be done at school, not amid home interruptions. But there can be meetings for readings and conversation in English and foreign languages. Instead of the present piecemeal schedule of studies, a subject will be studied intensively until a point is reached where a solid satisfaction is felt over a good-sized job done completely. This may take a whole day or several days. A present year's work in Latin could be finished in ten weeks. Then the examination could be taken, and the student begin another subject. Subjects easy for the student could be finished first, leaving the harder ones till greater maturity.

The author's very thorough explanation of the influence of the unconscious on a pupil's behavior and how the teacher by a knowledge of its phenomena can better understand and help him, should prove very useful. He also gives a concrete example of a successful recitation experiment in Latin, a combination of spell-down and self-government. The reviewer can heartily endorse this method, for he used it himself, though in simpler form, in a subject even less interesting than Latin, namely: Sunday-School lessons, and the bad boy class that had worsted several teachers became as lambs,

the energy going into rivalry, which had formerly used the outlets of noise and mischief.

On page 214 there is a wild leap of imagination into "some distantly future day" of true democracy, when children will be taken by the state and shunted from place to place, job to job, and family to family, government inspectors meanwhile keeping the exchange homes up to a standard of efficiency and morale, and everything will be regulated for the production of the most useful citizens. (This happy land should certainly be called New Prussia.) There will be no spiritual hermits of the repressed variety. Everybody's mind will be open to everybody else's inspection. Repression of the kind which drives unpleasant or painful ideas back into the unconscious will not exist. Anybody may say or attempt to do anything to anybody, etc. (On second thought a better name than New Prussia would be *Unrepressia*. Probably most people will hope that this day will be very distantly future.)

The book is rather disjointed, and needs considerable boiling down (for instance, the author diagrams the interplay of conscious and unconscious thought and action with all the relentlessness of a Latin conjugation till the reader is fairly dizzy); still, for those ignorant of psychoanalysis, there is so much valuable material in it that teachers and parents will do well to read it.

DUDLEY WARD FAY

WASHINGTON, D. C.

Echo Personalities. A Short Study of the Contributions of Abnormal Psychology towards the Problems of Normal Education. FRANK WATTS. New York: Macmillan, 1919. Pp. 111. \$1.00.

The book consists of five chapters: The Scope of Abnormal Psychology; The Crowd at School: Its Control and Education; Psychopathology and the Development of Personality; The Psychology of the Defective Mind: Its Influence upon Teaching Methods; and The Supernormal.

In the first chapter the author explains how the modern study of abnormal psychology has changed our conceptions of normal psychology, since we have realized that the abnormal is only a more marked development of the normal. Normal or experimental psychology has been forced to become less static and more dynamic, to turn from the study of sensations to that of emotions and impulses, while abnormal psychology has invaded the normal field, so that the two are now overlapping.

In the chapter on the crowd at school he outlines crowd psychology with its impulsiveness, credulity, and excessive suggestibility and shows how the teacher, instead of fighting these tendencies, can utilize them to develop interest in school work. By a knowledge of group psychology the teacher can lead his pupils through their suggestibility, sympathy and imitation up to the time when they begin to reflect and deliberate for themselves. He should preferably be a crowd leader and govern them through prestige, but if he cannot himself lead he can at least pick out the leaders among the students and tactfully imbue them with his own ideas and wishes. The author does not merely theorize, but gives practical hints on how to attain these results.

The chapter on psychopathology and the personality seems the most valuable. Here he explains the modern concepts of the conscious and unconscious minds, the phenomena of association and dissociation, repression and sublimation, and points out the necessity of developing the child's native interests and not repressing them into dissociation. Not to stifle curiosity and thus stunt the growing mind, but lead it into the secrets and wonders of nature, not to oppose pugnacity but lead it into achievement, not to break up the hoarding habit but guide it into such avenues as stamp collecting with the resultant real interest in geography and history or collecting plants and flowers with its stimulus towards nature study, not to repress self-display and exhibitionism but utilize it in the dramatic methods of teaching literature and history; in short, to guide the child's strong impulses into proper, valuable channels, not merely "sit" on them when they express themselves in undesirable ways. The teacher had better leave off cramming ill-nourished minds with undigested facts and turn to strengthening ideal tendencies, building up stable, sane personalities through sublimation. "What is important in the theories of Freud and Jung is the fact that the child, in some very definite way becomes a double-minded creature in early life with strongly formed inhibitions." In this conflict between good and bad impulses the desire for self-control should be made the master complex, and the child taught to frankly criticize his own wishes and be able to detect his rationalizations. Such ability for honest self-criticism is worth more than the facts in a thousand textbooks.

In the chapter on the defective mind he sketches the history of the attempts to educate defective children, citing among others Binet and his followers, Seguin, and Montessori. He criticizes the

latter for attending to the development of the sense activity only and neglecting the humanities. A balance of sense and intelligence is needed; with too much sense perception we are like the deaf, quick to see but slow to think, with too little we are like the blind, incapable of quickly grasping the significance of a situation. The lessons learned in teaching defectives have been applied to the training of normal children, but only recently has the supernormal child been given special consideration. Hitherto he has been held back to the pace of the average, lazying along with easy triumphs, complacently losing initiative, or else growing disheartened at being fettered. (An impassioned appeal for the supernormal child is made by Boris Sidis in his short *Philistine and Genius*.) The author also promises a book on the subject if this volume meets with approval.

It certainly should get a warm reception for he boils down into small space the essential facts of modern dynamic psychological research and gives practical hints on how to apply them to education. No progressive educator should be without this little book.

DUDLEY WARD FAY

WASHINGTON, D. C.

Psychiatrie de Guerre. A. POROT and A. HESNARD. Paris: Alcan, 1919. Pp.

This book of Drs. Porot and Hesnard gives a methodical and complete presentation of the special clinical pictures observed during the war. The strong emotions continuously brought into action without any periods of relaxation, the dangers presented under new and terrible forms, and the uncertainty of the outcome, kept the nervous force of a vast army of men from all stations of life strained to utmost tension, with the result that there was an astonishing number of nervous breakdowns. Nevertheless it can not be said that any really new type of psychosis, any specific mental syndrome, was brought to light, the mental diseases generally observed being of the types that have always been found to follow great cataclysms. The authors of this book have carefully studied the etiology of these psycho-neurotic disturbances, giving due weight to the various factors involved, constitutional or acquired morbid predispositions, and also to the extraordinary moral and physical conditions which existed at the front or behind the lines. An interesting study was made of the different types and the forms of reaction peculiar to the various races who took part on

the French side especially in regard to their susceptibility to traumatic psychoses. The clinical chapter is devoted to the syndromes of the psychopathic states resulting from war. The clinical descriptions of the various types encountered bring out clearly all the symptoms, manifestations and colorings emphasized by the peculiar circumstances by which they were influenced. The description of the symptoms of mental confusion and oniric states is especially interesting. Mental confusion, it is said, makes its appearance in a transitory form and in a slight degree in a very large number of combatants taking part in modern battles, especially after bombardments; and in a large number of men having a nervous diathesis, these exciting causes develop the rudiments of a syndrome—somnolence, difficulty of comprehension, disturbances of memory and of orientation, tendencies to automatic actions, nightmares, etc. Sometimes following an emotional traumatism such as the bursting of a shell at close quarters, the disturbance begins with a premonitory state of slight anxiety which may not make its appearance until several hours or even days after the shock. Prolonged states of confusion and oniric conditions follow. When there is oniric delirium, it develops parallel with the mental confusion, the condition from which it arises. The delirium may, however, be intense while the confusional element is only slightly pronounced. The recovery takes place either suddenly, or after a period of uncertainty during which the patient wavers between his delirious dream and reality. He may retain, when he is restored to lucidity, a series of false ideas or delusions which developed during his oniric condition. The final chapter of the book is devoted to therapeutic psychiatry in war. According to these authors it must be intense and applied immediately. It is really an *emergency psychiatry* whose purpose is to modify the acute psychic disturbances. Isolation in bed; milk diet or special regime against auto-intoxication, dyspepsia, asthenia, etc.; purgatives; serotherapy; galvanotherapy; hydrotherapy; etc., should be resorted to and the administration of the department to which the physician belongs should place all these restorative means at his disposal. Every doctor entrusted with the care of psychoneurotic cases should be acquainted with the tendency to tuberculosis, general cachexia, sudden exhaustion, etc. Between the patient and the physician there is a constant battle in which the physician makes use of gestures, persuasions, etc., to encourage and help the patient, and takes advantage of the patient's suggestibility to gain over him

a moral ascendancy, which the physician uses for the affective reëducation of the patient. In conclusion these authors speak of the possibility of showing the superiority of the energetic therapeutic methods they advocate over the traditional methods, and express the hope that the result of their application may be the recovery of a larger number of "psychopaths."

MARY O'MALLEY

ST. ELIZABETH'S HOSPITAL,
WASHINGTON, D. C.

Troubles Mentaux et Troubles Nerveux de Guerre. GEORGES DUMAS.
Paris. Alcan, 1919. Pp. 227.

In this contribution to the subject of the new phases of neuro-psychiatry brought into relief by the recent war, Dr. Dumas has endeavored to collect in a single book his personal observations covering a period of three years, to compare them not only with the experiences of his confrères but also, at times, with the facts observed by German physicians; and to draw from them the conclusions which seem most logical. He treats some of the neuro-psychic disorders with brevity, but describes confusional and hysterical conditions at length, stating that it was to these phases that he had particularly directed his attention and that if a synthesis of the various studies made under different war conditions is to be made and the various facts and conclusions are to be correlated, each one who was in a position to make observations should give greatest prominence to the phases which fell under his own observation. In the light of his experiences Dr. Dumas has analyzed into their fundamental conditions and illustrated by numerous examples the various nervous and mental disorders that arise from perturbations of the sort encountered in military experiences. He comes to the conclusion that the essential pathology of the war may be summed up under six heads: (1) Wounds produced directly or indirectly by projectiles; (2) internal wounds, precise lesions, produced in the nervous system or the organs of sense by the force of the explosion, by the compression or decompression of air or by explosive waves, evidencing themselves in sensory and motor disorders; (3) toxic troubles, illy defined, evidencing themselves in mental confusion and amnesia; (4) emotional troubles evidencing themselves psychically by anguish and emotion, and physically by shaking and tremors, etc.; (5) pithiatic troubles, evidencing themselves in various disturbances of voluntary movement or of sensibility; (6) simulated troubles.

Passing over the first class as lying outside the province of neuro-psychiatry he states that new experiences with internal lesions, hemorrhages, cellular perturbations, etc., have enabled us to give an explanation of certain disturbances which formerly psychiatrists were wont to attribute too hastily to hysteria. His observations convinced him that lesions of this sort, when they are only slight, may be complicated with pithiatic disorders which cause the patients to magnify their symptoms, extend them, or even, if they were of transient nature, continue them so that they survive in a pithiatic form.

Dr. Dumas explains pithiatic disturbances as those of suggestive and especially of autosuggestive origin, manifesting themselves in disorders of the motor and sensory spheres; autosuggestion, he says, appropriates for its material real troubles which were once actually present, though perhaps only slightly accentuated; it emphasizes them and gives them permanency. Complications of this sort may arise in all the disturbances due to war influences. Of toxic conditions our knowledge is limited, as they really fall within the province of biologic chemistry, but we are justified in believing that toxic conditions give rise to confusion. Now, mental confusion and its accompanying docility is just the symptom nearly always present in the pithiatism exhibited by those suffering from shock, so that we are led to the conclusion that toxic disorders may also be continued in a pithiatic form. Emotional troubles, too, when their real emotional phase disappears, may be continued in pithiatic form. Simulated disorders, though they are sometimes invented without any foundation at all, occur most frequently as sequelæ of the various pithiatic or organic disturbances, which the patient is able to imitate at will.

While it is often difficult to say with precision at what moment a trouble ceases to be real and becomes pithiatic, or when it becomes simulated, or just how much of the disturbance is due in a given case to simulation, or to auto-suggestion, and how much to real organic lesions, there seems justification for arranging these disturbances in the order of their appearance: emotion and perturbation (with their organic and mental consequences); confusion (with its intellectual and affective characteristics); autosuggestion; prolongation, simulation. The author remarks that a very small number of those suffering from shock have passed through all the stages, and that the number of simulators has been relatively very small.

Because of his painstaking observations the conclusions drawn by Dr. Dumas are of exceptional value and he arranges his facts very convincingly to support his theory that nervous intoxication, which results from initial emotions and perturbances, gives rise to confusional troubles, preparing the way for the pithiatric disturbances that succeed and survive it.

MARY O'MALLEY

ST. ELIZABETH'S HOSPITAL,
WASHINGTON, D. C.

L'Expertise Mentale Militaire. A. POROT and A. HESNARD. Paris: Mason, 1919.

Deploring the lack of consistent uniformity and definiteness in the interpretation of mental examination tests, these authors have given us an extensive resume of their work during four years of the war, in both military and civil environments. The material was gathered chiefly among the French troops and detention camps of North Africa where may be found not only the elemental and abnormal indigenes of that country, but a host of misfits, outcasts and delinquents of Occidental lands, with the offscourings of the Orient who sought to enter service there or were detained by the law. These formed a rich penal clinic with a wealth of diverse mental phenomena. The treatise commends itself to all on account of the practical conception and application of methods used in determining the origin and solution of mental problems somewhat complicated or difficult of analysis. A loose classification divides the material into four sections. The first describes the methods used to determine an applicant's aptitude for service, and studies the military worth of defectives, psychoasthenics, etc., laying especial stress on the significance of hereditary influence and anomalies of character and intelligence. Under "Mental Disorders directly imputed to War" the authors deal with the factors of predisposition and circumstances in relation to retirement and rate of compensation. In chapter 3 they discuss the responsibility or culpability of delinquents; this should be of much value to judges of court-martial. It is the following chapter, however, on Mental Simulation that is of especial interest to psychiatrists, as heretofore too little attention has been paid to the psychotic elements involved in what appeared to be flagrant cases of malingering, in which the symptoms assumed were usually credited with conscious and malicious simulation in order to gain selfish or particular ends. The

authors found few of the simulators normal, the majority showed either a defective state or a real psychical disturbance which rendered them irresponsible for their acts, and what appeared to be symptoms assumed for utilitarian motives proved to be, in the majority of cases, phenomena that were either the incipients or residuals of fleeting psychopathic states, exaggerated perhaps by the coefficients of suggestibility or education (tricks taught them by others). In a detailed account of how mental simulation is manifested and recognized, and the method of conducting an examination, the psychiatrist is warned of the necessity of inquiring very carefully into the relation of the possible utilitarian motive exhibited and the circumstances of environment, in order to determine the mental state of an individual who would make such an inadequate and inefficient attempt at escape from social obligations. It is held that the medical rôle of a physician-psychiatrist has not ended with the detection and interpretation of simulated symptoms, that he must further consider the matter of reconstruction and of social adjustment. The authors omit all nosological and pedantic discussion, but the wealth of material makes the book of great documentary value and the whole problem of mental examinations is set forth in such clear and concise manner as to place within the grasp of all a subject with which physicians in general are too little familiar and have considered as yet too specialized.

MILDRED E. SCHEETZ

ST. ELIZABETH'S HOSPITAL

Neuroses et Psychoses de Guerre chez les Austro-Allemands. G. DUMAS & H. AIMÉ. Paris: Alcan, 1918. Pp. 242.

In this production Drs. Dumas and Aime have attempted the rather difficult task of reviewing an extensive summary by Dr. A. Birnbaum of Berlin, covering all phases of normal and pathological psychology as reported by over three hundred Austro-German physicians and psychiatrists. The German authors wrote with especial reference to mental disorders directly provoked by war or those brought about by its novel conditions and unusual situations. They observed a diminution of cases during the exhilaration of mobilization, not only among troops on the march, but also in prisons and sanitariums due, they believed, to the spirit of the times and the distraction of physical needs. They discuss at length the origin and syndromes of neurasthenia and neuro-psychic exhaustion states, and the relation of shell shock to the

neuroses of fear, traumatic neuroses and hysterical states, advancing theories very complicated and intricate.

A few authors attempt a logical explanation of an organic basis for psychic manifestations, but the majority favor the psychogenic theory. They considered the symptoms manifested due to a reactional state resulting not so much from the nature and force of the psychic traumatism but from the specific pathological constitution and character of the individual that suffered the trauma, the pathological emotional state being in the greater part only an augmentation of normal manifestations of fear and anguish and their effects on the vegetative and vasomotor systems.

The classification of these psychic pathological states is very vague and unsatisfactory and the French writers express themselves as astonished at the omission of any mention of *Verwirtheit* (confusion), which was noted so frequently in France, associated with the emotions and commotions of battle. They feel that the omission was not due to the fact that the Germans suffered less than the French in that way, but that Birhbaum consistently refused to distinguish it from hysteria, which has been so largely studied by the French.

Otherwise the facts afforded by the German neurologists resemble in all points those observed by the French neurologists. The latter believe that war produced many more neuro-psychic disturbances than were cited by the Germans, and they rather sarcastically remark that they believe the confused and illogical classification of the Germans was due to the fact that they had difficulty in properly interpreting their observations on account of their inability to gain access to French ideas and publications during the war.

MILDRED E. SCHEETZ

Les Maladies de l'Esprit et les Asthenies. A. DESCHAMPS. Paris: Alcan, 1919.

In this book the author presents a detailed study of the disturbances of mental function occurring in the asthenias. He substitutes the term asthenia for neurasthenia and includes in it psychasthenic states as well. The essential disturbance in asthenia lies in the function of the production or distribution of energy, whether or not associated with actual disease of the nervous system. The origin of this energy is one of the fundamental problems in pathology and physiology and the nervous system merely transmits

it. The term "nervous energy" then does not correspond to any reality and the terms "vital energy" or "biological energy" are used in this book to designate the mid-stages in the transformation of energy which begins as chemical activity in the body cells and ends in heat and movement. When the chemical energy is defective the kinetic energy is insufficient and we have a condition of asthenia. It is granted that asthenia of purely psychic origin may occur but the question is raised as to whether in such cases there may not be minute physical changes that we have been unable to detect. The indivisibility of mind and body is insisted upon and psychophysical parallelism is disposed of as an anthropomorphic error. Speculations as to the ultimate nature of physical and psychic energy are of no scientific value, being metaphysical, but the relationships between different forms of energy are legitimate objects for scientific study.

The asthenias are divided into two main groups; (1) the symptomatic (following exhaustion, infections, secretory disturbances, organic illness); and (2) the idiopathic (resulting from a constitutional insufficiency, an inherent incapacity for as great a production and distribution of energy as is found in the average individual). They may be acute, chronic or intermittent.

Following two introductory chapters comes the first main division of the book, a presentation of the psychopathology of asthenia. Mental activity must be studied through the adaptation of the individual to his environment. It has no spontaneous existence but consists of the incessant experiences which occur during this process of adaptation, and can be divided into two groups: (1) internal experiences (intelligence, sensibility, will), psychological activity; and (2) external experiences or logical activity (the art of applying psychic states to social life). The disturbances of internal experiences are traced back to a fundamental defect, a diminution of the power to *construct* thoughts (or any forms of psychological activity) in complete adaptation to reality. This condition is contrasted with hysteria where the defect consists in a diminution of the power to *receive* conscious impressions from stimuli. The asthenic receives impressions but fails to construct relationships between the objects and himself. The result is a diminution of the power of constructive or creative consciousness with an increase of subconscious activity, a regression to a lower form of activity, for the subconscious is conceived of as forming the transition between biological and psychological phe-

nomena. All psychological activity is laborious, an insufficiency marks all intellectual, affective, psycho-motor and voluntary activity. This psychic insufficiency rests upon a more fundamental psycho-physical insufficiency which in turn is dependent upon inherited or acquired physical or organic inferiorities. The result is a diminution of the energy (psycho-physical tension) which is necessary for the functioning of the cerebral organs. The assumed fundamental physical defects have not been demonstrated anatomically and the author suggests that they may be of physiological or physico-chemical origin, a functional insufficiency.

Different forms of intellectual, affective and psycho-motor activity are discussed in detail with reference to cases showing abnormal function and then the disturbances of external experiences are presented, the paralogisms and reactions of inadaptation. The latter may be diffuse or well systematized with the production of obsessions, phobias, tics, etc. The same fundamental defect is found in external experiences, a diminution of the constructive power due to the primary insufficiency.

The second part of the book is devoted to an interpretation of the phenomena observed in the asthenias and to grouping and classifying experimental groups of syndromes in such a way as to show the unity of the psychic pathology and psychic function underlying the great complexity of the phenomena. The attempt is made to show the relationships rather than to attempt to explain the phenomena.

In classifying psycho-pathological states the term *dyspsychisms* is used to include all disturbances of psychic function. These can be accidental and symptomatic or permanent and idiopathic. For the latter he proposes the term *psychic miopraxy*.

The third part of the book deals with therapy and some general conclusions. The importance of treating the physical conditions is emphasized first and then psychotherapeutic methods and tactics are discussed in relation to each form of dyspsychism. The object of all psychotherapy is *conversion*, the substitution of true ideas for false ones, a new belief. The importance of conversion and faith have long been realized by theologians but more or less neglected by psychologists. Belief is given a very prominent place among psychological phenomena. To it is attributed the force that mobilizes mind and body. For the author it takes the place given to the wish in the Freudian psychology and he does not discuss the influence of the wish in modifying the belief. Psychoanalysis is

grouped with suggestion, persuasion, reëducation, etc., as one of the partial methods which really have for an end conversion. The author does not find that the study of dreams gives any special information concerning dissociated subconscious mental activity (called automatisms by him and complexes in the Freudian terminology).

The importance of avoiding any definite system of treatment and the necessity for careful study of each individual is emphasized frequently, any method being valuable which will help the individual to adapt himself to reality and to know his own powers and weaknesses so that he may avoid situations which put too great a tax upon "the defective instrument which nature has given him."

HELEN D. CLARKE KEMPF

Rational Sex Ethics: Further Investigations. W. F. ROBIE. Boston: Badger, 1919. Pp. 330.

Sane Sex Life and Sane Sex Living. H. W. LONG. Boston: Badger, 1919. Pp. 157.

These two works contain advice on sexual conduct. Both are frank, in some parts they are more blunt than appears necessary. To the sexual anchorite parts of both books may appear disgusting, some may find nothing not already known to them, but ordinary men and women will discover facts applicable to their own sexual lives that many years of married (or other sex) experience may not teach them. Ignorance and prudishness need not be replaced by licentiousness, either mental or physical, and by obscenity, but they should be replaced by knowledge. The sex desires condition to such a great extent all, or most, of our actions, and sex relations are so important in art and literature and in religion that they cannot be disregarded by anyone pretending to have an interest in things as they are.

Dr. Robie is an adherent of some of the Freudian doctrines, but not to those that he considers extreme. He uses a modified form of psychoanalysis to discover hidden "complexes," and uses dream analysis for the same purpose. He recommends auto-erotic gratification for certain people under certain conditions, and would have the sexual life of the individual regulated so as to bring about in him the maximum of pleasure or happiness.

Dr. Long's book was first written for and in manuscript form was placed in the hands of those who sought his professional advice. After many readings it was prepared for publication, but in its

publication neither author nor publisher corrected proof in a proper manner for it is replete with errors in spelling and punctuation. The price of the work (\$5.00) as compared with its size (157 pages) and ordinary binding would lead to the guess that the author is receiving from the publisher the equivalent of an office fee for each book that is sold. This method is commended to the consideration of all those psychologists who write books on applied psychology.

Long makes many assertions without explanations, and gives his opinions as if they were matters of fact. Perhaps at the present time when there is so much prejudice and misinformation about sexual functions, accuracy may have to be sacrificed in favor of positiveness, but since the book is dedicated to the medical profession and to those who may read it under the direction of physicians it would have been better to be less positive about certain little understood phenomena.

SHEPHERD IVORY FRANZ

NOTES AND NEWS

THE present number of the *BULLETIN*, dealing with psychopathology, was prepared under the editorial direction of Dr. E. E. Southard, of the Harvard Medical School.

THE May number of the *BULLETIN*, dealing with comparative psychology, was prepared under the editorial direction of Professor W. S. Hunter, of the University of Kansas.

THE March number of the *BULLETIN*, dealing with social and religious psychology, was prepared under the editorial direction of Professor J. H. Leuba, of Bryn Mawr College.

ANNOUNCEMENT has been made of the marriage of Dr. Josephine S. Curtis, of the Boston Psychopathic Hospital, and Dr. W. S. Foster, at present Major, Sanitary Corps, U. S. A.

THE following items have been taken from the Press:

DR. J. V. BREITWEISER, professor of psychology and education at Colorado College, has been appointed associate professor of education in the University of California.

THE University of Minnesota has announced that five teaching fellowships will be awarded in the department of psychology. The conditions under which awards are to be made may be obtained from the chairman of the department.

PROFESSOR R. H. WHEELER, of the University of Oregon, has returned to take up his work at the University.

DR. F. L. WELLS, of the McLean Hospital, has been released from the Army and has returned to his position at that institution.

DR. PAUL CARUS, editor of the *Open Court* and the *Monist*, died on February 11, aged 68 years.

DR. JAMES DREVER has been appointed Coombe lecturer in psychology at the University of Edinburgh.

PROFESSOR J. R. ANGELL, of the University of Chicago, has been appointed chairman of the National Research Council, and will have duties for the year at the Council headquarters, Washington, D. C.

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THE PSYCHOLOGICAL BULLETIN

A MULTIPLE UNIT SYSTEM OF MAZE CONSTRUCTION

BY R. H. STETSON AND J. F. DASHIELL

Oberlin College

The maze mode of experimentation is one that has had a great deal of use in the psychology of recent years. It may be said to have established itself pretty definitely among the methods of the laboratory. The general idea was used by Thorndike, when doing his pioneer work on animals, in the form of a simple pen or labyrinth for chicks formed of books-on-end. Small and Kinnamon did early work on animals with more elaborate mazes, particularly of the well-known Hampton Court pattern. This and other forms were used for work on various animals by Porter, Rouse, Allen, Sackett, Watson, Carr, Peterson, Vincent, Richardson, and others; and Watson and his students, including Bassett, Hubbert, and Lashley, have been using mazes built on the plan of concentric circles.

This type of apparatus has recommended itself as peculiarly well adapted for the study of habit formation in animals. In the successive trials of a subject to thread his way through the complex passage-ways to reach his goal, the time consumed in each trial, the errors or ineffective variations made, and the distance covered, are all subject to exact measurement and record. The rate of progress is thus accurately indicated, and many of the technical problems connected with learning are readily approachable (*e.g.*, correlation of rate of learning with age, with temporal distribution of trials, with species of animal used, with kinds of incentives employed, etc.). Simple mazes have also been used by Yerkes for studying sensory discriminations.

The applicability of the labyrinth method to the study of human learning came to be appreciated in time, and some of the problems

of experimental pedagogy, for instance, have been given a fresh approach thereby (Perrin, Pechstein, Webb, and others).

From the first, one characteristic has been true of all the mazes used: they have been built in more or less permanent and unchangeable form. Perhaps most have been of solid wood walls nailed to

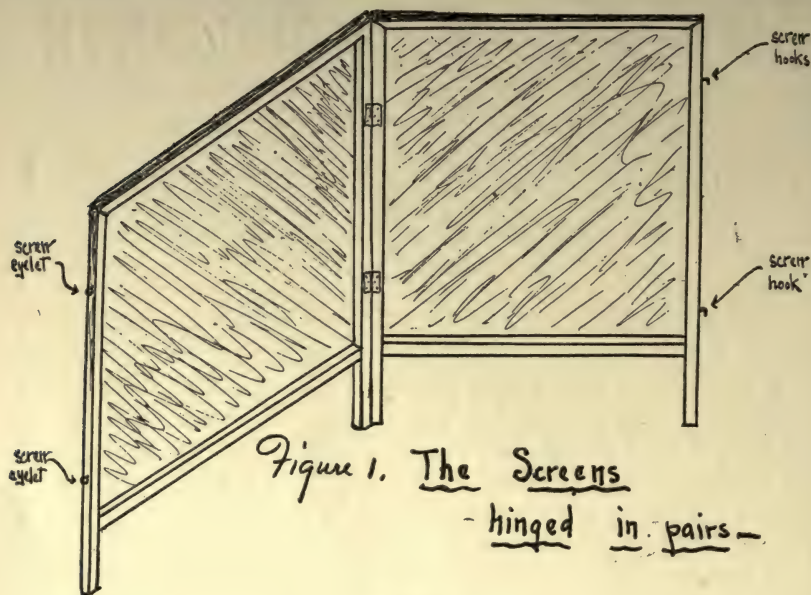


FIG. 1

the floor, some have been of wire mesh, some of solid aluminum, etc. A few investigators have introduced minor adjustable arrangements, as to change lengths of blind alleys (Peterson) or to close at will passageways from one to another part (Pechstein). But the full possibilities of the maze method were by no means exhausted as long as the apparatus was constructed completely or almost completely solid and unchangeable. The idea of setting an animal different kinds of problems in his maze learning has heretofore called for the separate construction of each pattern to be used. Besides the inconvenience, the expensiveness of using many different patterns has been an obstacle.

It is with a view to helping to meet these difficulties that the writers have developed a departure in the method of constructing mazes: what may be called a multiple unit system, whereby an indefinite number of different patterns may be built without tools

and within a few minutes for each, from a single set of materials. The idea originated with one of the authors¹ when seeking for a practicable maze in the study of kindergarten children. What was needed was a set of mazes that could be erected in any fairly large room by kindergarten teachers-in-training, could be packed away

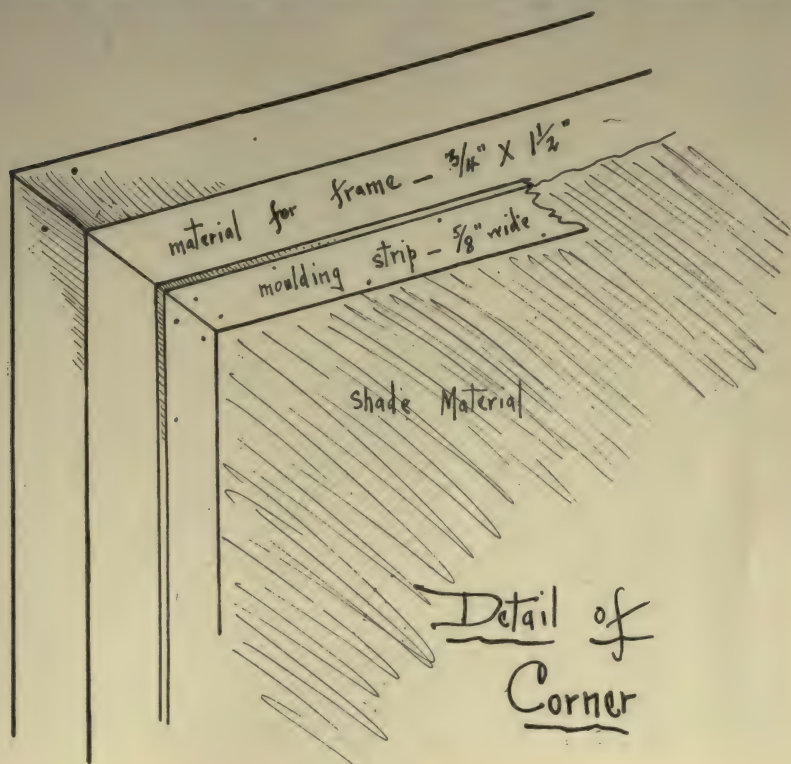


FIG. 2

in small space when not used, and could be adjustable (to study, *e.g.*, the relations of one simple habit learned to another to be learned).

The idea took the following shape. Upon a wooden frame 36" x 44" was mounted a nearly square piece of Holland shade material. The frame was raised from the floor upon legs 4" long (to protect the cloth from children's shoes), making the total height 48", and presenting an appearance not unlike a common form of household screen. At one end or side of each frame, or unit, were

¹ R. H. Stetson.

attached two screw eyelets, at the opposite end, two screw hooks. A few of the units were joined together in pairs by hinges replacing the hooks and eyelets. To erect a maze, one had only to find a floor space of suitable size; lay out his pattern on paper; and then stand up one unit at a time upon its legs, attaching it at one or both ends to other units. A partition of, say, 18 feet length would thus be constructed by successively attaching 6 units end to end, and any third partition branching off one either side would be begun by attaching a new unit at the hook-and-eyelet connection between two of the original units.

Figure 1 shows a draughtsman's sketch of units viewed as wholes, and Figure 2 shows the details of construction.

Figures 3 and 4 show photographs of the human maze material as set up in two typical ways used in the Oberlin College laboratory

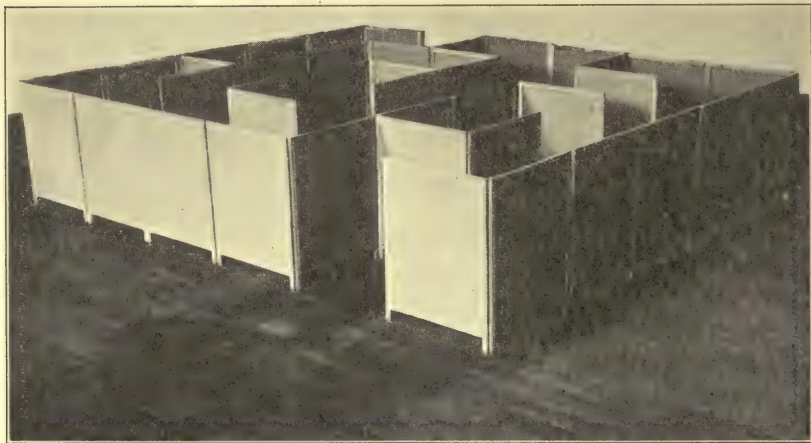


FIG. 3

and in the Oberlin Kindergarten Training School—on a rectangular plan and on an irregular plan. (The “bulging” appearance of top of maze is due to the elevation of camera.)

This set of materials has been used with children by both writers quite satisfactorily. Some of the types of problems approachable made with it will be suggested below.

The fundamental idea of the children's maze just described was found readily applicable to the study of the behavior of white rats by one of the authors.² The practical problem here was to find the

² J. F. Dashiell.

kinds of material that could be made up in a similar fashion on a much smaller scale and for a different kind of species. The solution was worked out as follows: The floor was cut from the composition cork flooring commonly used in libraries and other public buildings and mounted upon a flat wooden base. This could be made any desired size; that used here was a square 30" x 30". The partition units were squares 4" x 4" of galvanized iron with two 3'8" steel

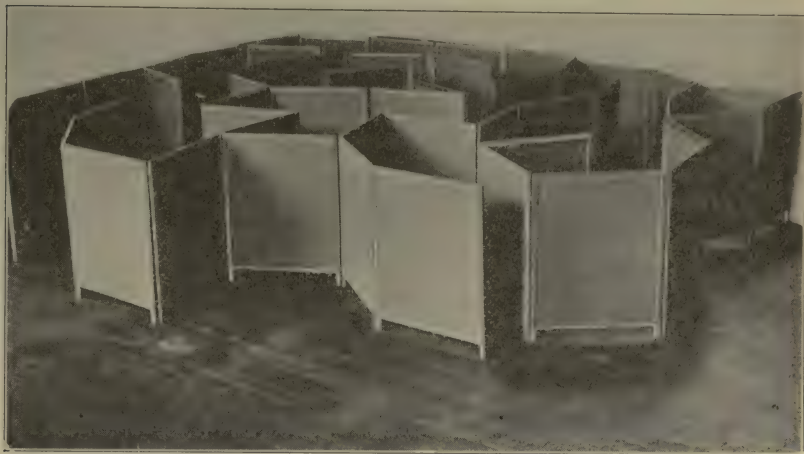


FIG. 4

points soldered into small slits on the edge to be used as the bottom. The units were easily curved in a tinner's roller for maze patterns calling for curving paths.

The assembling of a fairly complicated maze was a matter of less than thirty minutes. Light pencil lines were drawn on the cork composition flooring according to the design to be used, and the iron squares set end to end along these lines with their steel points driven easily into the floor. Extra rigidity and evenness was secured by two simple devices: round paper clips attached at the top of each end-to-end joint, and tin strips 4" x 1" bent at the desired angle (usually 90°) down the middle lengthwise, placed at the corners of the walls, and secured with paper clips of the sort mentioned. Over all was laid a cover of glass the size of the floor. When finally set up the maze had a surprising degree of rigidity, equal to the most violent assaults of any animal small enough to move inside—and white rats do not make violent assaults. Scep-

ticism as to whether the unpainted iron square, tin strips, or paper clips might not form disturbing elements has been dispelled by careful observations throughout several extended experiments.

Figures 5 and 6 show photographs of the animal maze material as set up in two typical ways. The rectangular arrangement is one of a great variety that have been used in the Oberlin laboratory.

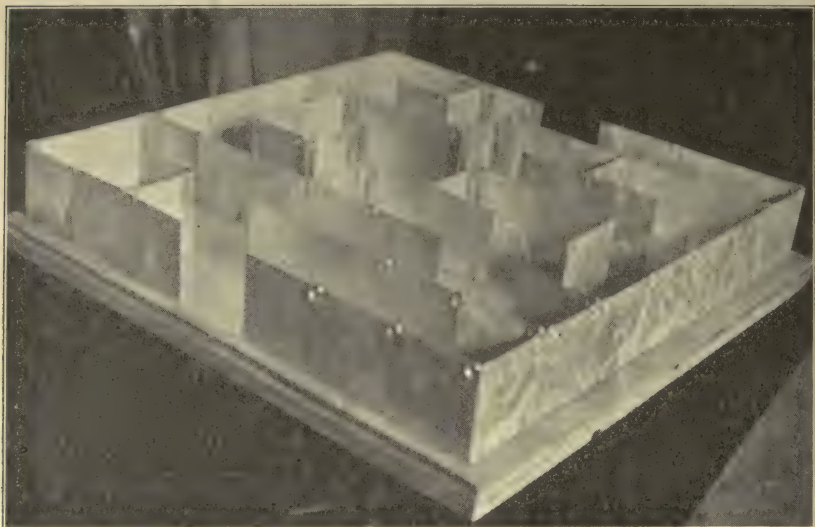


FIG. 5

The circular arrangement is an adaptation (somewhat simplified) of the type of maze developed in the Johns Hopkins laboratory. Figure 6 shows glass cover in place.

The advantages secured by use of the multiple unit system of construction are, first, economy of effort, time, and expense over the usual methods of construction of mazes; and, second, increase in range of problems approachable.

The cost of a human maze like that described should be between \$1.25 and \$1.50 per unit; that of the animal maze should be under \$10.00 for an outfit of the dimensions described in this paper (30" x 30" floor and top with about 65 units and the necessary clips and corner pieces). Either set of maze material is to be readily made up by a good cabinet maker or tinner.

To elaborate the second point somewhat:

1. Comparative studies of the learning processes of animal and

human subjects have recently been made by Hamilton, Hunter, and Yerkes with other than maze apparatus, and by Hicks, Perrin, Pechstein, Webb, and others with mazes; but the writers believe that more completely comparable maze situations than those of the latter are provided by using the multiple unit forms. Some comparative observations on white rats and kindergarten children have been made in the Oberlin College laboratory and in the Oberlin Kindergarten Training School that may be extended and published in the future.

2. The readiness with which all parts of the mazes can at any time be redistributed without change of pattern, offers excellent opportunities for isolating and checking many of the subtle factors that may or may not operate in maze running; especially incidental sensory elements such as visual cues in human and olfactory and visual cues in animal learning. Some attention has been given to

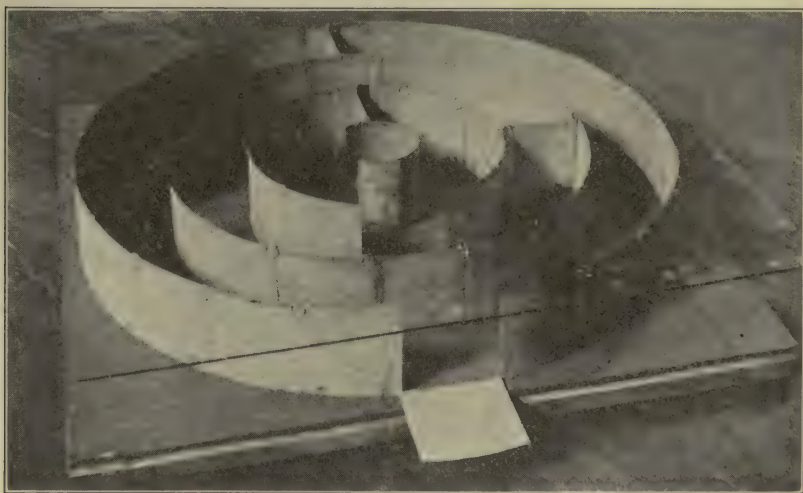


FIG. 6

these possibilities by the writers. In a preliminary way it may be stated that frequent 'shuffling' and redistribution of maze parts tends to show that such sensory cues as those just mentioned play a surprisingly little part in the learning of a maze.

3. The readiness with which the patterns of the mazes can be rearranged suggests at once a fuller opportunity for the study of the inter-relations between different processes of habit formations

than has yet been had. Results of experiments on transfer factors between habits and on comparison of two different modes of learning a given pair of mazes are about to be published.

4. The facility with which multiple unit mazes can be altered indefinitely in a few minutes has opened up a field of quite new problems—an intensive study of the many elements and details involved in the lay-out of a maze situation. Publication is to be made shortly of studies carried on in the Oberlin laboratory of the comparative values of different arrangements of cul-de-sacs.

It may be noted in closing that the writers are at present working on further extensions of the multiple unit idea: to the construction of a pencil maze for experimentation on adults, and to the construction of a tri-dimensional maze for the study of the behavior of rats in a more complicated situation than is afforded by labyrinths built upon the one plane only.

TWO MODELS SHOWING THE INTERRELATION OF SEVERAL SIGNIFICANT CORRELATION VARIABLES¹

BY ARTHUR W. KORNHAUSER, FRANKLYN MEINE,
AND BEARDSLEY RUML,

Carnegie Institute of Technology

With the strong impetus which mental testing has received during the past year or two, the importance of correlation as a psychological instrument has become more commonly recognized than ever before. At the same time, students of statistical method appreciate the dangers involved in the widespread use of correlation coefficients by those who have not sufficiently mastered the significance and limitations of ' r ' which do not appear from the mere use of a handy formula. Our psychological literature contains no end of studies, for example, where thoroughly unjustified conclusions are drawn on the basis of the correlation coefficients alone, no mention being made of the probable error of r , of the standard deviations of the variables, of the regression equations, of the standard error of estimation, or even of the precise nature of the group measured. Correlations obtained on heterogeneous material are used for predicting relationship in more homogeneous

¹The models here presented were constructed in connection with a course in biometric methods given by Dr. Beardsley Ruml at Carnegie Institute of Technology.

material; equal correlation coefficients are presumed to indicate equal relationship without respect to the distribution of the variables involved. In order to make a little more clear the complexity of r and the wide possibilities of variations not depicted by it alone, we have considered it worth while constructing two models of the important variables involved.

MODEL A

Showing Types of Frequency Surfaces and the Meaning of r , σ_x , and s_x .

The model (Plate I.) represents a scatter diagram in three dimensions. The X -arrays (rows) are shown as small frequency surfaces. The sum of all such partial frequency curves is the



FIG. 1

total X -distribution and is shown as the large frequency surface at the top of the model. Evidently the Y -distribution is a surface in which each interval has the frequency of that particular array of X 's. Only one regression line ($X = b_{xy}Y$) is shown and we shall assume in this discussion that the relation dealt with is that of X to Y rather than the reverse. As its most general function the model enables one to appreciate vividly the nature of a correlation table as a three-dimensional relation.

When set with any particular combination of curves the model represents a specific contingency table or frequency surface. The precise shape of this surface may be varied *ad infinitum* so that it may be made to approximate any contingency distribution actually encountered. The model, in addition to the general aid it gives in understanding the contingency relation, is of value in two directions: (1) it illustrates the innumerable possibilities of frequency surfaces and shows the special significance of each; (2) it indicates the interdependent changes in the values of the three variables— r , σ_x , and s_x .

1. As the model is now arranged the Y -variable is assumed to be distributed in the form of the normal curve and the X -variable in the form shown by the large curve of the total X -distribution. The small curves represent the distribution of X -values for the particular arrays indicated. The following properties may be noted in this regression: the means of the arrays (small curves) fall along a straight line (linear); the standard deviation or σ of the arrays does not change (homoscedastic); some of the array curves are skewed (allikurtic); the skewness is not equal throughout, some arrays being skewed positively and some negatively (heteroclitic); the change in skewness is continuous or regular (nomic). In a similar manner any regression may be completely described.¹

It should be noted that strictly speaking we have not fully described any correlation surface without all these items. Practically, of course, such procedure is ordinarily out of the question. The important point, however, is that we recognize the existence of this tremendous complexity and do, in view of these facts, exercise the utmost caution in drawing general conclusions from correlation figures. The fact, for example, that we do not care to sacrifice the time necessary to apply a test for linearity in the case of every regression does not mean that we should not be ever on the alert to avoid incorrect inferences as to the degree of relationship and reliability of prediction due to unjustified assumptions of linearity. The same applies of course, to all the other less clearly recognized variations in contingency tables.

2. The three important variables mentioned (r , σ_x , and s_x) are easily explained from the model. The rod passing through the

¹ The corresponding opposites of the terms here used are: non-linear, heteroscedastic, isokurtic, homoclitic, and anomic. The terminology is that of Pearson (Draper's Company Research Memoirs, Biometric Series II., 1905).

mean points of all the small array-curves represents the regression line. The slope of this line to the Y -axis is the regression coefficient, b_{xy} . r bears the simple relation to b_{xy} expressed by the equation $b_{xy} = \sigma_x/\sigma_y r$. σ_x is seen directly as the standard deviation of the large curve at the back of the model. s_x is the weighted average of the standard deviations of the array-curves. s_x is known as the standard error of estimation of X -values. It is readily derived from the formula $s_x = \sigma_x \sqrt{1 - r^2}$. This standard error of estimation is a kind of average of the standard deviations of all the rows of X -values and hence in the usual case of frequency surfaces of more or less uniform scatter it is roughly equal to the standard deviation of each array (each small curve in the model). s_x is the standard deviation of $(X - b_{xy}Y)$, *i.e.*, the standard deviation of the distances of the true X 's from the predicted X 's. The standard error, represented by E , is a pure number and is simply the ratio of s_x to σ_x or of s_y to σ_y , *i.e.*, $E = \sqrt{1 - r^2}$.

The interdependent changes in these variables may be observed in the model.²

By keeping constant any one of the three variables involved we may readily note the relation of changes in the other two. (σ_y is also constant, of course, by the nature of the model.) For example, if the standard error of estimation (s_x) remains constant it may at once be seen that increasing the scatter of the X -variable (σ_x) necessitates a corresponding increase of r by revolving the regression line away from the Y -axis. Similarly, if the standard deviation of the X -variable remains constant, it is evident that decreasing r (revolving the regression line toward the Y -axis, that is) necessitates increasing the scatter in the arrays, *i.e.*, increasing the standard error of estimation. For constant r , finally, note that the larger the standard deviation of the total distribution the larger the standard error. The model enables one by changing these variables to note their interrelations under various conditions of linearity, scatter, and so on. The quantitative relation of the variations is not shown, however, in this model.

MODEL B

The Relation of the Variables r , σ_x , and s_x

The model (Plate II) is a three-dimensional graph of the formula, $s_x = \sigma_x \sqrt{1 - r^2}$. r is measured to the right and left from zero at the center; σ_x is measured from front to rear; s_x is measured vertically upward.

²The mathematical relations are shown graphically in Model B.

The surface for constant r , seen by passing a vertical plane perpendicular to the back of the model, is perhaps the most obvious and least interesting. The relation is linear, indicating that increase in σ_x is accompanied by a proportional increase in s_x .

The surface for constant σ_x , any vertical plane parallel to the one formed by the back of the model, is more important. This indicates that as r decreases from $+1.0$ or increases from -1.0 , the standard error increases with extreme rapidity. Concretely, when r is equal to $.86$, the standard error is half as great as it ever will be; when r equals $.50$, the standard error is seven-eighths its maximum size. The amount of error made in predicting from the regression equation on the basis of a correlation of $.44$ is nine tenths

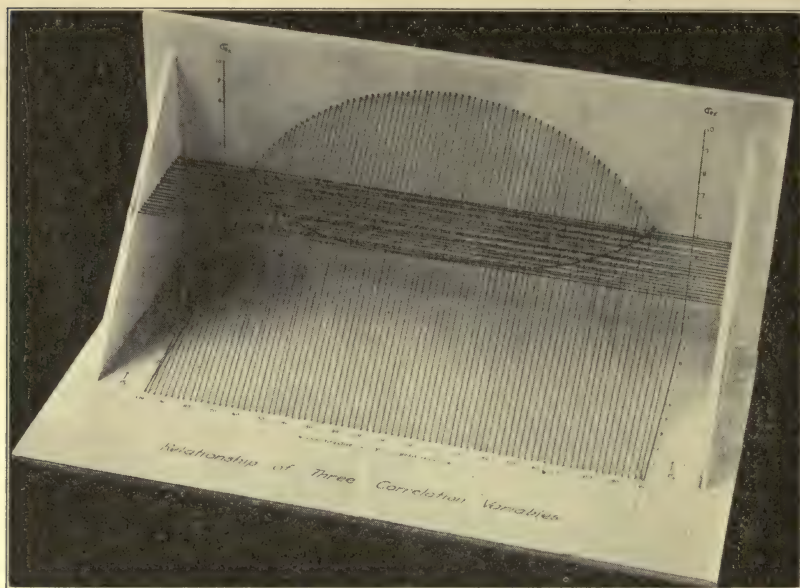


FIG. 2.

as great as the error made in guessing on the basis of no information whatever. The relation, as seen on the back of the model, is a semicircle if σ_x be measured in terms of s_x .

The surface for constant s_x , any horizontal plane such as the one shown (red in the actual model), is also of great importance. If the error of estimation be constant, as it is in homoscedastic regressions, r will change markedly with slight changes in σ_x , the

increase being most striking for those values of σ_x slightly larger than s_x . Concretely, when $\sigma_x = s_x$, $r = 0.0$; when σ_x is increased from this value by one tenth, r is increased from 0.0 to .45. Thus with a constant standard error of estimation, the correlation coefficient increases with the standard deviation of the group and approaches 1.00 as a limit when σ_x approaches infinity. The relation is parabolic.

A SCORING METHOD FOR MENTAL TESTS

BY L. L. THURSTONE

Carnegie Institute of Technology

Much has been said about the weighting of a series of mental tests so as to obtain the highest possible correlation between a criterion and a group of tests. This is accomplished by multiple correlation. Now, why should we not apply the same technique in ascertaining how much to penalize for errors in a single test in order to obtain the highest correlation with the criterion? How many mental test correlations could have been raised if the test had been scored in some other way?

Let us consider the number of right responses and the number of wrong responses as two independent variables which are to be weighted to obtain the dependent variable, the score. The weighting should be such that the score will give the highest possible correlation with the criterion. This is our problem.

We shall work with the general scoring formula $S = R + CW$, in which S is the score, R is the number of right responses, W is the number of wrong responses, and C is a constant which determines how much we shall penalize for errors. The constant C is usually negative.

Our first problem is to obtain a general expression for the correlation between the test score and the criterion. In other words we want to express the correlation $r_{I(R+CW)}$ between the criterion I and the score $(R + CW)$ in terms of the six fundamental constants which we shall assume to be given, namely r_{IR} , r_{IW} , r_{RW} , σ_R , σ_W , σ_I .

Remember that

$$r_{xy} = \frac{\Sigma xy}{n \cdot \sigma_x \cdot \sigma_y}.$$

Therefore

$$\begin{aligned}
 r_{I(R+CW)} &= \frac{\Sigma I(R + CW)}{n \cdot \sigma_I \cdot \sigma_{(R+CW)}} \\
 &= \frac{\Sigma IR + C \Sigma IW}{n \cdot \sigma_I \cdot \sigma_{(R+CW)}} \\
 &= \frac{n \cdot r_{IR} \cdot \sigma_I \cdot \sigma_R + C \cdot n \cdot r_{IW} \cdot \sigma_I \cdot \sigma_W}{n \cdot \sigma_I \cdot \sigma_{(R+CW)}} \\
 &= \frac{r_{IR} \cdot \sigma_R + C \cdot r_{IW} \cdot \sigma_W}{\sigma_{(R+CW)}}
 \end{aligned}$$

But since

$$\begin{aligned}
 \sigma_{(R+CW)} &= \sqrt{\frac{\Sigma (R + CW)^2}{n}} \\
 &= \sqrt{\sigma_R^2 + 2 \cdot C \cdot r_{RW} \cdot \sigma_R \cdot \sigma_W + C^2 \cdot \sigma_W^2}
 \end{aligned}$$

we have

$$r_{I(R+CW)} = \frac{r_{IR} \cdot \sigma_R + C \cdot r_{IW} \cdot \sigma_W}{\sqrt{\sigma_R^2 + 2 \cdot C \cdot r_{RW} \cdot \sigma_R \cdot \sigma_W + C^2 \cdot \sigma_W^2}}, \quad (1)$$

which is the relation sought.

Equation 1 is the equation of the curve in the accompanying figure.¹ This equation enables us to determine just what correlation we should have for any specified weighting of C . Suppose that we have the six fundamental constants enumerated above and that we give one point credit for each correct response and penalize 1/2 point for each error. We should then be using the scoring formula $S = R - 1/2 W$ in which the constant C has the numerical value $-1/2$. Substitute the value for C together with the other six constants in equation 1 and determine the correlation with the criterion. This saves us the labor of rescoring all the test papers and it saves us the trouble of calculating the extra coefficient.

In order to show the effect of different methods of scoring a test I have plotted equation 1 for the Number Completion test which is similar to one of the tests in the Army Alpha. I gave this test among many others to the freshman class at the Margaret Morrison School for Women at Carnegie Institute of Technology in November, 1917. The criterion against which the test was correlated in this case was the pooled instructors' estimates of the stu-

¹ I am indebted to Professor T. L. Kelley for valuable hints in deriving equation 1.

dents. The six fundamental constants for the Number Completion test are:

$$\begin{aligned} r_{IR} &= +.40, & \sigma_I &= 2.10, \\ r_{IW} &= -.10, & \sigma_R &= 3.19, \\ r_{RW} &= -.51, & \sigma_W &= 3.28. \end{aligned}$$

If we substitute different values for C in equation 1 we soon find that the correlation between the criterion and this test is very seriously affected by assuming a scoring method at random. I dare

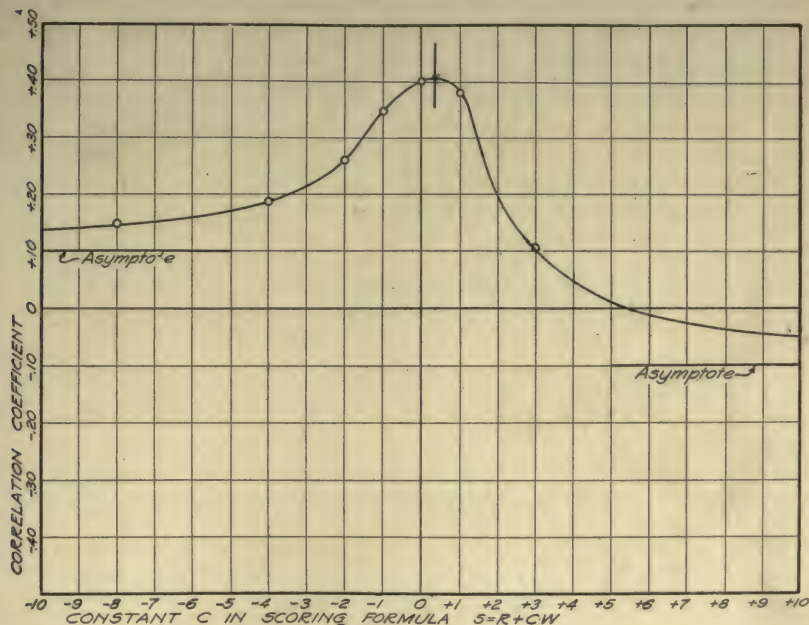


FIG. 1

say that many good tests have been discarded as useless owing to the unfortunate scoring method guessed at and adopted by the investigator.

Our next problem is to ascertain the scoring method which gives the highest correlation with the criterion. This is answered by finding that value for C at which $r_{I(R+CW)}$ becomes a maximum.

If we find the first derivative of $r_{I(R+CW)}$ in equation 1 with respect to C , equate it to zero, and solve for C we have

$$C = \frac{\sigma_R(r_{IR} \cdot r_{RW} - r_{IW})}{\sigma_W(r_{IW} \cdot r_{RW} - r_{IR})}. \quad (2)$$

This is a practical formula by which we may determine how to score our tests. Substitute the numerical value of C as found by this formula in the general scoring formula $S = R + CW$. If we determine our scoring method by equation 2 we shall be certain that we have selected the best possible scoring method for the test. If the test fails, the failure is not due to the scoring method. This assumes, of course, that the best scoring formula is of a linear form. Applying equation 2 to the Number Completion Test reveals the fact that it should be scored $S = R + 0.4 W$. In other words, we should allow some partial credit for each mistake instead of penalizing for errors. Speed in this test is apparently a significant factor although not as important, of course, as accurate speed.

Now suppose that we have determined our best scoring formula and find it to be, say, $S = R + 0.4 W$. Our next problem is to ascertain how much the correlation $r_{I(R+CW)}$ would be affected if we should use an approximation such as $S = R + 1/2 W$. If a test is extensively used we might prepare a table with two coordinates, R and W , and with the score S inserted in the squares of the table, thus avoiding calculation for each test paper. But if we calculate the score for each subject we should know the relative degree of sensitiveness of the scoring method. One obvious answer is to inspect the curve. If the slopes of the curve are steep on either side of the maximum ordinate the scoring is sensitive, otherwise it is not.

It is of some interest to ascertain at what numerical value of C the correlation $r_{I(R+CW)}$ becomes zero, especially since the calculation is easily made. From equation 1 we see that $r_{I(R+CW)}$ becomes zero when

$$r_{IR} \cdot \sigma_R + C \cdot r_{IW} \cdot \sigma_W = 0.$$

This condition obtains when

$$C = \frac{-r_{IR} \cdot \sigma_R}{r_{IW} \cdot \sigma_W}. \quad (3)$$

Let us consider a practical application of equation 3. One of our best mental tests for adults is a syllogism test. It is best scored $S = r - 1.63 W$ as standardized on high-school seniors. Now suppose that we should score this test only on the basis of speed, *i.e.*, the amount done in unit time. This is equivalent to the scoring formula $S = R + W$ in which C is assumed to be unity. The six fundamental constants are:

$$\begin{aligned}
 r_{IR} &= -0.21, & \sigma_I &= 1.73, \\
 r_{RW} &= +0.08, & \sigma_R &= 2.87, \\
 r_{IW} &= +0.29, & \sigma_W &= 2.31,
 \end{aligned}$$

Solving for C in equation 3 we find that the correlation $r_{I(R+CW)}$ is zero when the constant C is $+0.9$ which is dangerously near the value of C in the above assumption. Hence we conclude without even calculating the coefficient $r_{I(R+CW)}$ that it will be close to zero, but this should not justify discarding the test until the most advantageous value of C has been determined by equation 2.

When the best scoring method has been ascertained by equation 2 we want to know what correlation the test will yield if we do use the best scoring method. This can be ascertained by the standard equations of multiple correlation for three variables. Writing Yule's equation with our present notation we have

$$R_{I(R+CW)} = \sqrt{1 - (1 - r_{IR}^2)(1 - r_{I(CW) \cdot R}^2)}$$

in which $r_{I(CW) \cdot R}$ is a coefficient of the first order. Substituting the best value of C for equation 2 in the above equation and remembering that $r_{I(CW)}$ is identical with r_{IW} since C is a constant, we have

$$R_{I(R+CW)} = \sqrt{\frac{r_{IR}^2 + r_{IW}^2 - 2 \cdot r_{IW} \cdot r_{IR} \cdot r_{RW}}{1 - r_{RW}^2}}, \quad (4)$$

which gives the highest correlation obtainable with a linear scoring formula. Equation 4 gives exactly the same value for $R_{I(R+CW)}$ as is obtained by the more usual multiple correlation formulæ. Its advantage is in being expressed in terms of the six fundamental constants with which we start.

The asymptotes of the curve are of some statistical interest. When the constant C becomes infinite the correlation between the test score and the criterion becomes identical with the correlation r_{IW} . Since the correlation between errors and the criterion is usually negative the curve is usually asymptotic to a horizontal line at the negative value of the correlation r_{IW} . When the constant C becomes minus infinity the score is proportional to $-W$. Since the correlation between the criterion and errors is usually negative, the correlation between the criterion and the score with the constant C taken as minus infinity, is positive. Hence the curve is usually asymptotic on the negative side of C to a horizontal line at the positive value of the correlation coefficient r_{IW} with its sign reversed.

The curve may be constructed roughly on the basis of the three fundamental correlation coefficients. The y -intercept is the correlation r_{IR} . The maximum ordinate of the curve is easily ascertained from equation 4. The value of C at this maximum ordinate of the curve is ascertained from equation 2. The asymptote on the positive side of C is the correlation coefficient r_{IW} . This is usually negative. The asymptote of the curve on the negative side of the constant C is the correlation coefficient r_{IW} with its sign reversed. This is usually positive. The x -intercept is determined by the equation 3. This procedure gives five significant points on the curve from which it may be sketched.

PARTIAL CORRELATIONS ON A SLIDE RULE

BY HAROLD E. BURTT

Ohio State University

The writer was recently surprised to find that he could compute partial correlations with a ten-inch slide rule as rapidly and as accurately as with Kelley's tables.¹ The formula most used in such computation is of the form:

$$r_{12 \cdot 3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{1 - r_{13}^2} \sqrt{1 - r_{23}^2}},$$

which gives the correlation between variables 1 and 2 with the effect of variable 3 eliminated. The formula for coefficients of higher order such as $r_{12 \cdot 345}$ is in exactly this form and the method and labor of solving the fraction does not depend at all on the order of coefficients involved. Kelley divides the fraction into two parts:

$$r_{12 \cdot 3} = r_{12} \frac{1}{\sqrt{1 - r_{13}^2} \sqrt{1 - r_{23}^2}} - \frac{r_{13}r_{23}}{\sqrt{1 - r_{13}^2} \sqrt{1 - r_{23}^2}}.$$

He designates the fractional part of the first term by **A** and the second term by **B** and in the tables gives these **A** and **B** values for all pairs of two-place decimals from .00 to 1.00. After the three coefficients that enter into a given formula are found (either from original data of zero order or partial coefficients of order lower than the one to be computed) it is necessary to look up in the tables the

¹ KELLEY, T. L. "Tables : To Facilitate the Calculation of Partial Coefficients of Correlation and Regression Equations." *Bull. of the Univ. of Texas*, 1916.

value of A corresponding to two of them, multiply by the third and subtract the corresponding B value. The answer is usually taken to the nearest two decimal places and used in the determination of other coefficients of the next higher order. The work of any considerable interpolation in the tables is prohibitive and probably unnecessary.

In the slide rule method it is first necessary to make a table of values of $\sqrt{1-r^2}$ as r varies from .00 to 1.00. Such a table is given in Kelley's monograph but one can be made in less than an hour either by reading the double scale of a slide rule backwards and then taking the root of the result on the rule or by the use of 4-place logarithms. The latter procedure is preferable as it gives the third decimal place more accurately. This table of values of $\sqrt{1-r^2}$ once made, can be used for all subsequent work. A "polyphase" slide rule, *i.e.*, one with the inverted scale on the slide facilitates the work. For convenience of reference the common lettering of such rules is adopted below, *viz.*, D is the lowest scale on the rule, C the scale on the slide contiguous to D , CI the inverted scale on the slide, A the upper double scale on the rule and B the double scale on the slide contiguous to A .

The same formula that forms the basis of Kelley's tables is employed. For illustrative purposes the subscripts given in the above example will be used. The two coefficients that appear in the denominator, r_{13} and r_{23} , are looked up in the table of $\sqrt{1-r^2}$ and 1 divided by the product of the two numbers found, with the slide projecting from the left end of the rule, *i.e.*, $\sqrt{1-r_{13}^2}$ on C is set to the left end of D , the runner set to the right end of C and then $\sqrt{1-r_{23}^2}$ on C set to the runner. It would have been possible, though not quite as accurate to make the table for $1-r^2$ and use these values on B instead of the $\sqrt{1-r^2}$ values on C . The right end of C is now over a number on D which is the same as the A value of Kelley's tables. It is usually 1 followed by a decimal. The runner is set to this and it is multiplied by r_{12} preferably by setting r_{12} on CI to the runner and reading on D below the end of the slide. This number is generally a little larger than r_{12} and is written down on paper. The runner is still at

$$\frac{1}{\sqrt{1-r_{13}^2} \sqrt{1-r_{23}^2}}$$

on D . This has to be multiplied by $r_{13}r_{23}$ and can be most easily

done by setting r_{13} on *CI* to the runner. The slide is then very often in such a position that below r_{23} on *C* the answer can be read directly on *D*. If such is not the case the runner must be set to the end of the slide, r_{23} on *CI* set to the runner and the answer read on *D* below the end of the slide. This gives the **B** of Kelley's tables and is to be subtracted from the **A** already written down and the answer taken to the nearest two decimal places.

The signs are of concern only in the numerator of the fraction and their algebraic treatment is perfectly simple. As to the decimal point in *B* it is merely necessary to remember that *B* is approximately the product of r_{13} r_{23} and with a little practice one can locate the point directly from the setting of the slide.

The writer has used the method and also Kelley's tables quite extensively and there is very little difference either in the speed or the accuracy. In a typical group of 10 coefficients one method took 9 minutes and 10 seconds and the other 9 minutes and 20 seconds, with the same results in both cases. The slide rule does not appear noticeably more fatiguing than the use of the tables. The writer uses it frequently in checking over work done with the tables. One who does not have access to Kelley's monograph and who is skilled in the use of the slide rule need not be daunted by partial correlations.

TASTE SENSATIONS FROM UTERINE STIMULI

BY HOWARD C. WARREN

Princeton University

A patient who has been receiving electric treatment for a uterine tumor reports to the writer that she had a distinct metallic taste in the mouth whenever the electricity was applied. Her physician tells of another case in which the patient could taste the kind of drug used in treating the uterus.

Regarding the latter case the physician writes: "Mrs. H. could distinguish whether I used tincture of iron, iodine, carbolic acid or nitrate of silver, almost immediately upon application to mucous surface. There was an ulcerated and granulated condition of the cervix where I used carbolic acid in treating the ulcer and nitrate of silver in treating the granulations. She would say: 'You have used carbolic acid,' or 'You have used nitrate of silver,' not anticipating it, nor would I think that she would know.

While she was an educated woman she knew nothing about drugs and, as I remember, took no interest only to say, 'You are using such and such a drug and it is so disagreeable.'"

Have any similar experiences been reported?

GENERAL REVIEWS AND SUMMARIES

AFFECTIVE PHENOMENA—EXPERIMENTAL

BY JOHN F. SHEPARD

University of Michigan

No writer on the relation of organic and mental processes has defended a more specific or more invariable correlation than Marston (8). He studied the changes in systolic blood pressure caused by an attitude of deceit. He found no significant change of pressure with mere intellectual work. Subjects for the study of deceit were told that a friend had been accused of a certain crime, and a series of incriminating facts were given as established. If the subject chose to try to clear his friend by a lie, he framed an alibi accordingly; if he chose to tell the truth, he selected a marked paper which showed a consistent story written by an assistant, admitting the facts but exonerating the friend. This story was supposed to be the truth. In another set of experiments, the subject received sealed instructions and left the room. If he chose to lie, he opened the envelope, did as directed, came back and lied about it at the examination. If he chose to tell the truth, he did as he liked, came back and told a true story of what he had done. Blood pressure tests were taken before, during and after the examinations. A marked, consistent, gradual rise of blood pressure reaching a climax at a certain point in the story is reported for deceit cases and a tendency toward lowered pressure with truthful accounts. The experimenter on the basis of pressure results, obtained 96 percent. correct judgments as to the truth or falsity of the stories told; while jurors who listened to the testimony did not succeed in judging with much accuracy.

Basing his argument on Cannon's theories, Marston concludes that fear and anger are the only mental processes that can cause moderate rise of blood pressure. Intense joy, sorrow, disgust, or sex excitement may give extreme pressure changes, but only fear and anger show such effects as he found with deceit. He believes

the factor in deceit which influences pressure is fear. Attempted voluntary control of this fear results in a gradual rise to climax, the typical curve. There are numerous possibilities of error in the experiments as published, but it should be added that Mr. Marston, with the coöperation of Drs. Troland and Burt, has since carried through work in which many of the sources of doubt were eliminated. The matter certainly deserves several thorough investigations.

Robbins (10), in an interesting plethysmographic study of stammering, had occasion to find also the effect of shock (fright) upon the peripheral volume. Both shock and stammering gave marked vasoconstriction. There was a latent period averaging 3.4 sec. after the stimulus. The more intense and the more unexpected the stimulus, the greater and the more rapid the vasoconstriction and the slower the recovery. In response to shock, stammerers on the average showed 70 per cent. greater vasoconstriction than normal speakers, the constriction attained its maximum in two thirds the time of the normal, and the recovery required 23 per cent. more time than normal. Constriction due to stammering continued throughout the period of stammering; and for many subjects and for most shock stimuli, the reaction was not quite so great with shock as with stammering. Aside from temporary fall due to shift of attention when a person begins to read, speech (reading) gave rather vasodilatation than vasoconstrictions in normal subjects.

Hyde and Scalapino (5) found that the minor tones of Tschai-kowsky's death symphony caused increased cardiac rate and action current with fall of systolic and diastolic pressure. Toreador's song increased pulse rate, decreased action current, and increased systolic and pulse pressure. Only a beginning has been made with the experiments. The reviewer wishes to suggest that all such studies should use a continuous record showing breathing and as many other factors as possible in detailed interrelation.

Burge and Burge (1) found that great excitement (fright and anger) and activity in cats caused 90 per cent. increase in the catalase content of the livers compared with those of normal cats. This catalase is carried by the blood to the tissues to produce increased oxidation.

Hammet (4) finds glycosuria in approximately 50 per cent. of the cases examined after participating in or observing a football game, and after a difficult written examination. Tests before the

exciting mental process in each case had shown no glycosuria. Most of the effect had disappeared after four hours. He believes urine for medical diagnosis should not be taken immediately after a long physical examination has been given.

Stewart and Rogoff (11), as a preliminary to other experiments, attempted to determine whether fright and other emotional disturbances would exhaust the supply of epinephrin present in the adrenals. Increased liberation of epinephrin would not necessarily imply reduction of the epinephrin store in the glands, and, in fact, it was found that the amount of epinephrin excreted in response to stimulation was not decreased by preliminary frightening. This led to the problem. In the experiments, the nerve supply to one adrenal was cut, all operations being performed under ether anesthesia. Under these conditions, morphine caused relative reduction of the epinephrin supply in the still innervated adrenal in both cats and dogs, but in the cats it was accompanied by symptoms of fright, in the dogs by reverse symptoms. Actual fright or excitement without drugs did not with either cats or dogs cause such relative disturbance of the epinephrin supply in similarly operated animals. Also all the signs of fright could be obtained from an animal in which one adrenal had been removed and the nerves of the other sectioned; this includes dilatation of the pupil on the side on which the superior cervical ganglion had been removed, as well as the normal pupil. During and for some hours after an operation there is a decline in the store of epinephrin in an adrenal whose nerve supply is intact as compared with a denervated adrenal. Infections of various kinds caused marked depletion of the supply in innervated adrenals. Stimulation of the splanchnics increased the amount of epinephrin liberated into the blood, but did not readily reduce the stock of epinephrin in the adrenals. Short periods of stimulation with intervening rest many times repeated, however, gave a decrease.

Two reports by Young are based upon a study of introspective accounts by several subjects. In the first (14) he asks whether pleasantness and unpleasantness can occur simultaneously. A relatively brief stimulus was used to break into a continuous affective situation, or two briefer stimuli from the same or different sense departments were combined or given in alternation, or even a single stimulus was given. Some subjects reported mixed feelings, others did not; and those who did so reported them in sporadic groups. After an analysis of the mixed feeling reports, the writer

concludes that they are all statements about the experience, or statements which attach a meaning of pleasantness or unpleasantness to an object or objects, which express the awareness of an object which usually arouses feeling rather than being a direct setting forth of the experience. This error is favored by intellectualization, fatigue and sleepiness, etc., lack of training in psychological report, suggestion and habituation. Rapid alternations of pleasantness and unpleasantness, affective doubt, and brief interruption of a mood conceived as permanent are also likely to be confused with true mixed feeling. The author concludes that pleasantness and unpleasantness never coexist. Some of the reports said to be cases of "meaning-error" seem to the reviewer merely more or less inadequate descriptions of the sensory content with feeling, which should certainly be allowed in any reliable introspection. The same introspective accounts are used in a second report (15) in which the general method of treatment is similar. The author concludes that pleasantness and unpleasantness are not localizable and show no complicating qualitative differences when regarded independently; that is, abstracted from the sensory content. Reports were demanded of feeling abstracted from the sensory components. The questions of localized feelings and mixed feelings are intimately related.

Tolman and Johnson (13) found that association reaction times in response to words of unpleasant significance averaged distinctly longer than reactions to words of pleasant or indifferent significance, and this was true of words expressing simple sensory qualities as well as of those referring to deeper emotional experience. Women showed the tendency more strongly than men.

Moore (9) attempts to measure the strength of emotional disturbances by determining their distracting effects in terms of delay in solution of simple arithmetical problems. Fear caused the greatest disturbance, and then in order we find anger, embarrassment before a crowd, sex interest, repulsion. Fear and anger showed a negative correlation. The greatest individual differences were found with anger and embarrassment, least with sex interest and repulsion.

Langfeld presents two studies of the judgment of emotions from facial expression (6, 7). On the whole there was rather unexpected uniformity of judgment. Pain, distress, tormented fear were often seen in place of the more aggressive anger and hate, especially in the milder forms. Expressions of anger suggested fear also to

various subjects and fear suggested anger. Various forms of distrust and of aversion were fairly well judged. In combinations, the stronger emotion usually covered up the subtler. Laughter was nearly always observed correctly: Determination and animosity were readily seen. Most subjects quite regularly made use of kinaesthetic imitation and of association with remembered or imagined situations into which the expression would fit. One group of subjects approximated the supposed correct title of the picture in an average of 32 per cent of the cases, and in nearly all of these the correct title was accepted. Of those so accepted, a suggested wrong title was later accepted in 34 per cent. of the total. Of the supposed correct titles which were not approximated in the original judgments, 61 per cent. were accepted when presented, and in 49 per cent. of these a wrong title was accepted when suggested. There were marked individual differences both in the ability to approximate the correct titles in the original judgments and in suggestibility to other titles later; and variations in the one do not necessarily correspond with variations in the other.

A report by Thorndike (12) on esthetic appreciation of simple forms, while showing certain proportions most liked and others most disliked, nevertheless emphasizes primarily the extreme individual differences which one finds in all such work.

Children of kindergarten age and college sophomores are used as subjects in an experiment by Dashiell (3) on affective preferences of single colors, color combinations, and tone intervals. The most striking result was the small reliability of the children's estimates, the scores showing almost no group preference among the colors or color combinations. Aside from the low reliability, however, it may be noted that the children gave nearly the same order of single colors as the sophomores: blue, red, green or yellow, violet, yellow or green, orange. The children showed a negative tendency toward discords, but of less degree than the sophomores.

To obtain a measure of esthetic judgment of a series of 36 pictures, Miss Washburn and her coworkers (2) asked three experts to arrange the pictures in order of merit. The average deviation of the experts in judgments of rank of a particular picture ranged from 7.8 places to .4 of a place, and averaged for all pictures 3.4 places. Women student observers then ranked the pictures. The correlation between individual observer's ratings and the expert ratings varied from 0.82 to -0.42. The combined student ranking correlated with the expert ranking 0.33, p.e. of 0.10. A

subgroup of students of least artistic taste and training showed a correlation with the expert ranking of -0.11 . A subgroup of most artistic taste and training gave results which correlated with the expert 0.49 . A subgroup with no artistic training but especially interested in pictures gave judgments which correlated with the expert 0.43 , nearly as high as those who had also had training.

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ATTENTION

BY W. B. PILLSBURY

University of Michigan

Two articles only have appeared in the literature available on attention this year. Fukuya (1) studied the relative efficiency and speed during strained and normal attention in copying words,

making additions, and learning nonsense figures and symbols. The subjects were ten university students and ninety-six students from various grades in the Chicago schools. The results show practically no difference between the two forms of attention. Some individuals obtained better results in one, some in another, but the differences were on the whole insignificant. This statement applies to speed as well as to accuracy. On the whole active attention gave better results for short periods of work and at the beginning of all work. There was some tendency shown for the young children to be distracted by the demand for extra effort. Lobsien (2) applied Münsterberg's street railway employee's test to twenty children as a measure of attention. It was modified somewhat in detail, mainly by decreasing the number of cards, and increasing the number of danger points. He regards it as a useful test for the purpose, although the results as stated seem somewhat scant for the amount of space taken. The main positive contributions are that there is a high correlation (.84) between intelligence and the results of the tests, and extent and efficiency of attention show an inverse relation.

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SPACE ILLUSIONS

BY HARVEY CARR

University of Chicago

The literature on space illusions is confined to a single study on the Weber illusion of moving compass points (1). Forty-two regions of the body were systematically explored and thirteen subjects were employed. The illusion was obtained in twenty-four of the regions. It occurred more frequently for longitudinal than for transverse directions of movement. With a few exceptions the character of the illusion for any region was the same for all observers. The illusion was correlated with the varying degree of sensitivity of the skin as given by the tables of Weber and Vierordt and as measured by the method of equivalents. A continuous motion of the compass points is a necessary condition and the optimal rate of movement was found to lie between 4 and 12 cm. per sec. The illusion occurs with the congenitally blind and hence visualization is not a necessary

condition. Tests on negro subjects did not permit of any statements concerning possible racial differences. The illusion is influenced by such factors as the ease of localization and the intensity and clearness of the cutaneous impressions. Differences of cutaneous sensitivity and continuity of movement are regarded as the prime conditions of the phenomenon.

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CUTANEOUS SPACE

BY HAROLD E. BURTT

Ohio State University

Goudge (3) reports a study of Weber's illusion, namely, that when two points separated by a constant distance are moved with equal pressure over a cutaneous surface a converging or diverging is felt,—the former when moving from an area of greater to one of less sensitivity and vice versa. Goudge's study was more thorough than Weber's, comprising 42 regions of the body as compared with Weber's 12. A complete study of these 42 regions was made on one observer and those regions which yielded the most interesting results investigated on other observers. The illusion was found in 24 of the 42 regions with a fairly close agreement among different observers. The only notable disagreement with Weber's results was the existence of the illusion when the esthesiometer distance was below the limen for the region studied. Discontinuous movement did not yield the illusion but an impression of parallel lines at varying distances apart. The optimal rate of movement was between 4 and 12 cm. per second. Visualization was not necessary for the illusion but facilitated it, as shown by experiments on congenitally blind. Change in ease of localization (as graded by observers) corresponded with convergence as the ease decreased and vice versa. Considering the traditional order of sensitivity of parts of the body there was, with minor exceptions, a divergence with increase of sensitivity and convergence with decrease. The comparative sensitivity of parts where the illusion occurred was further studied by finding aesthesiometric equivalence ratios. Increases in these ratios on neighboring regions corresponded with convergence in the illusion. Finally the essential factors in the

illusion seem to be "difference in sensitivity of the cutaneous surface, and continuous movement of the two-point stimulus."

Friedline (2) attempted by systematic study of the volar distal forearm with subliminal stimuli to reconcile some of the controversies in the esthesiometer experiment. In each series two subliminal distances were used. They were first presented nine times each for practice and the subject then tried to recognize the two when presented in chance order. Any description of the pattern observed such as "line, dumb-bell, paddle, oval" was noted. The results seem to fall into two classes, those in which the experiment failed and those in which the subject made upwards of 80 per cent. correct judgments. The latter alternative was the more frequent. Various factors were noted which tended to derange the experiment: fatigue, physical condition, after images, emotional state, suggestion, temperature of the cast in which the arm rested, and extraneous noises. The results throw light on the disputed question of reduction of the limen by practice. Discrimination was often very greatly increased by change in the attitude toward the stimulus, *i.e.*, it was felt and recognized as a pattern or object. Improvement due to this shift in attitude is not the same as sheer reduction of the limen by practice. With reference to the supposed raising of the limen by fatigue, the experiment shows that much depends on the initial determination of the limen. If this happens to be a slightly subliminal pattern, fatigue would make its recognition impossible (*cf.* the two distinct alternatives above noted); whereas if the start was made with the two points clearly differentiated such fatigue would make little difference.

Curtis (1) studied the advisability, in using the two point threshold for anthropological purposes, of giving only one trial to each of a large number of individuals. An esthesiometer distance of 4 cm. was applied once to each of 444 persons ranging from superior adult to feeble minded. A much larger per cent. of the normal group than of the abnormal gave a "two" judgment, and a similar difference is found when the subjects are grouped by mental age. The method of one trial is recommended because it is possible to test a larger sampling, and because errors due to change of attitude and practice do not occur.

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GRAPHIC FUNCTIONS

BY JUNE E. DOWNEY

University of Wyoming

A summary of the work on handwriting scales inclusive of their organization, various applications, and the school surveys made possible by them is now available in book form, respectively by Monroe, DeVoss, and Kelly (8) and by Starch (10). Starch's résumé includes also material of general psychological interest as well as that pedagogically valuable. The detailed report on his new handwriting scale, Starch presents in another connection (11). This scale is constructed on the principle of judgment of general merit or excellence of quality and the values of the steps are determined with a high degree of accuracy. In this respect it is standardized with greater care than scales constructed prior to it. It also embodies a number of practical features. Other recent scales include those sent out by Zaner and Blossom (12) and by the Bureau of Research and Efficiency, Kansas City, Mo. (3). A new form of the Ayres Scale, the Gettysburg, edition, is cited. Breed (2) concludes from an experimental investigation that this form of the scale is somewhat more accurate than the older three-slant form.

An interesting departure from the more common reports is found in Koos' attempt to determine ultimate standards of quality in handwriting by an investigation of the standards of attainment actually achieved by various occupational groups (7). This determination is effected through a rating on the Ayres Measuring Scale for adult writing of specimens of non-vocational correspondence written by 1,053 adults in various walks of life. The average quality of the 1,053 specimens is 49.5 on the scale. But some interesting differences between groups is evident, for example, the high average quality of writing among clubwomen and engineers, and the low average for lawyer, physician, writer, clergyman, and musician. If, as Koos assumes from data at hand, the quality of handwriting does not greatly deteriorate after acquisition, an interesting problem is suggested concerning mental types and quality of handwriting, a point of attack which seems to the reviewer

a most promising one. The quality of handwriting needed for social correspondence Koos determined by a tabulation of the judgments of 826 adults as to adequate penmanship for social correspondence. It would seem that 50 on the scale is adequate. For vocational uses 60 may be set as the standard, with 70 as the attainment needed by some occupational groups.

The relation of left-handedness and mirror-writing receives some new light from the questionnaire study of it reported by Beeley (1) in his study of left-handedness. It is to be regretted that the finger-tapping test, cited as valuable in the determination of handedness, was given to so small a number of the mirror-writing children, since such a test would have served to check the reports as to degree of handedness, reports which are subject to considerable error. An interesting section of the monograph concerns itself with the methods used by teachers in getting mirror-writers to adopt a more conventional style of writing.

The utilization of handwriting in character-diagnosis has not been attempted to any degree by psychologists, in spite of the pioneer work by Binet, therefore particular interest attaches to the experiment by Hull and Montgomery (6) who tested a few traditional assumptions of graphology by obtaining the correlational coefficients for two orders of merit; one based on objective measurement of graphic traits; the other, on judgments upon character traits made by intimate associates. The correlations of heavy pressure with forceful personality; upsloping lines with confidence or ambition; fine tracery with bashfulness; perseverance with long t-bars; reserve with closed a's and o's, are tested out but with negative results.

A somewhat similar investigation by Downey (4) gave inconclusive results with respect to a number of graphological assumptions but yielded evidence of positive correlation between pre-occupation with details and small filiform writing, and also between an explosive or inhibited psychic make-up and the general graphic pattern.

In *Graphology and the Psychology of Handwriting*, Downey (5) disentangles the basal concepts of graphology; discusses the various methods the graphologists have employed in working out their system of character analysis; and tabulates in parallel columns the conclusions of the graphologist, the handwriting expert, the pathologist and the experimentalist concerning such graphic elements as size, slant, alignment, line-quality, continuity, and proportion.

In the experimental section of the book the author discusses handwriting disguise, variations in handwriting under stated emotional conditions, the relation between handwriting individuality and expressive movements, and reports a graphological study of the handwriting of a group of well-known psychologists.

Monteith (9) in an article on automatic writing that is spiritistic in import cites two varieties of such writing that should be further analyzed by the scientist. These varieties are: 1, the strictly automatic "where hand or forearm is temporarily paralyzed and devoid of any feeling while the power of writing is retained; and, 2, the inspirational or intuitional, when the automatist becomes mentally aware of the substance of the communication before the hand moves at all."

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SPECIAL REVIEWS

Psychology and Preaching. C. S. GARDNER. New York: Macmillan, 1918 Pp. viii + 389.

This volume is an attempt to apply the results of modern psychology to the function of preaching. Each of the first ten chapters deals with a particular psychological process and indicates its significance for the uses of the minister. The treatises of the best authorities are summarized with reference to instinct, imagery, feeling, sentiments, belief, attention, voluntary action and suggestion, and application made to the preacher's task of understanding and persuading men. Other chapters deal with Assemblies, Mental Epidemics, Occupational Types and The Modern Mind.

It is a sane, well-written work and contains little from which either the psychologist or the minister is likely to dissent. At the same time neither will be greatly illuminated by it. The psychology may be obtained in more satisfactory form from the authorities cited and the deductions for the art of preaching are not marked by novelty or liveliness. It is doubtful whether the attainment of persuasive public speech can be greatly facilitated by such a treatment of the subject. More valuable material for certain phases of the study might be found in the writings of the social psychologists, such as Charles H. Cooley.

The author rightly emphasizes the voluntaristic trend in psychology and in practical religious interest. The chapter on Occupational Types deals convincingly with the minister himself, the wage-earner, and the business man. The last is keen and alert, of limited intellectual range, practical, non-mystical, unsectarian. "Under the dominance of this type of mind we are witnessing a most interesting and important double development in Christianity— theological disintegration, on the one hand; and on the other, integration around practical enterprises of the great religious groups, originally organized on a basis of theological differences." The business men are said to constitute the most influential group in the local churches, and therefore the minister should understand their characteristics and shape his message to reach them as well as the more academic auditors.

E. S. AMES

The Mental Capacity of Savages. E. FARIS. *Amer. J. of Sociol.*, 1918, 23, 603-619.

Faris discusses in an interesting way the mental characteristics

of savages with reference to a Bantu tribe of the Upper Congo, among whom he has lived. In agreement with Boas and others, he deprecates the traditional belief in the inferiority of savage races. After enumerating and illustrating six sources of error often committed when passing judgment upon such peoples, he sets forth various observations which either indicate a high degree of mental ability (the complex structure of language, for instance) or refute commonly accepted opinions (the superior sensory acuity, sense of direction, and emotionalism of the savage, his imitativeness, etc.). The author's remarks upon the alleged intense emotionalism of uncivilized races are especially worthy of attention. In his opinion the emotionalism displayed by the American negro in his religion, does not necessarily indicate a high native susceptibility to emotion or a lack of rational control. The negro's extravagance can be matched in the white race that was the teacher of the black—in the white camp-meetings of the South, for instance; and in such revivals as those of Kentucky, in 1803. If under the influence of certain forces, these practices have disappeared among the whites, the same forces when felt by the negro, result also in a decreased emotionalism. The author has observed among the Bantus three distinct types of Christianity, none of them emotional to any marked degree. "Their reaction to Christianity has taken a form decidedly theological, and they can argue and debate like any one of our modern polemic sects." His opinion is that the American negro got his emotional religion from emotional white Christians, while the Bantus got their "intellectual" religion from a non-emotional type of Christians.

The paper ends with a plea for a scientific study of the mentality of savage races, with the help of the exact methods (tests) now in our possession.

JAMES H. LEUBA

The Validity of Religious Experience. G. A. BARROW. Boston: Sherman, French, 1917. Pp. 247.

This is a course of lectures delivered at Harvard University. A review of them hardly falls within the field of the BULLETIN, for the author is concerned "not with questions of fact, but of meaning." The analysis he proposes to make is "the philosophical analysis." The conclusion of the discussion is that the source of religious experience is super-individual, superhuman, and personal.

JAMES H. LEUBA

NOTES AND NEWS

PROFESSOR DANIEL STARCH, of the University of Wisconsin, is on leave of absence for the first half of the present year, to give courses at Harvard University.

PROFESSOR G. M. WHIPPLE, of the Carnegie Institute of Technology, has been appointed professor of experimental education in the University of Michigan.

DR. HARRY D. KITSON, instructor in psychology at the University of Chicago, has accepted the position of professor of psychology at the University of Indiana, vacant because of the election of Professor E. C. Lindley as president of the University of Idaho.

DR. W. W. CHARTERS, of the University of Illinois, will assume charge of the research bureau for retail training at the Carnegie Institute of Technology. In the same institution Dr. Kate Gordon has been promoted to an associate professorship in the division of applied psychology, but will be absent part of the year to conduct investigations for the California State Board of Charities. Professor C. S. Yoakum has been promoted to the directorship of the bureau of personnel research, with Dr. W. D. Scott as associate director (part time).

DR. E. G. BORING, of Cornell University, has been appointed professor of psychology in Clark University, to succeed the late Professor J. W. Baird.

THE following items have been taken from the Press:

MR. J. C. FLUGEL has been appointed lecturer in psychology at University College, London.

PROFESSOR D. S. HILL, of the University of Illinois, has been elected to the presidency of the University of New Mexico.

PROFESSOR NORMAN KEMP-SMITH, professor of philosophy at Princeton University, has been appointed professor of logic and metaphysics at the University of Edinburgh.

PROFESSOR W. S. FOSTER, has been appointed professor of psychology at the University of Minnesota.

DR. L. S. HOLLINGWORTH, of Teachers College, New York, has been promoted from an instructorship to an assistant professorship.

PROFESSOR J. DEWEY, of Columbia University, will be engaged in educational work in China during the year.

DR. EDWARD COWLES, well-known for his work with the insane as superintendent of the McLean Hospital, has died in his eighty-third year.

A GRANT of \$6,000 has been made to the psychological laboratory of the Johns Hopkins University "for investigating the informational and educative effect upon the public of certain motion picture films used in various campaigns for the control, repression, and elimination of venereal disease."

DR. E. H. HAECKEL, professor of zoology at the University of Jena, has died at the age of eighty-five years.

PROFESSOR D. B. LEARY, of the department of education of Tulane University, has been appointed professor of psychology at the University of Buffalo.

A PROPOSAL to establish an institute of commercial and industrial psychology and physiology in Great Britain is announced. The project has the support of many eminent British physiologists and psychologists.

THE PSYCHOLOGICAL BULLETIN

AN EXPERIMENT TO DETERMINE THE RELATION OF INTERESTS TO ABILITIES

BY ROSS HARTMAN AND J. F. DASHIELL

Oberlin College

In matters of vocational guidance there is some uncertainty as to the relation between one's interests and his abilities in those things in which he is interested, and this is a crucial point. Presumably, the vocational guidance expert should take some account of a man or woman's present likes and dislikes as a possible clue to his future likes and dislikes, if that person is to be happy in his work. But here the factual basis is not at all clear; the subtleties with which interests change and are changed by manifold intrinsic and extrinsic factors make attempts at prognosis practically worthless in the present condition of our knowledge. Again, the expert should, and does to some extent, make reliable measurements of capacity or ability possessed by the subject now as a basis for the prediction of later capabilities. The basis in facts here is somewhat better; one's relative abilities seem to change very little; and the scientific demand is for more and more adequate tests. Finally, whether he should or should not, the vocational guide very commonly makes his analysis of present capacities (and presumably of future possibilities) by an analysis of his subject's respective interests. Particularly with the grossly unscientific expert this method of extracting from a person a knowledge of his likes and dislikes now as the basis of prediction as to abilities now and later smacks of the charlatan. It has little demonstrated support in facts. Exhaustive studies of the question from many different points of approach are needed.

The present experiment is an attempt to apply only one of the

several possible methods, admittedly a crude one. Essentially it was by employing the method of ranking (a) relative abilities and (b) relative interests in six simple forms of psychological tests.

The subjects were thirty-one juniors and seniors in the summer session at Oberlin College.

The following six processes were prepared and given to the subjects: (1) *Word Completion*. Blanks were given to the subjects having "skeletons" of sixty words on them. A few of the letters of each word were given to provide a clue to the rest of the word; and the subjects were asked to fill out the missing letters. The subjects were graded here upon the number of words they filled out correctly in five minutes of time. (2) *Code Writing*. The subjects were given blanks having at the top of the page a double-number code for the letters of the alphabet and below it a passage to be translated into the code. The subjects were graded upon the number of letters of the passage they translated correctly in five minutes of time. (3) *Immediate Retention of Visual Impressions*. Ten pieces of cardboard were prepared having upon them "tit-tat-toe" frames with pictures or symbols painted upon them. The first one of these was very simple, and the others grew more complex in the order in which they were given. Each frame was shown for a period of five seconds, and the subjects were asked to reproduce as much of the figure as they were able to remember. They were graded in this manner: two points were given for each symbol reproduced in its proper place in the "tit-tat-toe" frame, and one point was given for each symbol reproduced correctly, but in the wrong position in the frame. (4) *Arithmetical Problem*. A problem was prepared which had some forty steps, and in which the answer to one step is needed in the following step. The steps were of such a nature as to be as nearly equal in difficulty throughout as possible. The subjects were given five minutes to work in, and were graded upon the number of steps they solved correctly. (5) *Pitching Pennies*. Each subject pitched ten pennies toward a line nine feet away, and the average distance of the pennies from the line was measured for each student. (6) *Letter Cancellation*. A card was given to each subject having a large number of letters printed upon it apparently promiscuously. The subjects were asked to cancel the A's and the O's; the one who finished first put up his hand, and the rest were stopped at that point.

After going through these six processes each subject was asked to denote his range of interests in them, assigning a 1 to the process

most interesting, a 2 to the process second in interest, and so on throughout the list. The results of the tests were then graded, and for each individual it was found in which process he was the best, in which the second best, and so on through the list. These ranges in ability were found by first ranking the different subjects of the whole group according to ability in each process, then finding the order of ability and the order of interest for each subject in all processes. Thus the subjects' ranks for ability were found, not by comparing their scores with absolute standards, but by comparing each individual's scores with those of the rest of the class. These two ranks, of abilities and of interests, once found for the subjects, they were correlated for each individual, and the degrees of correlation for all averaged. This average was found to be 0.243. A table showing the individual correlations is given here:¹

Subjects	Positive Correlations	Negative Correlations	Subjects	Positive Correlations	Negative Correlations
1	.143	...	17	.915	...
2	.315	...	18	.486	...
3	.657	...	19	.143	...
4	...	.371	20	...	.199
5	.143	...	21	...	.200
6	.657	...	22	...	.371
7	.657	...	23	.143	...
8	.315	...	24	.486	...
9	...	.200	25	.315	...
10	.143	...	26	.143	...
11	.486	...	27	.315	...
12	.657	...	28	.143	...
13	.143	...	29	.657	...
14	.314	...	30	.143	...
15	...	.200	31	.513	...
16	.143				

The result found is qualified somewhat by the fact that several of the students did not experience a definite difference of interest among the six processes, and consequently assigned their ranks of interest more or less arbitrarily. However, if ranks of interest were assigned absolutely arbitrarily, the correlation for the whole class would approximate 0.000. As it was, twenty-five of the thirty-one subjects showed positive correlation; and the highest individual positive correlation found was 0.915, while the highest negative correlation found was 0.371, and the average for the whole class was 0.243.

¹ As determined by Spearman's "Foot-Rule" formula: $R = 1 - \frac{6\sum g}{n^2 - 1}$

The figures given are thought to have some significance in the light of two considerations: (a) the indirectness of the method of calculating ranks in ability; and (b) the nature of the activities used, these being mostly paper-and-pencil tests of the traditional types and presumably not calculated to arouse as varied interests as would activities chosen from wider fields.

TESTS OF DISCRIMINATION AND MULTIPLE CHOICE FOR VOCATIONAL DIAGNOSIS

BY DAGNY SUNNE

Tulane University

As part of the testing of disabled soldiers for the purpose of vocational diagnosis, at the Callendar Laboratory by Professor Fletcher and the writer, the Yerkes multiple choice apparatus and the McComas discrimination apparatus were utilized very satisfactorily. The multiple choice apparatus used was one made at Clark College under the direction of Professor Porter. At first the problems were of the type suggested by the work of Yerkes and Porter, which had already been tried by some of our students in experimental psychology. These consumed too much time and as we had no sufficiently standardized results, it was difficult to form a comparative estimate of a man's ability in the memory-reason processes tested. So it was decided to try out a problem similar to that reported by Professor J. Peterson.¹ The subjects were told that the twelve keys had been numbered at random and that the point of the test was to see how quickly they could learn the number of each key so that they would be able to go through the series from 1 to 12 without a mistake. The keys, counting from left to right, were numbered: 4, 6, 12, 1, 5, 8, 2, 9, 11, 7, 10, 3. The subject was instructed that the key numbered 1 would make the lamp light; when he had succeeded in locating it, that key 2 would make the lamp light, and so on for each number up to 12. Every key struck was recorded. The results were scored as suggested by Peterson, according to the number of errors: (1) unclassified, (2) illogical, (3) perseverative, (4) both illogical and perseverative. The apparatus helped to make the men less self-conscious and made the testing of the slower ones much less taxing than the scheme tried by Peterson.

¹ *Psychol. Rev.*, 25, 443-467.

The discrimination apparatus was constructed and operated according to the directions given by Professor McComas.¹ Every man was given a preliminary drill to familiarize him with the key corresponding to each of the four colors and then had three trials, each one continuing till sixty correct reactions had been made. The number tested was smaller than for the Multiple Choice experiment, as we found an unusually large percentage of color-blind among these men.

Most of these men were also given the army Alpha test, the Cube test according to Pintner's standardization and the Healy Picture Completion test II scored by the 1918 rating. The correlation coefficients (r) given in table I throw some light on the results of these tests as compared with the other three tests. These

TABLE I

	Alpha Test		Multiple Choice		Discrimination		Cube Test	
	No.	Cor.	No.	Cor.	No.	Cor.	No.	Cor.
Multiple Choice.....	40	0.16	—	—	—	—	—	—
Discrimination.....	35	.19	53	0.09	—	—	—	—
Cube Test.....	43	.39	51	.68	44	0.38	—	—
Picture Completion.....	43	.34	44	.25	44	.25	43	0.23

No. = Number of cases. Cor. = Correlation coefficient.

coefficients show, as has been proved by the actual progress of the men, that the Alpha test rating would have been unfair to some of these men, if used as the basis for selecting vocational courses. Two men who were among the very lowest according to the Alpha test were among the highest in the multiple choice and discrimination tests. Limited educational opportunities explained this discrepancy. On the other hand, two men who received very high Alpha scores were among the lowest in both the other tests because they easily became confused and lost their self-control when situations were a little unusual or difficult. The highest correlations were found to be those of multiple choice with the discrimination and cube tests. Some of the contrasts in these performances, too, were as striking as the similarities. The men who came sixth and second from the top in the discrimination test were eleventh and twelfth from the bottom in multiple choice. The cube test showed high correlation only with the multiple choice test, but very different characteristics were also brought out by the two tests.

¹ *J. of Exper. Psychol.*, 2, 171-177.

Only one man of the highest group in multiple choice got the highest score in the cube test, the rest had low or medium scores. The mean was 7.2, lower than Pintner's average for 39 adults, which was 8.

Healy's picture completion test gave such surprising results when tried with our college students that it seemed profitable to use it with these men also. The mean for 45 college students was 68.3 and the scores ranged from 24.5 to 100. The men's scores ranged from - 15.5 to 85, with a mean of 43.36. The low correlation with the discrimination and especially with the multiple choice test indicates the differences in the memory, reasoning, and perception processes tested. From these limited observations it appeared that the cube test tried out quickness of perception and immediate retention; the discrimination test more complicated memorizing and speed of judgment under stress; the picture completion test the ability to notice and retain under varying conditions several important details and to choose consistently with not only the immediate but the previously observed concrete factors of the situation, just as the multiple choice test seemed to try out similar abilities with reference to more abstract factors.

In the discrimination test the records showed the number of seconds required and of errors made to get 60 correct reactions. Five seconds for each error were added to the time of the third trial and the 44 scores ranged from 346 to 49 seconds. They comprised a very low group (of 6) in which the errors in the third trial were more numerous than in the second, the mean of the time for 60 correct reactions 259 seconds, and the mean of the errors 25.6; a medium group (of 20) in which with three slight exceptions the errors decreased in the third trial, the mean of the time scores was 110.3 and the mean of the errors 8.2; a high group for which the mean of the time scores was 67.7 and the mean of errors 2.1. In this last group the three highest scores were obtained by men who made no errors and had an average time of 53.3 seconds for 60 correct reactions. The mean of the time scores for all 44 men was 113.1 and the mean of the errors 8.1 for 60 correct reactions. The time score in each case includes the 5-second penalty. Of the men in the lowest group in the discrimination test, four got D scores in the Alpha test, one got C, and another next to the highest Alpha score. This last man, though quick and well-educated, became easily confused and excited and his career in the vocational

training school has clearly proved him undependable under stress. In the highest group in the Discrimination test, two men received D in the Alpha test (the highest record was made by a D man), one B, one A, and the rest C scores.

In the multiple choice experiment all the men who made the poorest records also had Alpha test scores of C minus, D, or D minus, and those who made the best records varied from C minus to A in the Alpha test. Six of the men examined were so very slow and dull, that when their scores reached 1,000 with only two to five keys learned, the test was discontinued. Thus the results for the lowest group are inaccurate, but give some indication of the relation of the different kinds of errors. The following Table II gives the mean of the total scores computed by counting each unclassified error 1, each illogical error 2, each perseverative error 2, and an error both illogical and perseverative 3, and arranged in four groups according to the total scores. In group I, the total scores range from 1,000 to 800, in group II from 660 to 305, and in group III from 300 to 143, and in group IV from 100 to 32. The figures for the 45 men give the means for the 45 who completed the test excluding the six whose score was arbitrarily set at 1,000. The percentage of total errors for each type of error is shown in Table II. The figures in parenthesis give the number in each group.

TABLE II

	Total Score	Unclassified	Illogical	Perseverative	Ill. and Per.
Group I (10).....	970.1	273.7	255.6	33.0	45.7
Group II (16).....	433.1	132.0	115.3	14.3	13.2
Group III (18).....	213.0	74.9	53.0	8.2	4.6
Group IV (7).....	80.0	38.5	17.4	2.0	0.7
All 51.....	413.8	126.7	107.3	14.1	16.7
45 men.....	332.9	111.0	86.6	10.6	9.4

TABLE III

	Unclassified	Illogical	Perseverative	Ill. and Per.
Group I.....	46.2%	41.9%	4.9%	6.9%
Group II.....	48.0%	41.5%	5.2%	4.8%
Group III.....	53.2%	37.5%	5.9%	3.2%
Group IV.....	65.7%	29.7%	3.4%	1.2%

The most conspicuous features of these results are the increase in the unclassified errors and the decrease in the illogical errors and

in errors both illogical and perseverative. The increase in the unclassified errors is mostly due to the fact that many of the better subjects used some systematic method, beginning at one end of the board, at the middle, and so on, and thus might have to strike more keys than those who made random attempts. The learning curves of these subjects showed no sudden drops, though most of the better subjects made rapid decrease in errors, as also did some of the very slow. In the case of the latter, the number of errors increased again, while the former would continue to blunder about one or two keys. The appearance of perseverative errors and errors both illogical and perseverative marked some of the last trials of several of the more intelligent men, apparently because they would not be convinced that a certain key was not right. The men who obtained the three highest scores made neither perseverative errors nor errors both perseverative and illogical, and five of the best group made no errors of the latter kind.

TABLE IV

	Total Score	Unclassified	Illogical	Perseverative	Both Ill. & Per.
Group I.	232.7	74.0	59.3	11.9	5.5
Group II.	64.8	43.1	9.3	1.1	.28
All 16.	159.3	60.5	37.4	7.1	3.3

TABLE V

	Unclassified	Illogical	Perseverative	Both Ill. & Per.
Group I.	49.0%	39.3%	7.9%	3.6%
Group II.	80.1%	17.2%	2.1%	0.5%
All 16.	55.8%	34.5%	6.6%	3.1%

Sixteen girls in the experimental psychology class also took the multiple choice test. Four of them made no perseverative nor illogical perseverative errors, six made none of the latter type, and the girl who made the best score, learning the whole series in one trial, had only 33 unclassified errors in her record. The lowest total score was 433 and the next lowest 284. According to total scores, the class can be divided into two groups, group I consisting of nine girls whose scores range from 433 to 152, and group II of seven girls with scores from 93 to 33. Table IV gives the means of the different kinds of error for each of these groups and Table V the percentage of the total number of errors for each type of error.

Here also, the increase in unclassified errors combined with

decided decrease of the other kinds is evident in the record of the better group. In the case of these students, too, the test brought forth some of their predominant characteristics. An average student got the lowest score, one of the best the next lowest, and a very mediocre student the highest score. The first girl gets easily excited and is apt to do much random work; the second is very persistent and will continue the course she has determined upon, no matter how long it takes, till it is conclusively proved wrong; the third is capable of unusually effective performance in work about which she is enthusiastic. So the results of the test agree with traits that are not obvious in the class-room. Together with the tests already mentioned the disabled men also had several tests of motor ability and the results of the combined experiments have proved of considerable value in recommending vocational courses.

THE FUNCTION OF PSYCHOLOGY IN THE REHABILITATION OF DISABLED SOLDIERS

BY BIRD T. BALDWIN

(Formerly Chief Psychologist and Director of Occupational Therapy, Walter Reed General Hospital, Takoma Park, D.C.)

I. INTRODUCTION AND HISTORICAL ORIENTATION.

Walter Reed was the first Army General Hospital to have a trained psychologist detailed to its staff; it is the purpose of *this report* to formulate and present briefly the functions of psychology in a reconstruction hospital as they have been worked out *inductively* during the war period, from April 17, 1918, to April 17, 1919.

The energies of the Psychological Service at Walter Reed have gone into practical remedial applications to meet the war and peace emergencies, into the discovery and formulation of new problems, into the demonstration of results and into the training of others in the work. This, in the main, has been due to the Army policy, the developing of facilities, the shifting of problems after the signing of the Armistice and to the large turnover of patients with short residence at the Hospital.

The first fundamental problem which presented itself was, *What contribution is psychology prepared to make in the rehabilitation of the disabled soldier?* After the determination of the particular

needs and purposes which psychology could and should subserve, the second problem orientated from *the adaptation of the psychological point of view and technique to the problems and administration of an Army Hospital*.

For the first month the writer worked alone, selecting a few typical cases, analyzing them in detail, and presenting the results in brief form to the medical or educational officer who appeared to be most in need of the information. It was apparent from the beginning that the function of psychology must be demonstrated in a limited field and with a view to conservative but steady expansion through the methods of definite accretion of results along lines where need was distinctly apparent; this method was adopted and constantly held during the year which followed.

During the first two weeks the writer carefully examined 20 disabled men and presented the results of each in his first fortnightly report. Few cases required the same form of procedure but a condensed summary of the first case as given in the original report will indicate the method as a working type.

In order to get a synoptic picture of the patient, it should be noted that this case-study (Pvt. R. G. P.) included an examination of the personal, social and intellectual status of the individual with an analysis of his vocation and special aptitudes. Suggestions were made with the approval of the surgeons, as to types of curative and educational treatment needed, recommendations were given for future vocational guidance with a view to helping the man formulate his future plans and aiding him directly in making the necessary adjustments for their realization. He was given an initial psychological insight into his own reconstructive program and shown, by concrete example, some of the things that he could do which were not apparent to him. He was led to feel the need for preparation for future work and recreation.

In addition to the clinical study of the patient's social, educational and vocational history, intelligence ratings were given with particular reference to motor coördinations, since the disability was one of chronic osteo-arthritis of the metaphalangeal joints of the right hand. In mental army examination Alpha he made 212 points (C plus) which is the upper limit of the middle or average group for privates; in the performance test, 216 points (C) or the lower limit of the first quartile (77 per cent); in the army revision of the Stanford-Binet, a mental age of 15 (I.Q. 94 per cent. or C plus); in the Stenquist test for mechanical experience, 74 per cent.;

in the Army Trade Tests, journeyman in sheet metal working. The case was one of long standing and complicated social history with four courts martial, accompanied by a pronounced mental attitude of "waiting" and distrust, fostered by letters from a shiftless brother at home, both parents being deceased.

A portion of the report discussed the voluntary movements of the parts of the affected hand in detail.

This first case demonstrated the need of a synoptic picture of the (*a*) personal and (*b*) social history of the patient through intelligent interviewing; (*c*) educational rating as a basis on which reconstruction courses could be planned; (*d*) intelligence rating as a criterion of mental capacity for future training; (*e*) a trade rating as a point for future vocational reference; an analysis of (*f*) mental attitude, (*g*) interests, (*h*) aptitudes, (*i*) special abilities, and (*j*) morale for a basis of evaluating initiative and effort; an analysis of the (*k*) range and extent of voluntary movement in disabled parts for the applications of occupational therapy; and the (*l*) psychology of learning in motor control. It was soon found that the fundamental problem was one of developing the right mental attitude in the disabled man and also in assisting the hospital staff, visitors, the public and relatives to assume a wholesome relationship toward the patient. These main problems, outlined in the writer's first fortnightly report, furnished the program for the Psychological and Educational Service during the subsequent year, the chief psychologist also having been made Chief Educational Officer May 12, 1918.

The reconstruction work began in two rooms of an abandoned house, known as the Lay Homestead built on the sight of the Lay farm house which served as a "look-out" for Confederate soldiers during the Civil War. It was destroyed by shell fire at the suggestion of President Lincoln. At the beginning, the Director had two assistants and five reconstruction aides. In October there were in the Division, 140 officers, non-commissioned officers, privates, 100 reconstruction aides and a few civilians. The work was distributed in sixty-five different wards and eight new buildings were completed and equipped for the courses; twelve hundred wounded men were enrolled for several months. The cut on page 270 shows the plan of the hospital.

A number of psychologists coöperating in the hospital have contributed to the development of the different lines of psychological work into their various functions at Walter Reed. Doctor Buford

Johnson assisted for two weeks as a volunteer and Sergeants Bruce W. Moore and Edward J. Beck were detailed from Camp Greenleaf and remained several months. Captain Hughes Mearns was assigned temporarily for three weeks to the post and in July Lieutenant Louis A. Pechstein reported from Fort Riley for instruction and gave material assistance in the interviewing of patients and other assignments.

On July 18, 1918, the staff was increased by the voluntary assistance (three afternoons each week) of Doctor John W. Baird, and the full time of Doctor Ethel Bowman; both later became permanent members of the Hospital Staff. Doctor Baird threw his best efforts into the work until December 1, 1918, when he entered the Johns Hopkins Hospital, where he died February 9, 1919. He was particularly helpful because of his sympathetic interest in the general problem, his willingness to help in all phases of the work when emergencies arose, and his collaboration in the detailed scientific analysis of voluntary movement of disabled joints, with their remedial exercises. Doctor Bowman, from the beginning, began to assume the responsibility for the Laboratory work with curative joint cases. Doctor Eleanor Rowland Wembridge and Doctor Margaret E. Noonan emphasized for a short period the applications of psychology to bedside occupations. Sergeant Adam R. Gilliland devoted full time from July to September 30, assisting in the development of the problem of measuring the excursion of movements in joints. The important phase of measuring the strength of voluntary movement in disabled joints and amputation cases was initiated and developed by Captain Harold Richmond.

From the beginning of the psychological work, the surgeons in charge of the neuro-psychiatric wards learned to make constant use of the psychologists as consultants and for mental age ratings. On December 9, Captain Richard M. Elliott reported at the post for half time, where he was assigned, until his discharge from the Army in April, to the examination of patients in the neuro-psychiatric wards.

Captain Lindley Garrison also reported and was assigned to interviewing and trade testing. Later he assumed the responsibility of business manager of the *Come Back*. Captain L. W. Cole and Major George F. Arps reported at the Hospital for a short time. In July Sergeants Walter J. Greenleaf and Arthur M. Ottman reported for work in interviewing patients. Other men with special

psychological training, assigned to various phases of the work were Sergeants Osborne Williams, Edward Keaner, Joseph Blanchette, and Howard Booher, who reported from Camp Hancock in December. The educational instructors, Captain Frank Sanborne, Lieutenant Frank Lane and Mr. Adolph Shane, were particularly valuable in infusing psychological methods into their departments.

A majority of the instructors, occupational aides and medical-social workers have taken the psycho-educational point of view in their work in the restoration of functions of the disabled soldiers; psychology has also definitely influenced important phases of the medical and surgical services of the hospital. The director visited the Canadian Hospitals at his own expense and was in frequent conference with Majors Yerkes, Haggerty, Yoakum, and Terman.

II. OUTLINE OF PSYCHOLOGICAL SERVICE

Since the medical and surgical services in the hospital gave individual treatment, the psychological service also rested on *individual diagnosis* as opposed to group methods of army camps.

The individual patient was undergoing comparatively rapid physiological changes and mental adjustments and a progressive synoptic picture based on repeated examinations from different angles was found to be more desirable than a cross-section rating. The point of contact between the psychologist and the patient was remedial and curative; the analysis and direction of the patient's ideational and emotional background became of greatest importance, and mental tests as a rule, aside from cases of mental deficiency, served a subsidiary function.

The patient had met a series of unusual experiences and an injury with its accompanying physical shock and mental disturbances, therefore his adjustment to the limitations which his disabilities apparently or by necessity impose upon him, his readjustment to the inhibitions of army hospital life and his readjustment to many new social conditions that played on him in the hospital from a new angle bordering on misdirected charity, became significant factors influencing his normal recovery.

The patient's rehabilitation was also conditioned by his general intelligence, his outlook (which soon narrowed after he realized the extent of his injury), his training, his personal initiative, his temperamental reactions or individual morale. The fundamental problem was to help the patient "find himself" and to help him to desire to be an independent, self-directing public asset rather than an economic or social liability.

Briefly stated the scope of the psychological work consisted of:

- I. Surveys to obtain information regarding the patient's:
 - (a) Personal, social, educational and vocational history.
 - (b) Special interests, aptitudes and abilities.
- II. Examination to determine intellectual capacities and analyze mental abnormalities:
 - (a) Group and individual examinations of general intelligence for additional evidences of patient's fitness for a given curative occupational assignment or for permanent vocational training consisting of:
 1. Alpha examination for high grade literates.
 2. Stanford-Binet and Point Scale examinations for low-grade literates.
 3. Army performance test for literates and illiterates.
 - (b) Individual psychological examination for patients exhibiting special mental abilities or disabilities including:
 1. Examination requested by neuro-psychiatrists as an aid in diagnosis and disposition of their patients.
 2. Examination of psychiatric cases not interviewed and assigned to curative work through the usual methods, owing to their special defects and susceptibilities with assignment of such cases either to ward occupations, ward gardens, shops, typewriting, etc.
 3. Investigation of psychological causes of special cases of maladjustments, with counsel to patient and general recommendations.
- III. Examinations to determine skill in various occupations, by means of trade tests:
 - (a) In order that the patient may be assigned to curative work which may at the same time furnish vocational training, whenever such is possible.
 - (b) For the information of the Federal Board for Vocational Education and the Limited Service Board of the Army.
- IV. Measurements of voluntary movement and muscular strength in disabled joints:
 - (a) Procedure.
 1. Measurement in degrees of the range of voluntary movements of various joints in isolation.
 2. Measurement in pounds of the strength of muscles governing the various movements in upper and lower extremities.
 - (b) Purpose.
 1. To obtain necessary information for proper assignment to curative work.
 2. (a) Adapted to limited powers of the patient.
(b) As required for sufficient exercise to develop increased function of the partially disabled limb.
 3. To obtain in numerical and graphical form, reports which may be used:
 - (a) To encourage and stimulate the patient to persist in the curative work by showing him definitely the progress of improvement.
 - (b) To furnish the surgeon and physiotherapist definite information as to the patient's progress.
 - (c) To keep the instructor informed in order that he may adapt his work to the changing needs.
- V. Work on the learning problem with a view to determining and applying the most effective methods of teaching:

- (a) In developing greater use of the remaining or uninjured limb by transferring functions to it.
 - (b) In training for effective use of prosthesis, the artificial limb, or of a partially disabled limb.
 - (c) In applying psycho-educational measurements.
- VI. Development of morale:
- (a) By inducing a proper attitude on the part of the patient in regard to his disability and his future by:
 1. Showing him what others similarly handicapped have done.
 2. Showing him that the hospital treatment is really producing beneficial results.
 3. Making clear what steps the Government has taken to provide for his future in the way of compensation, insurance and vocational rehabilitation.
 - (b) By providing opportunities for the patient's recreation and amusement while in the hospital:
 1. Through the agencies of the Red Cross, Y. M. C. A., K. of C., and J. W. B.
 2. Through the use of the gymnasium and athletic field for athletics, dancing, etc.
 3. Through educational excursions to Mt. Vernon, the Capitol, etc.
- VII. Further projected psychological work not carried out during writer's command:
- (a) Measurements of sensitivity in cases of palsied or sutured nerves.
 - (b) Measurements of speed and accuracy of movement.

III. INTERVIEWING, AND PSYCHOLOGICAL TESTS

It was found that the rapport established through the first interview is of great importance. This meeting should be at the bedside if possible, short, informal, with the avoidance of copious notes, and with an opportunity for the interchange of experience, the establishment of friendship and the patient's confidence with clues for future coöperation. This should be followed by an interval for gathering additional information and an opportunity for the interviewer to familiarize himself with available data from the medical histories and other sources, which give a good background for a second interview and an assignment.

Special effort was made in the interview to discover the existence and character of special interests, abilities, and aptitudes which might be used for curative, occupational and vocational ends. Additional clues were furnished by a qualitative analysis of the performance tests and other psychological examinations, by impromptu educational and trade tests, by observation and by the evaluation of the man's capacities from various angles by the interviewer.

In the original psychological record blank, formulated in

the main by a group of psychologists at conferences at the National Research Council,¹ there were more than 150 questions for each patient covering physical, personal, social, educational and occupational data. These blanks were soon materially modified into a briefer form which was later supplanted by Form 58, calling for approximately 78 items and including many of the essentials of the original sheet. It was frequently desirable where a man's previous educational history was not available nor clearly outlined, to make, by means of measurement scales, an educational diagnosis or examination of the degree of attainment in subject matter in algebra, arithmetic, drawing, English, French, geography, German, grammar, handwriting, history, language and composition, Latin, physics, reading, Spanish, or spelling. Under ordinary conditions a survey of the man's ability in oral and silent reading, spelling, speed and quality of writing, fundamentals in arithmetic and reasoning was sufficient, supplemented by Reasoning Test No. 2 in the Army Alpha examination.

This psychological service dealt with adults who had had serious disabilities and in many cases prolonged emotional attitudes which had to be recognized, tactfully met, and finally brought back to normal channels of reaction. Examinations and tests were not ends in themselves, but merely preliminary means for determining the disabled soldier's capacities and possibilities for remedial training. The aim of the psychologist was to understand the man's mental attitude and direct his reactions into normal, healthy forms of expression. The disabled man must ultimately know what he can do and be led to feel a keen, healthy enjoyment in his own accomplishments. In short, he must learn to function again as a complete man, within his limitations. In many instances this purpose was best accomplished through a *rapport* gained from informal bedside conversations where the psychologist was a colleague and friend, rather than through the formal application of examinations in the laboratory. Occasionally group conferences and talks were desirable, but in the end a clear diagnostic picture was essential, accompanied by a constructive remedial program or the diagnosis failed in its fundamental purpose.

Among the important suggestions the psychologist bore in mind in this connection were the avoidance of undue fatigue of the patient, of misdirected emotionalism or the attitude of pity

¹ This committee was composed of W. C. Bagley, J. W. Baird, Major B. T. Baldwin, Mable R. Fernald, S. I. Franz, F. N. Freeman, Major M. E. Haggerty, E. K. Strong, Major R. M. Yerkes, and Helen T. Woolley.

or condolence, and of suggestions which will enhance the disabled soldier's discouragement or make him more sensitive in regard to his disabilities or handicap.

(a) Trade Testing

From the inauguration of psychological work at Walter Reed, the psychologists were called upon to rate the proficiency of convalescing patients in various army occupations. Before the armistice was signed, if a man was unfitted, as a result of a certain disability, to resume his duties with his former unit, the question arose as to whether the man should be retained in service, and if so, what branch of service he should be assigned. The War Department under necessity of utilizing all available man power, adopted the policy of retaining for domestic duty men who were not physically fit for full service provided they were 80 per cent. efficient in any army trade or specialty. The methods used were two-fold; first, the occupational survey by means of which information was secured as to the amount and type of experience of the patient, and second, the Trade Tests, by means of which the degree of trade ability, skill and judgment could be evaluated. The Trade Tests enable the examiner to rate the candidate as novice, apprentice, journeyman or expert, each of these designations connoting an increasing degree of proficiency in the order given. In a group of 119 patients, for example, 30 different trades were represented ranging from novice to expert. Of another group of 75 patients (July, 1918) representing 32 trades, 49 had had two years or more of training and the others less; of another group of 156 patients (July, 1918) representing 54 trades, 96 had had two years or more training and the remainder had less. Of these 31 were from amputation wards, 72 from orthopedic wards, 44 from medical wards and 9 from neuro-psychiatric wards. The occupational survey included the main occupation, years engaged, just what the worker did, name of firm, kind of business, department or branch, weekly wage, reasons for leaving, stability of employment, member of union, second occupation, third occupation, army experience, patient's occupational "preference" with reason. The general tendency was for the disabled soldier to pass through a period of instability, with his preference shifting from one line of occupation to another, and after he had spent a long period in a hospital almost any type of constructive activity would make a strong appeal to his imagination. The end in view was to give

the man an understanding of his possible future, to stimulate him to undertake the work necessary for reëducation.

The purposes for which the Trade Tests have been given may be summarized under the following heads:

1. Ratings for the Surgeon's Certificate of Disability Board indicating whether the disabled soldier should be retained in service or not.
2. Ratings for the limited service board stating the branch of service or occupation to which limited service men should be assigned or transferred.
3. Ratings to assist in making proper educational assignments in the reconstruction shops. The Trade Tests give information regarding the stage at which the student's training should begin and prevent his being given instruction or occupation which is too elementary.
4. Ratings to assist in vocational counsel and guidance. Vocational guidance was given after a thorough study of the case which included standard psychological examinations to determine the degree of intelligence, a qualitative psychological diagnosis for the purpose of discovering whether the man possessed any special aptitudes or abilities, a try-out in the shop under technically trained men and in Trade Tests.
5. Ratings for the Federal Board for Vocational Education. When the disabled man was ready for discharge, he was interviewed by representatives of this organization with reference to further training under their auspices. Reports on individual cases are furnished to assist in arriving at a decision on further training of a case; the grade of training with which he may begin and the amount of instruction which will probably be required to bring his knowledge up to the point where it will insure self-support.

(b) Neuro-Psychiatric Cases

Practically all patients recommended for S. C. D. on the basis of mental deficiency were examined individually by a psychologist at the request of the psychiatrist in charge of the neuro-psychiatric wards; and it was found that some of these patients rated as low as four years mentally, and others with an adult intelligence of A by the Army Alpha Scale.

The psychopathic patients, either with abnormal development of a few mental traits, or retarded mental development in general, were systematically interviewed on consecutive visits, and the examinations were supplemented by a careful study of the medical, social and psychiatric history of the patient, with personal inquiries formulated leading in the direction of the analysis of the pathological mental phenomena in question.

From December 15 to March 1, Captain Elliott, for example, examined one hundred patients with a distribution of tests used as follows: Alpha Examination, 10; Stanford-Binet, 73; Point Scale, 3; Performance, 14, which is representative of the frequency of distribution of tests used during the year by other psychologists.

The median mental age of distribution for all neuro-psychiatric cases examined was between ten and eleven years.

IV. MEDICAL SOCIAL WORK

One phase of work of psycho-social import for army hospitals, initiated and developed at Walter Reed, has been the use of medical-social workers with special training in social welfare and the elementary rudiments of medicine. This department began in January under the direction of Dr. Edna Henry, who was followed for a short period by Miss Ruth Emerson and then by Miss Louise Hoyle. The purpose has been to secure such personal and social data about the patient as will assist the accurate diagnosis, or lead to a speedier recovery and a safe discharge from the service. On May 1, 1914 cases had been systematically interviewed and remedial forms of amelioration put into action through conferences and correspondence.

The scope of activities of the new department was divided into three general fields:

1. New admissions into the hospital.
2. Acute and convalescent patients within the hospital.
3. Disposition and after-care of discharged cases. For example, in April, 1919, the number of patients visited within a week of admission was 203. They were individually reported to the Reconstruction Department, Red Cross, American Library Association, Federal Board for Vocational Education, Insurance Officer, Ward Surgeon and other agencies. Of those about to be discharged and referred to the After-care Department of the Red Cross there were 125; and 205 patients were acute or convalescent cases within the hospital receiving extended treatment or were cases on furloughs.

An inductive survey of the case records shows that the main problems arising between the aide and the new patients were difficulties involved in, or information relative to compensation, government insurance, allotments, Liberty Bonds, back pay, reconstruction work, furloughs, artificial limbs, opportunities for recreation, information regarding one's home, the regulations of the hospital. For those in the hospital in the after-care section, the conferences and lectures orientated around the family history, social and financial status, reputation and industry, educational life, housekeeping standing, deterioration since the war, the attitude of parents toward patient, attitude of man toward his com-

munity, marriage complications, love affairs, divorce, preparation of the family for the type of injury on the part of the patient, need of supervision in the home, living accommodations, church or recreational opportunities and opportunities for future training.

The influence of a bright, attractive social worker who depended more on her personality than on science, met the situation as follows:

Patient was referred to worker by reconstruction interviewer as one who refused work. When aide first visited patient, he was found in the last bed of the ward, his face turned to the wall, and with traction fastened to his stump. When spoken to he just responded, and that was all; he did not even turn his face from the wall. Worker asked one or two questions and patient answered only "yes" or "no" and said that he was not interested in anything.

At the second visit, patient still seemed uninterested but did turn to see the mail the aide brought at that time. Worker asked if he read very much. "No, I don't read anything and I don't want anything to read," he replied.

At the third visit worker took a copy of *Dere Mabel* and asked patient if he had read it. He said "No," so worker explained that it was written by a Lieutenant of the 27th Division, that it contained the letters of a soldier to his girl, etc. She read the first two letters, left the book and went away. This was Saturday; when the worker returned Monday patient was sitting up, and before the worker could say "Good Morning," said "Where were you yesterday: I waited for you all day. I want that other book."

The other book was secured immediately. When that was finished, he asked for other books, also asked to do leather work, and was much interested in all that was going on in the ward. He talked freely of himself, his family, plans for the future, etc. He improved rapidly and was transferred from the ward to the shops for work.

That these problems have a direct medico-social significance in the treatment of the case is shown by the fact that during one month 103 patients were referred to the medico-social workers by the ward surgeons in both the medical and surgical services of the hospital. That the medical-social worker can ferret out valuable information for the ward surgeon, reconstruction department, psychologists and the administrative authorities of the hospital, may be indicated by a brief summary of one of the many difficult cases:

After repeated interviews, Private — (leg amputation case) refused to take work — says he never has worked regularly, and now his mother says he need not. He has a father, mother, and five sisters and a brother; has reached only the fourth grade in school, and while he has done some auto work, he states he never intends to work again after discharge from the army.

The information from the home service representatives shows that this patient was employed six different times by a company which employs the father, and discharged five times by the same company before he entered the army, and that he is a "loafer." He was arrested eight times in his community for drinking, theft and disorderly conduct. His furlough home apparently did him harm, since he began to go back rapidly to his old habits, when among his former associates.

The psychological examination shows the patient to be a high-grade moron with marked criminal tendencies; the type of a derelict who no doubt will require following up for several years. The family will also need bolstering up.

Another type of after-care is illustrative:

Our Red Cross Visitor had a very satisfactory call upon the family of Private —. She found an unusually sympathetic and appreciative reception. The family is of the better class of Hebrew type, self-made and naturally intelligent though of comparatively little education. The boy's nervous trouble is much better and he has gained fifteen pounds weight since returning to his home. Is in good condition, "feels fine" and does not need medical attention at present. He has not yet made application for compensation though perfectly aware of his right to do so and is keeping up his insurance. Is at present helping his father in the shoe store, where he is needed, but the father says he will not stand in his way of change if it will be for his advancement.

Home service will keep in touch with the family and render them any assistance necessary.

V. OCCUPATIONAL THERAPY

Occupational therapy for the functional restoration of disabled joints, as stated in a previous monograph,¹ is based on the principle that the best type of remedial exercise is that which requires a series of specified voluntary movements involved in the ordinary trades and occupations, physical training, play or the daily routine activities of life. The curative shops were organized on the principles which enabled us to isolate, classify, repeat, and to a limited degree standardize and control the type of movements involved in the particular occupational and recreational operations. The patient's attention was repeatedly called to the particular remedial movements involved; at the same time these exercises had the advantage of being initiated by the patient and of forming an integral and necessary part of a larger and more complex series of coordinated movements. The periodic measurement of the increase in range and strength of movement made it possible for the patient to observe his recovery from day to day; and frequent comparisons between his progress curve and that of others offered good opportunity for explanations which helped him to overcome plateau periods or regressions that necessarily occurred. In addition to evoking an attitude of sustained interest, cheerfulness and optimism in the patient by showing him that he really was making progress, thus directly encouraging voluntary effort and personal initiative,

¹ Baldwin, Major Bird T., *Occupational Therapy Applied to the Restoration of the Functions of Disabled Joints*. A Walter Reed monograph printed by the Department of Occupational Therapy, 1919. 67 pp., 48 plates.

the records also enabled the examiner to determine which mode of treatment lead to the greatest and most consistent gains in a particular case.

The practice of formal mechanotherapy, or formal medical gymnastics, which has been so widely used, consisting of exercises of a quasi-passive nature on special apparatus designed to give opportunity for the execution of repeated movements involving specific joints, has the advantage of isolating particular joints from the rest of the body, and allowing for the construction of special apparatus designed to give repeated exercise under controlled conditions for limited periods of time. These two methods are not mutually exclusive but occupational therapy is the newer and more promising field which has not been developed to any great extent here or abroad.

The disadvantages of the mechanotherapeutic method are that the human body is more than a machine when voluntary movements are concerned and it is very doubtful whether the formal repetition of movement from a mechanical source is of maximum therapeutic value in increasing the amount of movement either in the affected part or as an integral part of the larger coördination of movement of which each particular movement must ultimately be an essential part. The application of mechanotherapy does not allow for the personal initiative of the subject, gives little or no opportunity for voluntary effort, and offers little incentive for sustained effort.

In the curative shops, ward, and bedside work for occupational therapy, special projects, special machines, and special tools were set aside for strictly curative cases and the instructors checked the movements which each man made in order to see that special joints were not favored or over-fatigued. In the work-shop the patient was a member of a social group and turned out a tangible product of economic value; he was thus brought to full realization of his social fitness and economic usefulness—a factor which is of inestimable value in encouraging and inspiring him.

Where more than one of the activities were equally desirable from the curative standpoint, the one with a vocational outlook was assigned in accordance with the patient's choice and the recommendations of the vocational advisor. Frequently the patient was taken through the shops to observe and to try out the work. Occupational therapy in work with a vocational outlook is, as a rule, preferable and most desirable from many points of view, but fre-

quently patients, whose stay in the hospital was short, preferred to work along the lines of an avocation rather than to return to vocational experiences.

The main divisions into which this work was classified were (a) diversional, (b) occupational, (c) curative, (d) vocational, (e) educational.

Type Cases in Occupational Therapy (Disabled Elbows)

1. Private B. N.—Elbow.

Diagnosis: Limitation of movement, right elbow.—B. S. W.

Prescription: Mobilization right elbow in flexion-extension by work for one hour a day avoiding undue fatigue.

Assignment: Carpentry. First project was in making a cigarette case for the Red Cross, doing the entire work himself and working at it in all his spare time. After this he made filing boxes. In both these projects the hammering with small hammer and nails required very slight elbow motion, but the sawing and planing of the wood necessitated elbow extension and flexion. The measurements of the range of voluntary movement showed a slight but steady increase from October 4 to November 2:

October 4, 21 degrees; October 11, 24.5 degrees; October 14, 25.3 degrees; October 25, 28 degrees; October 29, 29.8 degrees; November 2, 29 degrees.

2. Private

Diagnosis: G. S. W. forearm right upper $\frac{1}{3}$ FCC Radius. Limitation of elbow.

Prescription: Flexion-extension elbow; pronation-supination with warning to avoid fatigue of right arm.

Assignment: Carpentry (curative) 1:15 to 2:15 P.M., sawing for flexion-extension of elbow, planing for extension of elbow, use of screw-driver for pronation-supination; grasping of any tools for strength of grip. Telegraphy—9:30 to 11:30, though mainly occupational requires slight, quick, extension-flexion of elbow and flexion of fingers.

Progress of case: In carpentry worked on an average of six hours a week, making file boxes, looms, rakes (for knitting), picture frames—worked conscientiously and steadily; interested in the work in itself as well as from a curative standpoint. In telegraphy, attended regularly; was a good worker in spite of his disability. He sent twelve words per minute with his right hand, and received at the same speed. His wound prevented greater speed in sending.

Measurements taken in the psychology Laboratory from December 30, 1918, to January 25, 1919, showed the following progress:

MEASUREMENT OF STRENGTH
Elbow, Flexion-Extension

	Left		Right	
	Fl.	Ex.	Fl.	Ex.
Dec. 30.....	26	19	69.7	44
Jan. 7.....	28.3	20		
9.....	28.6	26.7		
11.....	31.7	27		
16.....	26	26		
18.....	33.3	29.7		
21.....	25.7	27		
25.....	32	29.3		

MEASUREMENT OF EXTENT

*Elbow, Left, Flexion-Extension**Elbow, Left, Pronation-Supination*

Dec. 30.....	83	Dec. 30.....	85.9
Jan. 3.....	97	Jan. 3.....	85.9
9.....	102	7.....	127.5
11.....	105	9.....	122.3
16.....	110.7	11.....	127.0
18.....	118	16.....	119.3
21.....	121.7	18.....	131.3
23.....	130.3	21.....	143.7
		23.....	150.3

VI. WARD OCCUPATIONAL THERAPY

From the curative standpoint there is a wide range and a most promising field in the application of ward occupational therapy to restoration of function in orthopedic cases, nerve palsies, amputation and neuro-psychiatric cases. This is in direct line with the policy of the occupational work without the ward in the curative shops and a close coördination has been made between the two since the beginning of the work. With the orthopedic cases the surgeon's diagnosis, his analysis of the movements in the disabled member, and his prescription of the functional result to be attained have been correlated with the analysis of the range and strength of the movements in the psychological laboratories, the analysis of the movements involved in each craft—or shop activity—and the passive exercises in the physiotherapy treatment. This has been carried out in detail for all shop cases and many ward cases.

For example, in ward occupations forcible extension of the fingers may be noted in bookbinding, in spreading paste, in pressing cloth or paper on back of book; leather work, in holding leather flat with one hand, and in tooling with the other, extension of second and third fingers in holding tool; basketry, in keeping reeds in proper position and in raking reeds into place; cord belting, in reaching for cords to tie knots and in holding leaders on which knot is tied; also in weaving, for the *wrist*, flexion (and extension) in making Colonial mats, in weaving, painting and book binding; for the *elbow*, turning the lever in the sock machine, pulling out long cords in making the Macramé belt, working with long reeds in basketry, winding the frame in a Colonial mat; for the *shoulder*, rug weaving; reaching to pull down thread in Gobelin tapestry loom; on jewelry:—slight extension (and flexion) in pulling wire and in hammering; in modeling:—slight shoulder movements in ordinary modelling, the amount varying with size and heaviness of

work; for the *hip*, work which requires use of foot lathes and jig saw adjusted for long and short strokes to increase the range of hip extension; and for the *knee* and *ankle*, in use of treadles in shifting sheds on Lane loom, use of foot treadle in machine for winding yarn, slight extension in use of sweater machine.

Similar remedial exercises have been worked out for abduction, adduction, circumduction, rotation, and other movements of the fingers, wrist, elbow, shoulder, neck, back, hips, knee, ankle and foot.¹

Development of a Normal Mental Attitude

The use of handicrafts for patients confined to their beds or to the wards, has been found to have a distinct palliative value through keeping patients occupied, cheerful and in a good mental attitude. The diversional type of work occupies the patient's time, keeps him awake during the day, causes better rest at night, decreases homesickness, prevents prolonged attention to a disability or anticipation of an operation or painful treatment, inhibits worry over minor annoyances and tends to foster normal healthy reactions through the substitution or modification of other more desirable emotional channels.

That this work has been of distinct mental and moral therapeutic value has been apparent within the wards and particularly when comparison has been made with those wards where such treatment is not in vogue. If a patient is not reached when in the acute sick ward he is very apt to become lazy and hospitalized when reaching the convalescent ward, whereas the simplest and sometimes effeminate type of work will awaken his interest to do something and evoke a desire to go on and do more advanced work.

Whenever possible the "manly crafts" and vocational activities are presented and there has been a marked tendency to increase these as the work has progressed; frequently, however, a patient is not in an attitude of mind to consider seriously his past or future vocation. He is weak after a long illness in a medical or surgical ward and he cannot do a man's job but must be given something he can do which will mildly stimulate his interest and offer easy motor reactions without undue fatigue. The activities with color, designs, rhythmic movements and of mechanical import each have their distinct psychological value and appeal aside from the end produced with its practical, decorative, or psycho-social significance

¹ *Op. cit.*

to the maker or the curative value in the restoration of impaired functions.

Schedules of occupational therapy for individual patients in the psychopathic wards whose coöperation could be obtained have have been carried out and it has been found that community undertakings, such as ward gardens and auto-repairing have been successful in arousing and maintaining interest. Cases necessarily kept in confinement or in bed have been given bedside handcrafts, and practically every patient has made one or more projects. The agricultural department, with its farm and greenhouses, provides employment for the more serious cases of mental disability which can be given their freedom, and for mental defectives without manual dexterity. The shops, with their manifold opportunities for systematic training in trades and vocations enable patients to regain those objective interests which are the most effective therapeutic agencies in milder forms of mental disorders, in confusional states, etc. The psychologist has maintained an intimate contact with the needs and progress of each individual case and has attempted a graded program of various types of occupational therapy which offer the most advantageous therapeutic activities to the types of cases presented in our wards.

"No single factor exerts a more powerful influence upon the patient's convalescence and subsequent rehabilitation than the mental attitude of the patient himself. The patient who has abandoned hope and who indulges in self-commiseration and gloomy forebodings has reached a condition which thwarts the best efforts of the surgeon and the educator. Lethargy and hospitalization are the inevitable results, and experience in the military hospitals of our allies has shown that, so long as despondency, pessimism, and instability persist, the case is utterly hopeless. On the other hand, a cheerful optimism on the part of the patient, a spirit of self-reliance, and a determination to coöperate are so vitally important as to be indispensable.

That the various types of occupational activity and curative courses have had significant therapeutic and vocational value in many particular cases is apparent to those in close touch with the details of the work."¹

The presence of well-trained women, occupational aides and medical-social workers, of strong character, lofty purposes and a

¹ BALDWIN, Major Bird T. Helping the Wounded Soldier to "Come Back," *Modern Hospital*, 1919, 12, 370-374.

love and abandon for their art, craft, or subject of instruction or remedial function has been found to have a marked influence on the morale of the patients and their motivation. Their presence has been of distinct value in the Army Hospitals; it was feared by many that they would further complicate the problem of discipline and interfere with the routine of the ward nurses, since the majority of the Aides were of the artistic emotional type with strong individualities of their own and unaccustomed to hospital routine. A few general principles may be gleaned from their work:

1. Their function has been to change the man's mental attitude as far as possible into that of a normal man,—physically, socially, and economically.

2. There has been a constant readaptation of the projects to new types of men that have been admitted, based on changing morale, changing seasons of the year, and the special abilities of the instructor or worker.

3. The bedside occupational activities have been materially extended and systematized into greater projects, with longer and shorter units of work.

4. The occupational work has aimed to increase a man's knowledge and definite tangible evidences of increased skill been shown him from time to time.

5. Group work has been introduced wherever possible although the work has been fundamentally that of individual instruction.

6. The work has aimed to be interesting but the patient has been encouraged to do what seemed most worth while, regardless of how tedious or uninteresting it was, since one of the fundamental problems has been to teach the man sustained effort and habits of industry.

7. A conscious effort has been made to give a patient a man's occupation, when he was able.

8. Ward occupations have not been carried beyond the point where the desired mental and physical improvement has been secured. The improved state of mind has been used to turn the patient's activities toward the curative shops.

9. All patients have been encouraged to do some work and a poor or useless product has been considered better than idleness on the part of the patient.

10. The ward work and the work in the shops has established a new educational principle, namely, that it does not require years for an ambitious young man to learn a craft or a unit of subject matter. If the work is properly organized and the man systematically trained, he may finish with profit a *unit of work* extending from one week to six months.

VII. AMPUTATES

The psychology of amputation cases is a subject full of interest and opportunities for work primarily in habit-formation. As a rule, these patients are very active when not confined to the bed, and present an apparently optimistic point of view while among their associates in the hospital. Several thousand were treated during the interim included in this report.

Most frequently, directly after an amputation there is a short

period of exaltation on the part of the patient, followed by an extended period which may last a lifetime of suppressed depression due primarily, aside from physiological readjustments, to the realization of the seriousness of the handicap, especially in personal habits of dressing, eating, care of the body, routines of social etiquette, and the consciousness of the loss of a life vocation or profession. A mental reconstruction is necessary, accomplished fundamentally through the building up of a background of self-dependence and self-reliance which requires training and the demonstrations of what others can do with similar handicaps.

1. Educating One Arm (or Leg) to Take the Place of Two

If an arm is amputated at the shoulder, the remaining arm must be trained to take the place of the two arms. Definite training, demonstrations, and practical work have been given the men individually by an instructor with a right-arm amputation, as to the best methods and devices for dressing, tying shoestrings, tying neckties, cleaning and cutting the nails, putting on the collar, eating, and such activities as striking a match upon a matchbox and rolling a cigarette with one hand. It is the ability to do these little things that makes the handicapped man independent in his home, and leads him to experiment with more difficult problems.

2. Educating the Active Arm (or Leg)

If an arm is amputated at the shoulder or near the elbow, the remaining arm must become the active or fundamental arm. When the right arm is amputated in right-handed individuals, the former finer accessory movements of this active arm must be transferred to the left arm. The "stump arm" now becomes the auxiliary arm; the normal arm, the active arm. For example, the patient is taught to write with the left arm. He may be able to write with the prosthesis on right arm, but he is taught to use the remaining or left arm in every way possible, and to rely on the prosthesis with a mechanical attachment as little as possible. In this way the auxiliary arm is trained to become the active arm. Young men soon learn to write well with left arm with good speed by the use of the arm movement method, a ball-pointed pen, and special instructions as to the methods of holding the pen and paper in a position that the hand will not cover the writing. When the auxiliary arm is amputated it is essential to increase the functional ac-

tivities of the active arm to make up the deficiencies necessitated by the limited activity of the auxiliary arm by other types of finer movement exercises, such as piano exercises, typewriting, telegraphy, carving, engraving, croconole, etc. Only six cases of double arm amputations have reported at the hospital and these represent special individual problems.

3. *Measuring Range and Strength of Movements of Stump Arm or Leg*

It is most desirable to increase the range of motion and strength of the remaining portion of the amputated arm and the methods described in a former monograph,¹ are applicable with slight modifications.

4. *Educating Auxiliary Arm with Prosthesis, and Exercising Remaining Stump*

If a temporary or provisional prosthesis has been fitted, special attachments have been used in work and play: as, for example, the use of various types of hooks and clamps for shop work, which may be attached to hammers, saws, planes, chisels, or attachments for games, including baseball bat and glove, tennis racket, and various types of apparatus in the gymnasium, such as pulleys, dumb bells, etc. Games have a particular psychological value in that they give the desired exercise, they appeal to play instinct, and aid materially in building up a mental background of self-confidence, self-respect, self-control, and the social coöperation with others.

5. *Educating Artificial Arm (or Leg)*

The psychologists has been found to be of direct aid in assisting the patient in adjusting himself to the use of an artificial limb and to the best methods of using it effectively in the least extent of time. It is remarkable how much of the inactivity of an artificial arm, or the limb accompanying an artificial leg, is due to *habits* which can easily be eliminated by a trained psychologist who is familiar with the general principles of motor coördination; but on the other hand it is inconceivable that an attached prosthesis for either the arm or the leg could ever replace fully the missing member with its dermal and kinesthetic sensations, or the finer coördinated movements involved in normal activity.

¹ *Op. cit.*

The functional value of an artificial arm is very small compared with that of the normal arm or with the expectancy on the part of the general public as shown by a review made on March, 1918, of several hundred arm amputation cases of long standing and the observation of hospital cases; many patients prefer the empty sleeve to the lifeless mechanical attachment of which they are constantly conscious. As implied above, the patient must be disillusioned in advance from believing that he can find a substitute which will enable him to do the multiple things he did with his normal arm and brought to a full appreciation that the future usefulness of the disabled member lies in the physical development, reëducation, and careful training of the remaining portion supplemented by a few artificial appliances or the adaptation of tools and machines to the remaining portions of the arm. It is on the active arm that he must fundamentally rely, for the new one will always be auxiliary.

It should be noted that since the artificial arm and hand supplied by the hospital are temporary or provisional, and since the hand is largely for esthetic rather than functional purposes, and since the men are discharged as soon as they receive the arm, we have had but little opportunity for training in the use of artificial arms *per se*. Definite training has been given in the use of artificial legs in walking and in the use and exercise of the prosthesis involved in running of lathes, jig saws, knitting machines, foot-looms, grind stones, harness maker's horse, etc.

In the curative shops arm amputation cases, for example, have been successful from the curative and vocational points of view, with the curative aspect fundamentally in prominence in telegraphy, typewriting (a few reaching a maximum of eighty words per minute), stenotypy, bookkeeping, drafting, drawing, cartooning, woodworking, acetylene welding, weaving, jewelry work, engraving, gymnasium work, agriculture and greenhouse work, a few in linotype printing and one with a special appliance in mending, repairing, coloring, and operating moving pictures, but he was refused work by the theaters and moving picture concerns on account of the fire hazards which so frequently arise in connection with the use of the film.

An intensive individual study of non-selected list of eighteen amputation cases (ten arm and eight leg cases), their disabilities, prescriptions (in curative shops) and former schooling and occupations—together with written statements from their medical officers, educational officers, vocational officers, and patients them-

selves, as to whether a change of occupation seemed desirable—resulted in (a) change of occupation desirable, 6; (b) change of occupation not necessitated by nature of disability, 12; (c) change of occupation desired by the patient in order to find one more to his liking, 4 of the 12 under (b).

TYPE CASES

1. Pvt. J. A. B. (arm amputation).

July 15, 1918, on Champagne front struck in left elbow by high explosive. Dressing at F.A.S., then to Mobile Hospital No. 1, wound cleaned and fragments removed July 16. Evac. Hospital No. 13—amputation arm middle third, left open. Flaps sutured ten days later. W. R. G. H. September 25, healed, massage, fitted with prosthesis.

Former occupation, farmer. Attended Business College. Future occupation (?). Educational assignment, bookkeeping, assistant in postoffice. Present assignment in training in use of fundamental arm in wood-working shop, physical training and games in gymnasium, including baseball and handball. Personal conferences with instructor (right arm amputation, case of nine years standing) in dressing, care of body, and eating. Training in use of prosthesis with Boller and Manger's hooks in shop, planing, hammering, chiselling.

Muscular strength in pounds: Left Shoulder—Pectoral 30.3, ant. deltoid 29.5, post. deltoid 15.2. Right Shoulder (Normal)—Pectoral 72.7; ant. deltoid 64.7, post. deltoid 63.0.

2. Pvt. C. E. M. (leg amputation).

June 13, 1918, while patient, injured by moving train at La Treport; left leg fractured. Carried to infirmary of Bn. 1, 140 Inf., splints and bandaged. Sent by ambulance to General Hospital No. 16. Leg amputated. September 18, W. R. G. H. Amputation at junction of upper and middle third. September 22 Liberty leg fitted. October 1, 1918, wearing Liberty leg, no ill effects. October 18, recommended discharge, mental and occupational rating.

Alpha mental rating C. Performance scale, C. Well driller 1 year, apprentice rating, in army since eighteenth year. Will resume former occupation of well driller after six months of training in operation and repair of gas engines. Desires also to qualify as oil well driller.

Curative workshop prescription. Active exercise in flexion-extension of knee and hip. Assignment (curative) woodwork, mornings on foot-turning lathe. Adjusted seat which increased the flexion-extension of knee and hip required to turn the lathe. Special project turning out legs for the serving trays used in the wards. Patient walked daily to and from Ward 75 to the Power House for increased exercise. Amputation right leg approximately 4 inches below knee. Muscular strength in pounds: Right knee—Flexion 7.7, extension 37.3. Left knee (Normal)—Flexion 41.3, Extension 90.0.

At the present time a number of public and private hospitals in this country, especially in Pennsylvania, Illinois, Massachusetts, New Jersey, Texas, and California have introduced occupational therapy as an integral part of the hospital life and treatment. The field is directly applicable to those disabled through industry.

GENERAL REVIEWS AND SUMMARIES

DRUGS

A. T. POFFENBERGER

Columbia University

Miles (9) has supplemented and amplified the work previously done by Dodge and Benedict on the psychophysiological effects of alcohol, by an intensive study of one subject. This subject was chosen from those studied by the earlier workers as the one whose results were the most irregular. The technique of the experiment is practically unchanged and the results confirm the earlier work in showing a depression following alcohol. However, the effect of single doses was studied for a period of five hours, and there was some indication of a facilitation in the reflexes following the primary depression. "Facilitation in these experiments therefore seems limited to the reflexes, and pending the accumulation of data with other subjects it is best to forgo further discussion of the matter here" (p. 129).

Fiske (3) discusses the effects of alcohol upon human efficiency in the light of recent investigations, especially those of the Nutrition Laboratory of the Carnegie Institute. Graham (4) attacks the assertions of the prohibitionists that alcohol is the cause of insanity and quotes from numerous authorities to the effect that alcoholism is a symptom of some underlying fundamental defect rather than a cause. Rowe (10) has made a study of the types of crime committed by persons while intoxicated. Statistics for the study are gathered from various sources. Anderson (1) presents a study of 100 cases of women brought into court for drunkenness. Of these cases, 68 were clearly distinguishable as abnormal mental types, of whom 32 were feeble-minded.

Marks (8) discusses intoxication as a race instinct, and suggests means of combating the increase in the number of drug addicts resulting from the war. Stanley (11) has made a study of 100 cases of morphinism in regard to age at which use began, type of drug, mode of administration, dosage, occupation of the addicts, manner of acquiring the habit, and the physical and mental effects of the use of the drug.

Johnson (5) reports an experimental and statistical study of the effects of tobacco smoking. The conclusion is that smoking "reduces the accuracy and to some extent the efficiency of mental

and motor activity." The investigator recognizes a certain inadequacy of method in the lack of controls, which he thinks is a defect very difficult to overcome. Burnham (2) makes a critical survey of the studies of effects of tobacco on mental and physical functions. He derives a set of conclusions from the survey. A bibliography of 18 titles accompanies the report.

Macht, Isaacs and Greenberg (7) report the effects of such drugs as quinin, aspirin, phenacetin and salol upon reaction times, simple and complex. The effects of this group were found to differ from those of the morphin and opium group in that there was no stage of stimulation. The effects, where evident at all, consisted of a lengthened reaction time, an increased variability or both. Further, the simple reactions were more affected than the complex reactions. It is concluded that the coal tar derivatives act upon "lower synapses" than the opiates.

Lashley (6) measured the effects of strychnine and caffein upon learning in the albino rat, in order to test the several theories of the physiology of learning. Altho no direct answer to this problem resulted, certain interesting effects of the drugs were noted. "Strychnine sulphate, when administered in doses large enough to produce obvious changes in tonus effects a saving in the amount of practice necessary for learning. Caffein in large doses markedly increases the amount of practice consumed and the retardation of the rate of learning seems proportional to the amount of the drug administered."

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READING

By E. H. CAMERON

Yale University

Breed (1) has made a comparative study of tests commonly used for comprehension in reading. Thorndike's question method and Starch's reproduction method were both used on the same groups of children. A lack of correlation was shown to exist between the results of the two tests. Breed concludes that they measure different phases of comprehension. For theoretical reasons he prefers the Thorndike test for the purpose.

An interesting study of comprehension by Wembridge and Means (2) was suggested by the results of the voting in various states on questions which were put before the voters in negative form. Experimental investigation showed that where questions are asked in this form subjects make replies which are directly opposite in fact to what is intended in a large percentage of cases.

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REACTION TIME

BY V. A. C. HENMON

The University of Wisconsin

Angell (1) reports a continuation of work with his trigger reaction key on the relations of length and strength of pull to other factors entering into reactions. The preliminary study with one reagent had shown no constant ratios between the length of reaction time and the strength and length of pull. The results with four subjects showed that if there is any correspondence between the reagent's attitude and reaction times, none is indicated between attitude and duration of movement. Not infrequently cases of secondary reactions or double pulls occurred, which raised the question as to the length of reaction time when the reacting member is already in motion. These so-called flying reactions are quicker than the simple even when moving against a stronger spring tension. The writer refers this fact to physiological factors, that in the flying reaction the antagonistic muscle is already relaxed by the

preliminary pull, a condition which would naturally bring about the most noticeable marks of these movements, namely, the slower motion and the quicker reaction.

Macht, Isaacs and Greenberg (2), in continuation of an earlier study which reported results on the effects of opium and morphin on reaction time, give results of the effects of antipyretics. The drugs given in therapeutic doses were quinin, acetanilid, phenacetin, antipyrin, salol, aspirin, and pyramidon. Simple sound, touch, and light reactions, and association reactions involved in mental addition or multiplication were measured. The conclusions reached were that (1) all the antipyretics with the possible exception of quinin tend to impair or retard reaction times, (2) simple reactions are more affected than complex reactions, (3) combinations of antipyretics give results explicable by addition of the effects of components, (4) greater change in simple reactions seems to point to the seat of action of antipyretics as being in some lower synapse than that affected by morphin or opium.

Titchener (3) reports a special study of reactions by a subject who in a previous investigation was unable to maintain the required constancy of attitude and whose times were long and very variable even after much practice. The subject apparently reacts in a sensory attitude to motor instructions and in a cognitive attitude to sensory instructions. In spite of continued practice the mean variations remain very high and the reaction times are long.

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SPECIAL REVIEWS

Jesus, the Christ, in the Light of Psychology. G. STANLEY HALL.
New York: Doubleday, Page, 1917. 2 vols. Pp. xix + 733.

As the author says, he is here a pioneer in a new domain. Textual and historical studies need to be supplemented and transcended by psychological interpretations. "The certain data are so meager, gappy, and contradictory, that psychology must, even more than it has of late, become henceforth our chief guide." This he regards as the brightest hope of Christianity. Experimental, introspective and behavioristic psychology have not been so important for the present work as genetic and folk psychology. Much use is made of Freudian concepts. Durkheim's studies are also in evidence. The author clings tenaciously to the much criticized theory of the recapitulation of the epochs of racial development, in the individual. An amazing amount of literature in biblical and theological subjects is cited and in some instances it has drawn the author far afield.

The main thesis of the work is that the new eschatological, psychological Jesus as presented in these pages can afford satisfaction for the cultural needs of religion (p. 113). Current orthodoxy is repudiated yet the author's studies have made it possible for him to "repeat almost every clause of the Apostles' Creed with a fervent sentiment of conviction." Not a clause of it is true in the usual meaning but all of it is true in a far higher sense (p. xviii). The historicity of Jesus is apparently maintained though it is asserted that this is not of great importance. There is little doubt, however, that this assumption of historicity gives a tone of reality and a degree of force to the psychological analysis which it would be difficult to attain otherwise. For example, the sermon on the mount is referred to as embodying the most essential teachings of Jesus. In the parables "we see farthest into Jesus' own heart." The miracles, though rejected as actual events, are accepted in their deeper meanings and every one of them is held to shed light on the inner life of Jesus (p. 595). This will seem like playing fast and loose with the subject to many readers and it must be difficult for the most nimble. Compared to the inwardization of Jesus, Dr. Hall regards Berkeley's subjectivization of the outer world only a parody (p. 337).

The sources of the great Christian conceptions are to be sought in the soul of the race, in "Man-soul." The events in the life of

Jesus have their significance as symbolizations of inner processes in the depths of human nature in its ascent from the animal to a spiritual state of existence. Thus the pity felt for Jesus' agonies is really self-pity on the part of man himself. "Only because of man's persistent ejective habit of thought is it hard to realize that it is all only a projection into the field of history of an internal process" (cf. pp. 235, 281). Jesus was the perfect totemic man. In his death the old degenerate God, Yahveh, was slaughtered. In the resurrection, the folk-soul brought to life the new God of Christian faith. "In raising Jesus from the dead Man-soul raised both God and itself, and entered a new world as a new creature" (p. 733).

This general thesis is developed through a wide range of topics beginning with the question of Jesus' Physical Personality. There is the greatest diversity in the pictures and statues showing that his personality has been left plastic to artistic imagination." All portraits of Jesus are thus mental imagery, as much so as if no such person ever lived." These ideal constructions of the artists are no more subjective and expressive of different norms than are the literary and doctrinal interpretations. The realization of this fact enables the genetic psychologist to understand Jesus more adequately and to see him as "the greatest projection that the folk-soul ever made."

The chapter on Jesus in Literature gives striking evidence of the author's capacity for marshalling in summary form an enormous body of rich and suggestive material. Probably nowhere else can one find in such condensed and effective presentation such diverse writings dealing with this subject. Included in this review are the works of the early apocryphal writers, medieval churchmen, modern story-tellers, novelists, dramatists, exponents of cryptic cults, and those who have described Jesus as a moron, epileptic, or otherwise defective. Of the works which employ psychological methods those are first discussed which are negative and antagonistic. Jesus is regarded by some of these as handicapped by heredity, by others as a paranoiac, as ecstatic, as a fanatic or as having a tragedy behind his baptism and ministry. Nietzsche is the bitterest enemy of Jesus and the Church in modern times and his views are given at length. More than fifty pages are devoted to those who regard Jesus as a myth and it is concluded that historic reality is of less importance than either the orthodox or their opponents suppose. "Why, indeed, should it make any more practical dif-

ference than it does to physics and chemistry whether atoms and ions are material bodies or immaterial centers of energy, or than it makes to the Swiss peasants whether William Tell was a person or a solar myth?"

Other topics to which separate chapters are given are: the Nativity, Palestine in Jesus' day with a survey of his social *milieu*, Messianity, Jesus' Eschatology, his Ethics and Prayer, Parables, Miracles, and his Death and Resurrection. It would have been interesting and valuable if a concluding chapter had been added presenting more completely than has anywhere been done the *ensemble* of qualities which this psychologist mentions. Descriptions of particular characteristics are to be found here and there but they might well be brought together in what would be the psychologist's portrait.

This would include the following fundamental components. In Jesus, as in every individual, slumbered a racial soul. The Hebrew mind of his time was full of Messianic hopes of a predominantly ethical kind. He knew these Messianic ideals before he felt any personal relation to them. Gradually his individual consciousness passed into the larger consciousness of the race. "He came to think, feel and act in super-individual or genetic terms." He projected and hypostatized this larger consciousness, interpreting it partly as Godhead and partly as the Kingdom. Thus he illustrates "psychic euthanasia." He was reared in poverty and believed the end of the world was at hand. He extolled poverty. "Jesus foresaw neither the Church, science, modern industrialism, law, courts, nor medicine, and had no conception of statecraft. But he did see, as no one before or since has seen, the principle of service and mutuality." He had an invincible sense of his own superiority over other men, and he concealed this sense of inner divinity from the world. This gave rise to a conflict of opposite impulsions which kept him alert, keen, and charged to the saturation point with energy. He lived under the power of a supreme wish supremely repressed. From this tension which was augmented by persecution and threatened death, certain traits developed. He was highly sensitive to pleasure and pain. He had great power of love and hate. He possessed ecstatic and abounding life, joyous and free, and attained an unconquerable spirit which defied even death.

The work as a whole would have been more valuable as a psychological treatise if it had been half as long, omitting extended discussions of questions which belong to historical and theological

domains. In spite of diffuseness, lack of close organization, and a marvelously unfamiliar vocabulary it is a stimulating and profitable work to students in this field. The author does not conceal the fact that he has a vital, practical interest in the subject and that he believes studies of this kind are necessary means to freer, more intelligent and more helpful religious faith.

E. S. AMES

UNIVERSITY OF CHICAGO

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

CHILD PSYCHOLOGY

BY DAVID MITCHELL

New York City

General Discussions.—The textbook on the Psychology of Childhood by Norsworthy and Whitley (35) is intended for use in normal schools. It contains little that is technically difficult. The responses of "original nature" are indicated, and an outline of the development and modification of these in the child's life is given. Instincts are classified as social and non-social. Children differ from adults in span or range of attention and in "complexity of object." Perception is discussed and the possibility of its improvement through attention. Memory is viewed as a gift of original nature and, therefore, not capable of improvement. The memory of the child is better for isolated facts than is the adult's. Because of this, educators should attempt to fix certain fundamental ideas as a basis for the child's future conduct. In their methods of thinking children also differ. Mechanical adjustments occupy a large portion of a child's time, and thinking is prevented in the child because of the adult's tendency to solve problems for him. The paucity of the supply of accurate facts also prevents a child thinking as an adult. In reference to the formation of habits of learning, various laws are discussed. Regarding play, the different theories are considered and play is defined as an activity without an economic end, and is distinguished by the attitude taken by the individual. One chapter of the discussion is devoted to cross-sections of child-life at ages five and eleven. Measurements of physical, social and mental factors are generally given, and exceptional children are

described from the standpoint of physiology, neurology, and mentality. The book concludes with a delimitation of the field of child psychology, together with an outline of coöperation with other fields.

A general survey of child study is given by Hall (19). After the introductory section treating the different fields and theories of predecessors and contemporaries, the author centers on psycho-analysis, indicating some aspects of psychic content or capability which this method has helped to disclose. The study of various qualities described by James, Freud, and Jung has led to new conceptions of fear, anger, etc. The notions of the egotist and of the altruist, together with the notion of compensation and the maintenance of psychic unity, are considered. According to this author, these psychic mechanisms which have been disclosed by the aid of psycho-analysis are more active in infant years, and a complete understanding of them might save much arrested development.

An *Introduction to Child Psychology* by Waddle (58) is another textbook for normal schools. It is written with the intention of giving general knowledge of the child rather than educational methods or psychological data. An historical account of child study includes a discussion of the various movements, theories, agencies and literature. The reliable methods of studying children are the biographical, clinical and the questionnaire, the latter being less reliable than the others because of the possible suggestibility of the child. Behavior is traced from chemical action to neurone activity. "Non-learning" behavior is described in terms of organic and muscular reflexes, and acts, either instinctive or with an instinctive basis. The pedagogical value of a number of the instincts with their time of appearance and the adaptability for education is indicated. Work and play frequently cannot be distinguished either objectively or subjectively, but play is a better stimulus to growth than work, since it is a response to natural demands. Speech development begins in reflex and involuntary exercises, passes through a period of imitation of sound, and lastly becomes thought expression. The author finds drawing of great value as an expression of the child's innate tendencies, and outlines several dramatic stages which are the scribble, the artistic illusion, and the self-conscious. The reactions of children can only be described as unmoral since they are largely natural or the results of innate tendencies. Juvenile delinquency is attributable to "moral immaturity," as well as to the increasing complexity of modern life. In

the general mental development of the child one must consider certain well-defined capacities, "pre-determined in form and content by the selected mental activity of his forebears."

The contribution by Von Hug-Hellmuth (57) on the mental life of the child traces the development of reasoning and the balance between reality and imagination. The tendency of the first part of the discussion is followed as the author traces the development of certain abilities and ideas of time and space to sex interests. Mistakes in school reading, as well as in inventions and substitutions in speech are indicative of unconscious mental processes in the child.

Lay (28) represents the "new" psychology which is that of the Freudian school. He holds that the unconscious has an important, if not an exclusively controlling influence in the life of the child. Explanatory illustrations are given which reveal mental content other than that in consciousness, and considerable space is devoted to the demonstration of the interrelations of the various combinations of conscious and unconscious thought and action. Mistakes and obstinacies in a child are frequently explainable on this basis. The partial trends of sadism, masochism and exhibitionism with the mechanisms of the new psychology are all explained. Mental life is concerned with external realities, particularly those of reproduction. Those thoughts that are denied their natural form of expression find other outlets. This sublimation may be through music, poetry, etc., as well as through minor habits or reactions. In discussing the theory of compensation, the author says that a display of good mathematical ability is not necessarily a demonstration of a strong innate capacity, but is rather to be understood as an acquisition to disguise the fact, known sub-consciously, that the subject is inferior in this respect. Among these rather fantastic considerations the author brings out one very important point. He says it should be recognized by the teacher that the child cannot give the real reasons for the majority of his acts, and consequently he should not be questioned about them. As an indication of the enormous complexity of the mental life of the child, this book has a valuable function, but should be considered only as suggestive until the experimental evidence is sufficient to warrant the acceptance of many of the conclusions.

Another discussion with the psycho-analytic background is found in *The Mental Hygiene of Childhood* by White (63). Behind action lies interest, and instinctive interest is the basis of the child's

development. The various interests differ in the different stages. Up to five years the pleasure motive controls. At this stage there is an unqualified self-interest. From five years to puberty is designated as the latency period; during this time repressions take place. Shame appears and curiosity is veiled. From puberty to fifteen years of age the increased sexuality causes many of the tendencies of infancy to reappear. At this time three steps in sex development, auto-eroticism, homo-sexualism and hetero-sexualism, occur. Special attention should be given to the tendencies of the second period, since without proper sublimation the stage of heterosexuality may never be completely obtained. Various educational problems are treated, but the author apparently did not intend to make his exposition complete. Any method should be based on the instinctive reactions with repression or development of the various phases.

According to Heniger (20) play is the great factor in a child's life, and forms a valuable basis for educational work. The author is particularly interested in the dramatic side and emphasizes the need for possible development along this line. She feels very strongly that children have naturally a keen discriminative appreciation which is often ruined by adults who try to "play down" to a youthful audience.

Exceptional Children.—Campbell (9) cites cases of nervous children and suggests methods of training. Many of the apparently neurotic symptoms are products of a child's experience and not of any neurotic constitution. One child who disliked cereal and eggs would threaten to vomit when urged to take this food. He would make good this threat. The mother unconsciously cultivated these reactions because they formed an outlet for her desire for service. Treatment of the child involved the education of the mother so that she might understand the part which she played in the development of this characteristic. Another child apparently suffered from weakness and nausea. No evidence of gastro-intestinal disorder could be found, and a complete cure was effected by a different type of training. In general, for the nervous child, two conditions are desirable,—a wholesome objective regime, and an atmosphere of frankness. As the author says, "the personality of the child is as complex, if not so richly furnished, as that of the adult."

Blanton (6) studied 6,500 children, five to fourteen years of age, in the *Volksschulen* of Trier. He wished to determine the effect of malnutrition on the physical and mental development. For

this purpose, clinical observations rather than psychological tests were necessary. Interviews with teachers, observations of the child in school, together with certain psychological tests gave the necessary information. The conditions and results are discussed in great detail, but many of the conclusions are subject to criticism. Various factors, other than those which the author ascribes, may be responsible for the conditions noted. Nevertheless, certain important facts are mentioned. Malnutrition was found in 40 per cent. of the children; neuroses, tics and conduct disorders were more frequent. The number of borderline defectives had increased, together with the number of failures in grade promotion. The specific changes in malnourished children were a decrease in nervous energy, inattention, poor comprehension, poor memory, and nervous restlessness. Children of good stock, however, withstand undernourishment for a longer period than those of poor stock.

Montague (31), reporting on cases examined in a children's court, discusses the method of choosing cases and classifies them as normal, retarded mental deficiency, constitutional psychopathic inferior, psychotic, psycho-neurotic, and epileptic. The age of the children varied from six to sixteen years, and the chief conclusion is that the recidivist is the real problem in criminology.

Three types of mental defect are described by Higgins (21). They are the glandular, the syphilitic, and the hookworm. Mental deficiency should be classified according to the etiological basis and prognosis, rather than according to degree. Unscientific classification of the mentally deficient has been in part responsible for the indifference manifested toward its logical treatment. Diagnoses dealing in generalities should no longer be acceptable.

An attempt was made to ascertain the "mental power" in some ungraded classes by Teas (53). The greater number of boys is said to be due to the fact that the boy is less restrained in his activity than the girl, and so comes in conflict with his environment. Certain of the tests used presented specific difficulties, and "it is interesting to note that the test that is largely influenced by training has the lowest number of failures."

Campbell (8) made a survey of 1,281 children, ranging in age from six to sixteen. He discusses the methods of determining the status of the child and holds that mental tests are insufficient. The mental level of success in an environment may depend upon the geographical locality. An examination should include physical, emotional, and social factors.

Truants, incorrigibles, and general offenders are considered in the discussion by Clark (11). For these children who are mostly high-grade feeble-minded, ungraded classes are insufficient. The principles underlying their management should be the same as those for normal children but the interest appeal must be greater. Because of the general backwardness in subjects requiring abstract reasoning these children are thrown into a condition of despair which brings on a pathological state. For such children, expert teachers should be provided, and sport and recreation should be used as an outlet to other activities.

A boy, six years of age, who had a paralyzed right arm, had failed to learn reading and writing in eighteen months at school. According to the writers, Stevens and Russell (51), the child was practically at age, judging by mental tests and his behavior. In eight months, under special training, the child made such progress that he was returned to the grade with the same children from whom he had been separated.

Lacy (27) makes a study of 100 retarded fourth-grade pupils. He grouped them according to social status and found that intellectually the groups were approximately the same. As a group they were behind the normal, but the curves of distribution for these children and a group of normal children overlapped greatly. The conclusion is reached, but hardly justified, that the greatest number of these retarded children have normal intelligence.

The rate of improvement of feeble-minded children is discussed by Murdoch (32). Twenty-one defectives, representing school grades four, five and six, were twice tested, an interval of twelve months elapsing between the two tests. There is a very low correlation between the results of the two tests, but the rate of learning of these children was found to be less than the rate for normal children of the same age level.

Children of superior intelligence are studied by Race (47). The chronological ages of the children ranged from seven years seven months to nine years eight months, and they had intelligence quotients ranging from 120 to 168. According to the teachers, better dispositions and social adjustments were displayed by these children after they had been placed in the class with others of their own mental caliber.

Coy (13) reports a study of a child nine years ten months of age who is doing fifth-grade work. A record of her interesting and more marked responses is given.

The mental standing of the deaf is discussed by Pintner and Paterson (41). Two outstanding facts are presented; first, the startling deficiency of the deaf in their ability to comprehend and handle written and printed language; second, the general mental inferiority of the deaf as a group. Lack of social intercourse is responsible for the language deficiency. The difference between congenitally and adventitiously deaf is studied, and the causes for their difference from the normal in intelligence are discussed. In general it is stated that the deaf child is from two to three years behind the hearing child. Academic training cannot profit the deaf child very much, so industrial training should be emphasized. In motor capacities he is more nearly on an equality with the hearing child.

Speech and Vocabulary.—A report of an experiment in infant education is made anonymously (1), with an introduction by Terman who says that at 26 months of age this child "read from any primer fluently though with babyish pronunciation." The report is written by the father who says he began the experiment with the child at the age of four months at which time she had used her first three words. At 20 months she knew letters and began words. At 21 months she discovered that words meant thoughts and then began to read. At two years of age she had a reading vocabulary of 200 words and at 30 months it had increased to 700.

The Brandenburgs (7) made a record of the conversation for an entire day when the child was 40 and also 52 months old. The number of words and questions, both rational and meaningless, was recorded. Numerous examples are given and a complete list of the words, classified according to parts of speech.

Nice (34) reports on the relation of ambidexterity to delayed speech development. The literature of the subject is reviewed. A full exposition of the case of a man of intellectual family and personal accomplishment who had a history of being left-handed and being trained to use the right is given. Speech disorders resulted. Several other cases are given briefly, but the author concludes that both the conditions of retarded speech development and ambidexterity may be the result of unrevealed causes. She is conscious of the meagerness of her data and suggests further study.

Terman (54) discusses vocabulary as a measurement of intelligence and first meets various objections that have been raised to the use of this test. He considers the quantitative and qualitative treatment of the vocabularies of children ranging in mental

age from five to nineteen years. His conclusion is that the vocabulary test is valuable.

Swift and Hedrick (52) attempt to differentiate the mental make-up of a stutterer from that of non-stutterers. Blanton (5) makes a contribution to the science of mental hygiene in a study of emotional expression in children with special reference to speech. The article is written for parents and teachers but is important also for the physician and psychologist. It has many concrete suggestions for the stimulation of healthy emotional and intellectual growth. According to this discussion defects in speech delicately gauge irregularities in emotional development.

Special Topics.—The original emotions of fear, rage and love are discussed by Watson (60) together with various methods by which the implicit side of emotions may be detected. This study is closely related to previous discussions and should be known by any one who wishes to understand the behavior of a child.

According to Gesell (17) the task of mental hygiene is largely individual, demanding the development of intimate personal methods of diagnosis. The hygiene for children does not begin with school life but with the nursery years. The developmental records should include speech, play, movements and interests, and social traits with any disorders or peculiarities manifested. The school record should include a technique for determining traits of character such as the emotional, volitional, and social, as well as a determination of intelligence rating. An outline of seven possibilities in hygiene is given.

Campbell (10) says that little attention to training in character has so far been given. The instruction has been confined to arithmetic, language, and such other subjects, and has been carried on in groups. Character training, which is training in feeling and doing, must be by the individual method. So far the school has taken an interest in defective eyes and ears, diseased teeth and tonsils, but now the real child must be considered and he is a complex bundle of highly organized instincts, emotions, and attitudes.

Since chronological age has not been sufficient to use as a standard for developmental processes, Zigler (64) says we must now consider the complexity of the varying phases of development. He deals first with physical development and then shows the tendencies and interest which begin at about six years of age. Active and sustained attention is only beginning to function and the sense of judgment is developing. Imagination has reached a climax at five

or six, and during the period up to that time, children are apt to use words without necessarily understanding their meaning. Neuro-muscular development is complete at six years. The author touches upon pathology, morbidity and mortality and gives a bibliography.

A study of the learning process is made by the Hulls (24). Urinary control is the function and detailed data with learning curves are presented. The development of speech is also considered.

Cole (12) attacks the traditional idea of entering children in school at the age of six. Testing children of five and six years, who were in the same grade, he found a very slight difference in mental age and concludes that admission should be by the latter determination, although admitting the unreliability of his results due to the small number of children.

A case report is given of 25 bright children by Gillingham (18). She suggests that instead of encouraging bright children to spend all their time on school subjects, we should emphasize joyous recreation, free play, care of physical condition, and that some of the children's time should be used for music, art and industrial work.

A group of very bright children is described by Specht (50). The children were selected through the use of the Terman Tests and all had an I. Q. of 120 or over. An outline of the curriculum used is given and the statement made that the progress of these children was from one to four grades in a six months period.

The development of a child's imagination is discussed by Nice (33). She gives a detailed study of an eight-year-old girl with an analysis of stimuli and conditions. Illustrative stories are included. Tschudi (56) reports on the wishes and joys of children with a discussion of the effect made on them by teaching.

Barker (3) presents the conventional classification of instincts and sentiments, the latter being very complex things, and described as "feelings related to certain objects." McDougall's four levels of conduct are mentioned. Psychopathic children and mental defectives are the result of heredity. Environment should be considered from the physical, psychic, and social sides. The various factors in these different sides are outlined, and methods of training are suggested. Particular stress is placed on avoiding the development of a feeling of inferiority. Special effort should be made to enable the child to counter-balance either physical or mental defects. The problem of avoiding spoiling the child is biological, medical, psychological, and social.

After a brief historical review of the problems of alexia, Schmitt (48) discusses the theories of causation. She finds the difficulty to be more frequent among boys than girls, and concludes "in view of the fact that ability to read may be developed in these children, the failure of the child is related to the psychology of meaning and association."

In the psychology of special disability in spelling, Hollingworth (22) concerns herself with the processes involved in good spelling and the conditions which accompany special difficulties in this ability. She reviews the literature of the subject and reports an experiment with children who had good general ability but were defective in spelling. The report contains a detailed analysis of difficulties and results.

Ashbaugh (2) twice tested children in spelling to determine the variability in success. A further experiment showed similar results and the author estimates that a series of words presented three times on the same day or consecutive days will result in a 20 per cent. variability.

In reference to the moral discipline of children Wells (62) discusses the recapitulation theory as applied to the religious beliefs of children during the stages up to adolescence. There are three stages of religious development,—the primitive, the morality and the redemptive. The author believes that the God of external authority and law is needed to influence the conduct and discipline, so that when a child has reached the age of reason he has established habits of conduct.

Twelve photographs of children from four to fourteen years of age were used by Pintner (40) as a basis for estimating intelligence. Judgments were made by physicians, psychologists, teachers, students, and others. They arranged the photographs in order of rank according to intelligence, but the lack of unanimity is such as to lead one to place little confidence in the result.

Horn (23) presents a full description of the characteristics of a 12-year-old boy who seems to have been partly deaf from birth and who had developed extreme abstraction from his surroundings. No conclusions are reached and no solution is offered for overcoming the difficulty.

Experimental Studies.—Pintner (39) investigated the "community of ideas" of several groups of people including 119 school children of 12 years and younger. He reports: "In general the characteristics of the children are the same as those of the adults,

except that the percentages for the most frequent words are generally not quite so large, while the percentage of failure is larger."

Esper (14) experimented on analogy. Associations were taken and a time record made for children from nine to thirteen years of age as well as for other subjects. In 51 to 85 per cent. of the cases the responses are words of the same category, that is, adjective responses to adjectives, numerals to numerals. The variation or "scattering" of response is the least in children. This is contrary to the findings of Ziehen and Watt.

The correlation of immediate and delayed recall is considered by Gates (16). After presenting evidence from various authorities, the author discusses the method of testing subjects, believing that it has in some way predetermined the results. A description of the method of procedure and results are presented. The conclusion is that correlation rather than compensation is the rule. This conclusion is in accord with Meuman's, and opposed to those who insisted that speedy learning is compensated for by rapid forgetting, and vice versa.

By means of immediate and delayed recall Paterson (38) finds that objects were remembered better than written names, and written names better than spoken. From a memory test with digits the author concludes that memory increases with age rather than with intelligence. He discusses various types of errors and found that they represented stages in the failing of the memory image. Maximum memory power is reached at an early age, the result for the seventh-year grammar grade being almost the same as that for several years later.

The children of a Hebrew Orphan Asylum were the subjects for the study by Berliner (4), of esthetic judgments. She used sixteen postal cards, illustrating rhymes and songs for children. Girls were found to agree more closely in esthetic judgment than boys, but boys agree more in their dislikes and likes.

Shore (49) devised a picture completion test which he claims contains the equivalent of the Binet Test for color, form, comprehension, similarities and absurdities. He also claims that it tests the ability measured by the Trabue Scales. He used 90 children of ages eight to twelve and presents a table of median scores and time records. "The test is proposed as one of a series of performance tests to supplement those now in common use."

Another picture test was devised by Lindley (29) and given to 70 children of mental ages from six to eleven and to 88 public-

school children. The average number of mistakes decreases with age, but the children of the two groups differed in their method of procedure and in their qualitative aspects. The test may be valuable because the language element is small, but it requires an ability to see relationships.

Weinbridge and Gabel (61) used a series of cards for a multiple choice experiment. There were fifteen choices planned and the child was requested to select the right card when the arrangements were made in exactly the same way in any given series. The number of trials necessary for the child to learn the order of placing is used as the score. Conclusions are lacking except a recommendation for further work.

Lowell (30) has attempted a very laudable performance in selecting 25 tests for group purposes, which will fulfill the conditions of clear and brief directions, allowing only one correct response, having simplicity of material with ease and quickness of distribution. His subjects were 904 school children whose ages ranged from five to ten years. The chief points are: the provision of a measuring scale for large groups of young children and a more accurate index of the intelligence than is provided through Binet individual results.

Another attempt to construct a group scale suitable to children of the elementary grades was made by Otis (36). The scale was used with 121 children and the method of procedure for obtaining equality of increments of ability is described.

The Presseys (44) formulate a group test of intelligence so arranged that 90 per cent. of third grade children can pass some of the tests and that not all of high school children would be successful. Many different types of tests are included and the statement is made: "If the tests were the measure of the results of schooling rather than general intelligence, the norms would be more similar for the grades than the age."

In another article (45) these authors report the use of this scale in attempting to determine its efficiency in separating the feeble-minded and the superior children from the total population of a school. Of 48 gifted and subnormal children otherwise selected, 42 were correctly graded by the scale. In reference to the individual tests it is said that rote memory and logical memory tests do not differentiate well, while analogies, opposites, logical selection, and moral classification give the most reliable results.

A study to discover sex differences was made by Pressey (43)

with 1,300 girls and 1,200 boys, ranging in age from eight to sixteen years. It is found that the central tendency of general intelligence for girls is at every age slightly higher than for the boys. The author studied further 880 children to discover sex differences in special abilities. Girls were found to be better in rote memory and literary tests, while boys were superior in arithmetic and practical information. It was considered that the differences were marked enough to be regarded in general intelligence tests.

A directions test is presented by Pintner and Toops (42), one part being suitable for children six to eight years of age, and the other for children seven to thirteen years of age. From the two scales a single one was constructed which would differentiate subjects from six years of age to "superior adults." Tentative norms and the method of scoring are given for this new test.

Paschal (37) used the Witmer Cylinder Test with children as young as six years. He describes the construction of the test, methods of procedure, and scoring. His conclusion is that the shortest time trial is the best quantitative measurement of performance ability. Qualitative differences, however, were found in the performances of different mental types.

Ide (25) worked with kindergarten children to determine the age level for the Witmer Formboard and Cylinders, discussing their clinical value, the earliest passing age, the causes of failure and the value as tests of educability. Details of procedure are given and statistical results for boys and girls of different nationalities and different ages.

The formboard is studied as an educational device by Kephart (26) who made an analysis of failures and a study of a subject who had performed the test with a minimum amount of teaching. His procedure and score are described in detail. The child taught was slightly more than twelve months of age when the experiment began and was 32 months old when he was able to complete the performance. In analyzing failures it is said little, if any, relation was shown between age, formboard time, diagnostic rating, and diagnosis. Practically all failures are due to some form of inattention.

Wallin (59) describes his peg formboard tests and gives the method of procedure and results obtained for children of ages varying from three to eight years. The test consists of four boards with six pegs in each, some boards having the same shaped pegs, and others two or three different shapes. The test is said to be adapt-

able to children from one and a half or two years to six years of age, and the series would seem to be a valuable supplement to the scale of performance tests presented by Pintner and Paterson.

A serial test of intelligence was worked out by Terman and Chamberlain (55), the aim being to devise a scale which might be used both as a point and a mental age scale. There were 23 tests and the 41 children selected were those whose school records and Binet ratings were available. The authors hope that this scale may be used for group testing.

A study of mental ability in 2,000 children by means of tests of logical and rote memory, learning ability, free and controlled association, and completion, was made by Pyle and Collings (46). Results were compared with those obtained from children in small cities. The conclusions presented are; that city children on the average are of better stock, and that mental development is hastened by the city environment, but the author is not sure that the rural community studied was typical.

In a study of the relation of mental and chronological age Evans and Castle (15) wished to consider the assumption that a twelve-year-old child with nine-year mentality will react like a normal nine-year-old child. A comparison was made between children whose chronological and mental ages were the same and those whose chronological age and mental age differed. Various tests which were classified as those of mental ability and maturity, gave results which seemed to show that the former contained the real tests of differences which underlie school work.

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EDUCATIONAL PSYCHOLOGY

BY C. TRUMAN GRAY

University of Texas

The survey of the literature in educational psychology given below warrants the following general statements:

(1) The interest in educational tests continues. This is evidenced by a considerable number of new tests and scales and by the large amount of work which has been done with the old scales. Numerous attempts have been made to refine, to criticize, and to modify the existing tests and scales so that more accurate results may be obtained with them. (2) There is a rapidly growing interest in general intelligence tests as a basis for educational procedure. (3) Considerable attention is being given to educational diagnosis and prognosis. (4) The detailed methods of the laboratory prevail in a number of studies. (5) The general problems involved in memory, imagination and other forms of mental activity are treated in but few articles.

I. TEXTBOOKS

The only text devoted entirely to educational psychology which has appeared is by Starch (143). According to the preface, the author has attempted to pick out those problems which are most relevant in their relation to education and to deal with them from a strictly scientific standpoint. The book divides itself into three parts. Part I deals with the native equipment of human beings, Part II is concerned with the psychology of learning in general, and Part III treats of learning as exhibited in the various elementary school subjects.

Part I is made somewhat brief because the author thinks that too much emphasis is usually given to the topics under this heading, and because the experimental data upon them are somewhat limited. The discussions in Part II are the usual ones. It is in Part III that the author has departed from tradition by bringing together a

body of material not usually included in books of this kind. It is to be noted that this part includes only discussions of elementary school subjects. It seems that the work would have made a wider appeal if a treatment of a few high-school subjects had been given. Other objections which might be made to the text are minor ones and there is no doubt but what it brings together a body of material which is more distinctly educational in its nature and more usable in its form than any book which has appeared. The reviews which have come to notice are favorable and the text will, doubtless, have a wide use.

Judd's text (83) for introductory courses in education is an attempt to break away from the traditional first courses in education. It is the result of several years' experimentation with the author's classes and brings together a wide range of topics. Those chapters which are of interest at this time treat of play, individual differences, periodicity in the pupil's development, and standardization. The general problem which the author has attacked is a vital one, and other social sciences are making attempts to meet it in their respective fields. The book should receive the careful consideration of all those who are charged with the responsibility of giving introductory courses.

Bobbitt's text on *The Curriculum* (16) will be of interest to psychologists. This author divides educational experiences into those which are upon a play-level and those which are upon a work-level. A very careful and detailed distinction between the two types of activities is drawn in terms of the ends reached by each. A later chapter is given over to a discussion of the function of play in human life. According to this discussion, it is the business of play to fill the gaps in human life which are left by work. Other chapters which may be given special mention are those concerned with ideas in their relations to work-experiences, and scientific methods in curriculum making. The book is stimulating and will bear study. It should have a wide use in educational courses which relate to the curriculum and in reading circle work.

A text entitled *Measuring the Results of Teaching* has been written by Monroe (105). The work is very similar to one which appeared some time ago with the present author as a co-author. The chief difference between the two books lies in the fact that the later one gives more attention to the determination of defects in the abilities required by the various school subjects than did

the earlier text. This fact makes the book of greater value to teachers in service. It will also find use in courses upon tests and measurements and in reading circle work.

Parker's text on elementary school methods (118) has in its second part much that is psychological in character. The chapters of this part treat such topics as "How Children Learn," "Apperception," "Preparation," "Interest," "Drill and Practice," and "Individual Differences." The treatment is intended, according to the preface, to be elementary. It is, at the same time, thoroughly accurate and scientific. The book will find ready use wherever the applied psychology of the above topics is required.

A very timely volume is by Hall-Quest on *The Textbook* (62). Psychologists will be interested in his chapters on the selection and judgment of textbooks, and on the use of the textbook by students.

Terman's book entitled *The Intelligence of School Children* (155) is an attempt to set forth in simple language the many facts concerning individual differences and methods for dealing with different grades of mental ability by means of mental tests. His discussion of the superior child should be read by every teacher.

A third edition of Rusk's *Experimental Education* (138) has recently appeared. Some of the later literature upon the topics treated in the book has been included.

A volume by Peters (123) upon *Human Conduct* should also be mentioned. The attempt has been made to bring together a body of material suitable for high school students.

2. MONOGRAPHS

Courtis' report upon the Gary Schools (38) is one of the most thoroughgoing pieces of scientific work which has been done in the field of measurements. The classroom products which have been treated are handwriting, spelling, arithmetic, English composition, and reading. The report may well be divided into three sections. Each of the chapters has a division which gives only the essential and significant data collected upon the topic at hand. A second part of each chapter is devoted to a critical discussion of the various factors which enter into the measuring process. At the end of the volume are appendices which contain directions for scoring, record sheets, etc. The student of education will find in section two of each chapter a considerable amount of interesting material. The careful manner in which the conclusions are stated will serve as a model for investigations in education.

The Eighteenth Yearbook (115) is devoted to a discussion of economy in learning. The chapters are given over to a consideration of this topic as it relates to different elementary school subjects. Each one is devoted to a summary of the scientific material in a particular subject. These summaries are of such a nature as to give the teacher a definite set of rules for her procedure.

A number of monographs have appeared in the series issued by Teachers College, Columbia University. Most of these are devoted to problems in educational measurements and involve statistical methods. These may be considered briefly as follows:

1. Holtz (74) has devised two scales in first-year algebra. Both scale A and scale B are divided into five parts as follows: Addition and subtraction, multiplication, equation and formula, written problems and graphs. The various problems comprising the tests have been carefully evaluated by well-accepted methods.

2. A contribution to educational diagnosis with reference to the individual has been made by Buckner (24). The work is based upon eleven different tests. A part of these are in school subjects, while others are such as the opposites test, direction test, etc. The results involve three different phases: (1) Individual variability as compared with group variability. (2) Extreme variability of individual cases. (3) Correlations between the results for the various tests. His conclusion is that such tests can be used in a satisfactory manner for diagnostic work.

3. The overlapping of attainments in certain grades has been investigated by Kruse (89). In many studies where a single test has been used, a large amount of overlapping has been found. The present author uses a series of tests instead of one. He comes to the conclusion that the error in using single tests as a basis for determining overlapping is great, and that the present grading system places children fairly well.

4. Fretwell (50) has made a study in educational prognosis. The work is based upon results from a series of tests and from teachers' marks. The conclusion is reached that the use of the tests which took only a small amount of time at the beginning of the year agreed with the classification of the teachers after they had taught the children for one year, except in five cases where thirty pupils in a class is used as a basis for the estimate. Another important phase of the investigation had to do with the rating of various tests for the purpose of prognosis. The four most valuable, in order of their importance, are the reading test, the visual vocabulary test, the opposites test, and the spelling test.

5. Rogers (136) has also made a study of prognosis by means of mathematical tests.

6. An investigation upon improvement in relation to different distributions of practice time has been made by Cummins (40). In one case the practice periods were kept equal, while in the other they were reduced from day to day. Practice was given in learning French vocabularies, geographical, and historical facts, single-column addition, and short division. Four different experiments were tried. Some of these were carried out under the conditions of the elementary school. In most cases, the advantage was with the schedule in which the time was gradually reduced.

7. Hollingsworth's (72) study of defects in spelling ability is a type of work, the need of which is very much felt in educational psychology. It is concerned only with normal children who are deficient in this one subject. The defects are analyzed by elaborate methods and remedial measures prescribed. The literature upon the topic is treated.

Three monographs are at hand from the laboratory of the School of Education, University of Chicago. Each of these is in the nature of a laboratory investigation. The first to be mentioned is by Judd, (84) upon the nature and development of reading. Some of the most interesting chapters are concerned with determining characteristics of adult's and of children's reading. This comparison is done by means of eye-movement records. Another important chapter has to do with experiments in training poor readers.

Freeman's (49) monograph on handwriting gives results for the first attempt at using motion picture records in the study of handwriting movements. The apparatus was of such a nature as to allow thirty exposures for each second. The records were later projected, one by one, upon the material written and thus a detailed record of the movement for any letter or word was built up. In this manner, very distinct differences were found between the records of good and poor writers. The volume closes with a discussion of an experiment in training children in handwriting.

The third volume from this laboratory is a study of left-handedness, by Beeley (11). The main part of the treatment is given over to a discussion of a test for handedness. In this connection, several well-known tests, such as the steadiness tests were tried out but were found unsatisfactory. The test which was devised is in the nature of a tracing test. The results show it to be satisfactory in diagnosing handedness.

A valuable compilation of material has recently appeared as numbers five to nine of the current volume of the *Psychological Clinic* (132). It is in the nature of a reference book for clinical psychology. Many valuable suggestions are given upon diagnostic teaching. While the volume has been prepared ostensibly to guide those who are concerned primarily with subnormal children, yet an understanding of such methods and devices will be helpful to other teachers.

Garth (54) has prepared a monograph on fatigue. His subjects include 368 children. The mental operations involved are those required in simple addition. His conclusions are that slow workers fatigue more quickly than the more rapid workers and that the slowest and most rapid workers show greatest variability.

Tidyman's (161) manual for spelling deals with five different problems, as follows: (1) The content of spelling texts, (2) the psychology of spelling, (3) the pedagogy of spelling, (4) spelling tests and scales, (5) bibliography.

Richardson's (135) volume devoted to the psychology and pedagogy of anger should be mentioned in this connection.

3. VARIOUS FORMS OF MENTAL ACTIVITY

Emotions.—Some experiments upon this type of mental activity have been conducted by Buysman (27). The method used was to ask questions of such a nature that the child's ability to identify emotions was tested. An article entitled "A Child's Imagination" has been contributed by Nice (116).

Learning.—Speed in relation to accuracy has been studied by Broome, Spett, and Myers (23). The whole method of learning, as compared with the part method has been investigated by Pechstein (122). Other phases of this topic which are dealt with in various articles are curves of work, Garth (53), the constancy of the capacity to learn, Pyle (130), and learning based upon diagnosis, Scott (140).

Memory.—Logical memory in relation to school grades has been treated by King and Haman (87) and "Pedagogical Suggestions from Memory Tests" is the title of an article by Patterson (120).

Transfer of Training.—The relation of mathematics, of the classics, and of history to the training of the mind has been dealt with by Moore (110) and by Valentine (170). A summary of many of the experiments upon this problem has been made by Young (185). This article by a mathematician is very interesting. He concludes that the experiments support the doctrine of formal

discipline. Other phases of this problem have been discussed by Bode (17), Davidson (43), and Moritz (111).

Reasoning.—The development, and measurement of this ability has been treated by Burt (26) and Herring (68).

4. CERTAIN EDUCATIONAL PROBLEMS

Academic Guidance.—This topic is made the subject of an article by Harap (63).

Adolescence.—King has discussed the changes in adolescence (86). Other problems of a similar nature have been treated by Reymert (134).

Characteristics of Children.—At least two attempts have been made to apply the methods of measurement to certain general characteristics of child life. One of these, as reported by Smith, (141), suggests scales for the study of children's characteristics and an editorial in the *School Review* (3) compares two types of reports which are to be made by teachers upon this same general problem.

Distribution and Correlation of Abilities.—Studies made upon this topic may be listed as follows: (1) Correlation of Reading Ability with Grades in High School, Smith (142); (2) Relation of English and Mathematical Abilities in College Students, Tolman (163); Age and Grade Distribution of Rural Children, Phelps (124), and The Influence of Practice upon Correlation, Stickland (149).

Educational Diagnosis.—An article which may well be placed under this heading has been published by Whitney (177).

Elimination and Retardation.—Articles upon various phases of these problems have appeared by Rowse (137), Cooper (35), Toops and Pintner (164), Pickle and Winkelbleck (125), and Bixler (13).

General Intelligence Tests in Their Relation to Educational Procedure.—This topic is receiving a great deal of attention at the present time. Reports of the use of such tests have been made from the following institutions: (1) Brown University, by Colvin (33), Hamline University, by Walcott (174), (3) Southern Methodist University, by Hunter (77), (4) University of Illinois, by Hill (70), (5) University of Minnesota Medical School, by Haggerty (61), (6) Northwestern University, by Uhl (167), and (7) Dickinson College, by Filler (48). In this same connection, an article by Van Wagenen (172) treats of the mental development of college students.

The use of intelligence tests in elementary and high schools has been reported upon by Madson and Sylvester (96), Pressey (128), and Van Wagenen (173). Another very interesting contribution along this line is an intelligence test for children of the first grade of the elementary school by the Myers (114). A general discussion of the use of intelligence tests for determining fitness for college entrance has been made by Thurston (160), and the use of such tests in supervision is made the basis of an article by Samm (139).

Most, if not all, of these reports and discussions are of such a nature as to lead to the opinion that there is here a field which will receive a great deal of attention in the near future.

"Individual Differences as Found Among Fifth Grade Children" is the title of an article by Hubbard (76).

Kindergarten Education.—The problems of measurement as they relate to the kindergarten have been discussed by Abbott (1) and Temple (154).

Mental Ability of Particular Classes.—Special studies of rural children, and comparisons of Jews and Gentiles have been made by Mullan (113), Pyle and Collings (129), and Grier (59). Mention should also be made of a study of negro children reported by Mitchell, Rosanoff, and Rosanoff (104).

Pedagogy of Education Courses.—Contributions on this important subject have been made by Wilson (180), Andress (4) and Woody (184).

Precocious and Retarded Children.—Precocious children have been reported upon by Coy (39) and retarded children by Lloyd and Ullrich (93), Merrill (101), Renshaw (133), Stevens (148), and Connor (34).

Surveys.—Use of various tests for the purpose of making surveys has been made by Fullegar (51), Theisen (156 and 158), Todd (162), Childs (31), and a similar use has been reported in the University of North Carolina Record (169).

Supervised Study.—A critical evaluation of this type of work, as done by high school students, has been made by Breed (21). His results show that not in all cases is the advantage with supervised study when it is compared with other types of study. Other discussions of the topic have been contributed by Burr (25), Holley (71), Merriman (102), and Willett (178). Mention may also be made at this time of an article by Heck (66) which compares home work and school work.

School Grades.—Contributions to the various phases of this problem have been made by Chambers (30), Davis (42), Inglis (78), Jaggard (80), Johnson (82), and Zerbe (186).

Teaching Ability.—This important topic continues to be a source of interest to a considerable number of investigators. "The Relation between Scholarship and Success in Teaching" is the title of an article by Payne (121). A problem similar to this has been studied by Moody (108). A practical plan of rating teachers in a school system is suggested by Twiss (166), and a score card method for the same purpose has been discussed by Landsittel (91). Other important topics have been treated by Bradley (18), Clarke (32), Morton (112), Davis (41), and Ballou (9).

Textbooks.—A score card for judging textbooks has been devised by Stoops (150).

Visual Instruction.—This type of instruction has been dealt with in an article by James (81).

5. ELEMENTARY AND HIGH-SCHOOL SUBJECTS

Algebra.—Practical uses of scales in algebra have been reported by Cawl (28) and a plan for the classification of pupils in this subject has been discussed by Taylor (153).

Arithmetic.—Uses of tests in this subject have been reported by the Bureau of Research in Boston (5). A series of diagnostic tests have been devised by Monroe (106), and the diagnostic value of the Woody test has been discussed by Theisen and Flemming (157). An evaluation of different methods of subtraction has been made by McClelland (97). Other articles have been contributed by Garfinkel (52), Fairbanks (47), Ballard (8), Wise (181), Mead and Johnson (100), Knoche and Evans (88), Kallom (85), and Moore (109).

Art and Drawing.—The appreciation of pictures as shown by children has been reported upon by Pintner (126), and the ability of children in art courses is treated in an article by Whitford (176).

Biology.—The range of information test has been used in this subject by both Grier (58) and Downing (45). Downing (44) has also discussed what tests in science should do, and Van Cleave (171) has compared the grades in zoölogy by high-school students with the grades made in the first year of the university. A study of the interest of girls in physiology courses has been made by Gruenberg (60).

Chemistry.—A preliminary test in this subject has been suggested

by Webb (175). An article by Bell (12) treats of the attainments of high-school pupils in this study.

English.—Various aspects of the measurement problem, as it relates to English composition have been treated by Gordon (55), Parker (119), Courtis (36), Pintner (127), Towne (165), and by the Boston Department of Educational Measurements (46). Brandenburg (20) has discussed the psychological aspects of language, and different methods of teaching composition have been compared by Thompson (159). In addition to the above work, two articles by Lyman (94, 95) have appeared. One of these is upon certain factors which enter into English composition, and the second is concerned with a coöperative investigation in ninth-grade English. Ability in letter writing has been investigated by Barthelmess (10).

Geography.—Scales in this subject have been reported by Lackey (90) and Witham (183). The Hahn-Lackey scale has been used by Mathewson (98) and mistakes of children in geography have been investigated by Taylor (152).

Geometry.—Irwin (79) reports a very interesting investigation in this subject. His work has to do with the derivation of a test for the mental manipulation of space relations. Minnick (103) has presented the results of his earlier investigation in this subject in the form of a scale. Another article by Courtis (37) is concerned with the measurement of high school mathematics.

Handwriting.—An analytical scale in this subject has been devised by Lister and Myers (92), and a score card for measuring this school product has been reported by Reavis and Aikin (131). A scale has also been devised by Starch (146). A later article by the same author (144) reports a revision of this scale. Other investigations have been made by Almack (2), Mead (99), and Starch (145).

Latin.—Only one article on this subject has appeared. This is by Blanchard (14) upon the value of Latin.

Music.—Very important contributions upon the determination of ability in this school subject have been made by Seashore (168) and (115).

Reading.—The Monroe Silent Reading Tests have been made the basis for two articles. One of these by Monroe (107) is a report upon their general nature and derivation, and the other, which is concerned with the scoring of the tests is by Witham (182). The value of reading tests in improving instruction has been in-

vestigated by Gray (57), and the reliability of reading tests has been investigated by Starch (147). An extensive report upon the status of reading in the Indianapolis public schools has been made by Gray (56), and Bobbitt (15). Other contributions upon this school subject have been made by Heilman (67) and Hayes (65).

Spelling.—A new scale in this subject has been devised by Ashbaugh (6). Various problems have been reported upon as follows: An evaluation of methods, Zirbes (187), various factors in the spelling process, Brierley (22), and Brandenburg (19), the psychological examination of poor spellers, Hollingsworth (73), value of derived forms in spelling, Horn and Ashbaugh (75), variations in spelling ability, Ashbaugh (7), and suggestions upon the giving of the Springfield spelling list, Hill (69). Further studies relating to this subject have been published by Heilman (67) and Nifenecker (117), and Chadsey (29).

Religious Growth.—A very interesting attempt by Hartshorne (64) has been made to apply the methods of measurement to religious growth.

In addition to the above uses of tests two articles have appeared upon more general phases of the problem. One of these by Swift (151) treats of tests for the use of the teacher and the other by Wilson (179) deals with the proper content of a test.

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SPECIAL REVIEWS

The Intelligence of School Children. How Children Differ in Ability. The Use of Mental Tests in School Grading and the Proper Education of Exceptional Children. LEWIS M. TERMAN. New York: Houghton Mifflin, 1919. Pp. xxii + 313.

This book is written for three classes of readers: grade teachers, normal school students, and parents. The purpose is to show the wide range of individual differences in school children and the educational significance of this variation. The author bases his conclusions on investigations carried on by his graduate students. Much of this material has been published in previous studies.

The results of intelligence tests indicate that throughout the grades there is a great overlapping of mental ages. Unless the mental ability of a child is compared with that which may be expected from one of his age, this overlapping is not apparent. Since school success is unavailable as a criterion of ability in the kindergarten and first grade, mental tests are of especial value at that period. Mental age offers an index of the grade in which a child will be able to do work of average quality, which is much less subject to error than the teacher's estimate; its relation to chronological age forms a fairly reliable basis for prediction of development and school progress. Innate differences are, to a large degree, responsible for retardation. Elimination is selective, leaving pupils of greater ability.

Experimental studies of one hundred superior children lead the writer to conclude that ability is general rather than special and is marked in moral and personal traits; superiority appears early and is permanent; it is a family characteristic. For such children "opportunity classes" are advocated because they offer not only rapid progress but enrichment and broadening of the curriculum, as well as an atmosphere which is intellectually stimulating.

At the present time, tests are valuable in vocational guidance not as a means for determining choice of occupation but rather as an indication of mental ability suitable for successful pursuit of a given employment. The importance of "conservation of talent" is emphasized and the burden of educational guidance is placed on the teacher.

LOVISA WAGONER

UNIVERSITY OF IOWA

Experimental Education. R. R. RUSK. New York: Longmans, Green, 1919. Pp. 342.

This volume is a new edition, completely revised and rewritten, of the author's *Introduction to Experimental Education*. Like its predecessor it is admittedly based upon Meumann's *Vorlesungen zur Einführung in die Experimentelle Pädagogik* although many references are made to our best American investigators. The work has been enlarged by the addition of three chapters including modern tendencies in considering the higher mental processes in children, the economy and technique of learning, and the psychology of additional school subjects.

That the books typify different periods in the history of experimental education is shown by brief statements from the respective editions. "This work (1914) seeks to make accessible in convenient form for English readers the main results of investigations in the *new subject* of experimental education." The author then proceeds, throughout his book, to *justify* the experimental method in studying educational problems in apparent anticipation of a somewhat general distrust of it. But with assurance he states in the last edition that "experimental education has within a brief period established its claim to be regarded as an independent science. . . . 'We have now reached a point in educational enlightenment where opposition to the scientific method must be frankly pronounced a prejudice.'"

In general the book may be divided into three divisions: (a) The purposes and methodology of experimental education, (b) general physical and mental development of the child, and (c) the psychology and pedagogy of the school subjects.

The author states that "in the future we shall . . . have to talk less of the teaching process and more of the learning process, and for guidance in method we shall have to depend on the psychology of learning instead of on 'formal steps' and the logical analyses of knowledge."

H. J. PETERSON

UNIVERSITY OF IOWA

THE PSYCHOLOGICAL BULLETIN

MATHEMATICAL VS. SCIENTIFIC SIGNIFICANCE

BY EDWIN G. BORING

Clark University

The conclusions attained in researches involving measurements are very frequently based on estimates of identity or difference between two or more characters measured; the scientist finds that he has to deal with differences between two constants or with the divergence of one function from another.¹ Every difference or every measure of disparity that thus comes under consideration is necessarily obtained from given data with a certain measure of precision (e.g., a P.E.) that gives rise to the question whether the difference is "significant" or not. When a difference is large with respect to its probable error, for example, it is assumed to be "significant," and when it is small with respect to its probable error it is said to be "less significant" or "insignificant." For this reason it is customary in the case of a simple difference between the means of two arrays to measure the "significance" of the difference by its ratio to its P.E.

It is usually held that this ratio is not a direct measure of significance, and needs to be translated into a scale of the 'probability of difference' by the use of a table of the probability integral. The values from such a table give us a series of numbers ranging from zero, when the difference is infinitesimal with respect to its P.E. (not "significant"), to unity, when the difference is infinite with respect to its P.E. ("significant"). This scale of probabilities is sometimes spoken of as the "probability that the difference is

¹ See my discussion with S. W. Fernberger: *Amer. J. of Psychol.*, 1916, 27, 315-319; 1917, 28, 454-459; *PSYCHOL. BULL.* 1917, 14, 110-113; also *Tables for Statisticians and Biometricians*, ed. by K. PEARSON, 1914, pp. xvii f.

not due to chance." It is also used as a measure of "homogeneity" and "heterogeneity"; for, if the difference between two samples of the same data is "insignificant," the data may be thought to be "homogeneous," whereas, if the difference is large and therefore "significant," the data from the two samples taken together may be considered "heterogeneous."¹

Pearson applies a similar principle in his "measure of the goodness of fit" between two curves. With his procedure one obtains a value χ^2 from summing the differences between two curves and, taking into account the number of cases, makes use of a table to determine the probability that the deviation of the one curve from the other is merely "random."²

It is a common experience of scientific persons working with human data that these formulæ frequently give values for the probability of differences that are "too high." One works, for example, with the performances of a group of women and a group of men in a mental test and one finds a "significant" difference—perhaps a probability that 99 times out of 100 the men will do better than the women,—and yet one is convinced that there is no "truly significant" difference indicated. Or one determines the deviation of an observed curve from an ideal form and finds, let us say, that only 2 times in 100 would data that tend to follow the ideal form deviate as much from the ideal as do the observed data; and yet in plotting the observations along with the theoretical form he may note that the two functions are sensibly the same, and may feel inclined (if he is not scared off by Mr. Pearson) to say that the ideal function actually does represent his data. It is with the basis for this particular scientific attitude that I am concerned.³

It appears that the apparent inconsistency between scientific intuition and mathematical result is not due to the unreliability of professional opinion, but to the fact that scientific generalization is a broader question than mathematical description. In scientific work we deal with samples, whereas we are always interested in the

² Cf. *opp. cit.*, especially *Amer. J. of Psychol.*, 28, 451 ff., and V. HENRI, *L'Année psychol.*, 1898, 5, 153 ff.

³ K. PEARSON, *Phil. Mag.*, 1900, 50, 157-175; W. P. ELDERTON, *Biometrika*, 1902, 1, 155-163; *Tables for Statisticians*, *op. cit.*, pp. xxxi ff., 26 ff.

⁴ The differences between Pearson on the one hand, and Merriman and Airy on the other, *Phil. Mag.*, *op. cit.*, 171 ff. are of this order; Pearson is statistician, and Merriman and Airy scientists. It is interesting to find Pearson shifting ground in *Biometrika*, 2, 1903, p. 367, from a statistical result that lengths of forearm do not fit the Gaussian curve to a scientific conclusion that they do.

larger groups of which the samples are intended to be representative. The mathematical formulae do truly measure the difference between the particular samples observed. Whenever we can assume that these samples "truly" represent the total group, then the mathematical method also indicates the probability of a difference between the groups represented. A sample "truly" represents a group when the mode of variation within the sample is the same as the variation within the group at large: this is what is meant when we say we have an "unselected" sample. But anyone who has attempted to obtain "unselected" samples with human material knows what very careful selection is required to achieve this "unselected" state.¹ There are many uncontrollable factors that enter into the getting of human stuff; human beings are usually resistant to an indiscriminate mixing-up and to that arbitrary selection combined with complete ignorance of the nature of the individuals involved which constitutes "chance selection." So it happens that the competent scientist does the best he can in obtaining unselected samples, makes his observations, computes a difference and its "significance," and then—absurd as it may seem—very often discards his mathematical result, because in his judgment the mathematically "significant" difference is nevertheless not large compared with what he believes is the discrepancy between his samples and the larger groups which they represent.

It is useless to try to limit the scientist to the mere description of his samples. Science begins with description but it ends in generalization. And, since in the nature of the case it is impossible for him to state in numerical terms the degree of representativeness that his samples possess, conclusions must ultimately be left to the scientific intuition of the experimenter and his public. Such an outcome with respect to the measure of the probability of difference is not wholly satisfactory but it is inescapable. It is equivalent merely to saying that, given only approximate control of experimental conditions, only approximate results can be achieved. A knowledge of the "probability that a difference is not due to chance" is distinctly worth while on the descriptive side; but this measure of significance does not necessarily apply to the general class for which a sample stands. In certain cases it may so apply, but ordi-

¹ Statisticians' rules for obtaining "chance conditions" and "random samples," though generally failing of an appreciation of the logical truth that complete ignorance is the sole condition of chance, show how hard this particular kind of ignorance is to achieve.

narily there is a constant factor operative in the selection of human material which must be taken into account and which frequently offsets a demonstrably "significant" difference that has been made out between the samples. It is for this reason that mathematical measures of difference are apt to be too high and may need to be discounted in arriving at a scientific conclusion. The case is one of many where statistical ability, divorced from a scientific intimacy with the fundamental observations, leads nowhere.

AN OBSERVATION OF THE PURKINJE PHENOMENON IN SUB-TROPICAL MOONLIGHT

BY STEPHEN G. RICH

Mansfield Park School, Durban, South Africa

The observation here reported was made at East London, South Africa, July 12, 1919. The town is in 32° S. Latitude, at the extreme southern end of the eastern sub-tropical margin of Africa. The moon was on this occasion approximately full; and at 8:30 P.M., when the observation was made, was at the zenith. The sky was cloudless, and the place of observation was beyond the area served by street-lights. The colors of objects seen by moonlight were verified by a daylight visit to the same places on the following morning.

In full moonlight a limited range of colors was visible. Reds were especially noticeable. A brick wall showed its characteristic hue; orange-red tiled roofs were plainly recognizable in color; maroon-red painted roofs were seen as a very deep brownish-red; a bright carmine letter-box appeared a dull crimson; but a dark brown-red painted roof appeared black. Greens were not all recognizable. Pine-trees appeared black; pepper-trees (*Schinus molle*), greenish-gray in daylight, were gray; but hibiscus and aloe leaves were noticeably green. My dark blue suit appeared black; the hue was identical with that of my fountain-pen held against the cloth. Yellows and violets were not observed.

In the shadow of a pine-tree all hues save a maroon-red, which became a deep brownish-red, vanished. A pair of tan shoes which I was wearing were of a dark russet color. This was clearly visible in the direct moonlight, but vanished utterly in the shadow, becoming a medium gray.

The possible interest of the observation here reported lies in the fact that the sub-tropical moonlight was exactly strong enough to give a true "twilight" vision which lasted for a considerable time. The hues that appeared most definitely when daylight vision was slightly excited were orange, red, and brown. Green appeared, but in a lesser degree.

GENERAL REVIEWS AND SUMMARIES

LEARNING

BY JOSEPHINE GLEASON

Vassar College

Pechstein had shown in an earlier paper¹ that in a motor problem certain modified forms of the part method are superior to learning by the whole. His present article (5) reports an experiment which extended to the field of learning verbatim the use of the various whole and part methods which had been applied to the maze problem. Two series of nonsense syllables were used: the A-Series of thirty-two syllables in consecutive arrangement, and the B-Series consisting of the same syllables in pairs. The whole methods were two in which the subject could retrace the material until fairly sure of his grasp, and a third in which such "returns" were prevented. The part learning was done by the "pure part" method in which the parts, first learned as units, are then connected; the "progressive part" method in which every additional unit as it is learned is connected with the material already mastered; and two "repetitive" methods in which the learned units are repeated as an introduction to the learning of the next. The results, given in terms of times, trials and errors, show that all the part methods were superior for the A-Series as they had been for the maze. The wasteful repetitive methods were inferior for the B-Series, but for both series the progressive part method is the most efficient.

When paired nonsense syllables were presented to learners both simultaneously and successively, Froeberg (4) found a difference of 12 per cent. in the percentages of right responses in favor of simultaneous presentation. This was probably due to the tendency, greater in simultaneous presentation, to articulate the syllables and combine them into words. When colors, letters, and signs were substituted for syllables, the differences were in every case in

¹ PECHSTEIN, L. A., "Alleged Elements of Waste in Learning a Motor Problem by the Part Method," *J. of Educ. Psychol.*, 1917, 8, 303.

favor of successive presentation. Froeberg concludes that the difference is a matter of attention: simultaneous presentation is superior only when the paired stimuli form an attentional unit. In the first experiments, an increase in the time interval between successively presented syllables from 0 to 5 seconds had no effect on the number of correct responses. When, however, the subjects obliterated their memory images of the first stimuli of the pairs by reading numbers aloud in the interval, there resulted a decrease in the number of right responses with the increase in interval.

In a series of articles (10, 11, 12) Reed discusses the relation of associative aids to various aspects of learning. As an experimental basis for the study, his subjects learned by the prompting method pairs of verbal stimuli of various types. These experiments, covering six days, were followed by additional ones which consisted in giving the pairs backward and in giving the first members of the pairs first upwards and then downwards. The first paper establishes the relation between rate of learning and rate of forgetting: "the rate of relearning varies directly as the rate of learning." The explanation of this is to be found in the greater frequency with which associations are reported to occur in the case of slowly forgotten pairs. A classification of the associations shows that with familiar stimuli they usually have a meaning basis, while with less familiar material they are likely to be sensory; and that the former are the more effective. The practice curves (11) in terms of repetitions, reaction times, and standard deviations of the reaction times for correct responses, on the one hand, and the curves for frequency of associations, on the other, have the same general shape: there is a rapid fall for the first three days followed by a gradual one for the remaining three days, and a gradual rise for the three additional tests. If associations are present on the sixth day they are accompanied by a lengthening of the reaction time. The experiment may also be taken as one in the transfer of learning: the experiments of the first six days form the training series; the additional experiments are a test series for measuring the improvement; and the learning times of the regular tests for the first day serve as a control. Since 84 to 91 per cent. of the correct responses made in the test series are accompanied by revivals of associations used in the training series, Reed concludes that there is transfer only insofar as associations established in the first set of experiments can be used in the second. Finally, (12) the experiment may be taken as a problem the solution of which involves at

its outset thinking, and gradually, with repetition, becomes a type of reflex action. The associative aids are observed to occur most frequently in the problematic stages and to disappear as the solution becomes mechanical. This means that thinking and association are not distinct processes; that thinking must rather be taken as controlled association. Reed then defends his use of objective reports—reports of meaning—as throwing more light on the dynamics of thinking than can psychological descriptions.

With a view to seeing whether learning capacity is specific, or more or less constant, regardless of material, Pyle (9) set his subjects at various tasks involving different sorts of material: substitution, learning of nonsense syllables, card distribution, and marble distribution. The records of several hundred university students give an average "raw" correlation of .50 between ability in one type of learning and ability in the other types. Pyle thinks that with elimination of extraneous factors, such as differences in previous training, the correlation would approach unity. His view is that brains differ in the ease with which bonds are established and that most learning methods involve both general and specific factors. The former are the bond-forming capacities of the central nervous system; the latter, the other characteristics of brain, sense organ and muscle.

Pyle (8) used the same test in card-distribution to observe transfer and interference of training. The compartments into which the cards were to be placed were numbered according to two schemes which used the same figures in different sequences. The subjects in group A alternated from scheme 1 to scheme 2 from day to day throughout the thirty day experiment. Group B used scheme 1 only for fifteen days and then scheme 2 only for the remaining experiments. The average distribution time of this second group for the first day with scheme 2 was only 42.8 per cent. of the average time for the first day with scheme 1. By the fourth day with scheme 2 the minimal time for scheme 1 was reached. Pyle explains this transfer in terms of such identical elements as skill in perceiving and recognizing the numbers, in handling the cards, etc. Group A's data, on the other hand, show inhibitory effects: though the initial speed is higher than is Group B's, the final speed is 10 per cent. slower for scheme 1 and 22 per cent. slower for scheme 2. The inference is that it is not economical to form two mutually inhibitory sets of habits simultaneously.

Thurstone (13) filed the records made by drafted men in re-

ceiving tests in telegraphy during their first hundred hours of practice, with the purpose of studying the distribution of ability in a group of learners at various stages of practice. The median receiving speeds for the group, and the upper and lower quartile speeds are plotted against the hours of practice. The distances between the upper and the median curves, and between the median and the lower curves at any point represent respectively the upper semi-interquartile and the lower semi-interquartile ranges at that stage of practice. These ranges, and therefore the variability, increase with practice. This variability is also shown in the more precise terms of the standard deviation, expressed in words received per second. An experiment carrying practice to its physiological limit should, by showing the relation of the standard deviation to the practice hours, make possible the use of the standard deviation for expressing a student's standing at any stage of practice. Peterson (7) takes issue with Thurstone's article on several grounds. His own curves representing the progress of students in code translation show that while variability measured in terms of attainment may increase, when measured in errors will decrease. Thurstone's inference will then hold only for attainment. Furthermore, if instead of the absolute units—the quartile and the standard deviation—their coefficients of variability are considered, Thurstone's own data show a decrease in variability.

Chapman (1) reports tests in typing passages given daily to students in typewriting over a period from the twentieth to the hundred and eightieth practice hour. Eight typical individual curves seem to show that that is no typical curve which they approximate: the short plateaus which occur do not appear at the same places in the various curves; some individuals vary erratically, while others deviate little from their true rate of performance. When the average number of correct words is plotted against the number of practice hours, the curve shows a comparatively small return for the last ninety hours of practice.

Dallenbach (2) gave to a class of feeble-minded children tests in visual apprehension which had been used with normal children. He found that with the feeble-minded as with the backward normal children the characteristic effect of practice is a slow and gradual improvement, whereas with the "medium" and "superior" groups of the normal children a large initial improvement is followed by a small one. The range of visual apprehension varies with the complexity of the material and the diversity of the associations aroused. It is directly correlated with mental age.

In his experiment in rational learning, Peterson (6) set his subjects the task of associating the first ten numbers with the first ten letters of the alphabet, paired at random. The letters were called out in order and the subject, after every letter, guessed the accompanying number until he hit upon the correct one. He was free to choose any methods occurring to him. Peterson classifies the errors made as logical and perseverative. The former consisted in giving a number which had already been used for an earlier letter; the latter, in repeating a wrong guess in response to a single letter. Such errors are to be attributed to the excitement attendant upon test-taking for some subjects, and to a limited distribution of attention among the essential factors of the experimental situation. The error curves do not differ radically from other learning curves, though in only the better of the records are there the significant drops which characterize the curve in maze-learning. Peterson suggests that such tests may promise something in the way of analysis of individual traits.

Dearborn and Brewer (3) give the results of a class experiment in the effects of practice. The practice consisted in translating long prose passages into the old Civil War code used in several mental tests. The subjects had to construct the code mentally, after the preliminary explanation, and were given five-minute practice twice a day for two weeks. Before and after the practice series they were given a group of five tests sufficiently similar to the practice exercise, it was intended, to be reinforced or interfered with by the improvement made in it. The tests selected were one in digit-symbol substitution, a complex dotting test, a number code, a test in digit-letter substitution, and a letter code. The scores of the practiced group in the first and the final practice periods were compared, and their test scores were checked by the scores of two control groups who took the same tests. There is a small positive correlation between the first and the final scores in the practice series. There is also a small positive correlation between gain in practice and gain in the tests, with the exception of the test in the letter, where a small negative correlation indicates interference.

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MEMORY AND THOUGHT

BY W. C. RUEDIGER

George Washington University

Berliner (3) reports two brief series of experiments on the time relations and quality in the recall of simple visual images. In the first series observations made in the morning and at night were compared and showed a distinct tendency for the images to be held longer in the morning, while the effects of the day's mental work upon the time required to call up the image, and upon the quality of the image as recalled, were less marked. Eight persons participated in the experiments, from three to five days each. The second series used an interval of half an hour of intensive mental work (addition of figures), and gave about the same conclusions. In this series only two persons took part, in one day.

In the field of the relation of the speed and permanency of learning, Gates (9) reports a study on the correlations of immediate and delayed recall. His subjects were elementary school children and his tests were based independently on nonsense syllables and connected sense material, the final results of the two types of tests being averaged. He found positive correlations as follows: (1) from .73 to .89 between amount recalled immediately after learning and amount recalled three or four hours later; (2) at least .50

between amount recalled immediately and the *proportion of that amount* recalled after the interval; and (3) .50 between the estimates of intelligence of the pupils furnished by the teachers, and all the tests of immediate and delayed recall. Between the various single tests of the two types of material he found a correlation of $+.50$.

With the purpose of (1) making a beginning in establishing the associational basis of English and (2) of comparing the results found in English with those found by Thumb and Marbe in German, Esper (6) reports an experimental study on word associations. He used 126 observers divided into three groups: 100 university students, 11 children, and 15 university janitors. As stimulus words, he used 10 names expressive of family relations, 10 adjectives, 10 numerals from 1 to 10, 10 pronouns, 10 participles, and 10 adverbs of time and place. Only one- and two-syllable words were used to avoid the possibility of prolonging the reaction-time. Reaction-times were measured with the Hipp chronoscope. From the results obtained the following conclusions appear to emerge: 1. The rule established by Thumb and Marbe, namely, that the more frequent an association is, the more rapidly does it take place, is confirmed by the English-speaking observers. Thus, out of 95 successful reactions to the stimulus word "father," 69 were "mother" with a median of 1.160 seconds; 4 were "son" with a median of 1.248 seconds, and 22 remaining cases with a median of 1.904 seconds. 2. In both languages, words of a given category are associated predominantly with words of the same category. (a) In all categories investigated, with the exception of the numerals, reciprocal associations were found. In these cases, a word *A* which calls up a word *B* is in turn called up by *B*. (b) Numerals are associated predominantly with higher numerals. (c) Adjectives are associated predominantly with adjectives of opposed meaning. 3. A comparison of the English and German results tends to show that the associations of English- and German-speaking communities correspond in the case of most words which are of familiar meaning and in universal use in both languages. 4. The reaction-times of the associations of children and uneducated adults are longer than those of educated adults, but the favored associations are in most cases the same and the essential character is similar.

Foucault (8) in an experimental study on forgetting, concludes that the formula presented by Ebbinghaus is too complicated and lacks the uniformity that is demanded, and that the attempt by Meumann to revive the formula of Ebbinghaus fails through

neglecting the influence of the time of day on the fixation of knowledge in the mind. His own results are presented so abstrusely that little can be made of them.

Arreat (1) revives the old question of whether we have one memory or distinct forms of memory. To accept the latter alternative he thinks implies the acceptance of the old doctrine of cerebral localization, and as he rejects this, he is forced, or thinks he is, to the conclusion that we have one memory. He does grant the possibility of distinguishing between a memory of perceptions and a memory of emotions, but beyond this he considers memory a unitary function whose application by different individuals is very diverse.

Under the title of "*Esthetique et Memoire*," D'Eichthal (4) points out the relation of memory to the appreciation of the beautiful. His theme is that the appreciation of music depends on the memory of the notes which are past. The repetition of a certain theme is for the ear the return of an old acquaintance. The pleasure derived from oratory and poetry is due to the rhythmic repetition of accents or rhyming syllables. Painting, architecture, sculpture—all depend upon symmetries, repetitions, and equilibriums which are carried in the memory as the appreciative gaze passes over the whole. This is all very good; memory undoubtedly does function in esthetic appreciation; but when D'Eichthal explains individual differences in esthetic appreciation by differences in memory he oversteps his bounds.

The present day conception of logic, according to Avery (2), differs from the traditional one in regarding logic as the science of relations instead of the science of the laws of thought. The term "thinking" has a subjective or psychological reference which, in the present interpretation of logic, should not be emphasized. The older view appeared to place logic within the field of psychology. If logic is defined as the science of relations, then, obviously, the types of relations met with must be distinguished. These Avery divides into (1) transitive and intransitive and (2) symmetrical and asymmetrical. A transitive relation is exemplified by:

A is to the right of *B*,

B is to the right of *C*.

Therefore *A* is to the right of *C*.

An intransitive relation is exemplified by:

John is the father of Henry,

Henry is the brother of William.

As the relation is intransitive, it cannot be concluded that John is the father of William.

A symmetrical relation is exemplified by $A = B$, and an asymmetrical one by A is B . In the former, one may go either forward or backward but not in the latter.

After reviewing the most prominent attempts made during the last century to give a logical division of judgments, Lodge (11) concludes that modern logic recognizes no logical division of judgments into coördinate types and species and that judgments cannot be divided on a logical, but only upon a psychological, basis. Taking, then, the psychological basis of the predominance of sensory and intellectual elements, he presents the following division: judgments of (1) perception, (2) experience, (3) symbolic judgments and (4) transcendent judgments. A judgment of experience differs from the perceptual judgment in that it depends more on memory or previous perceptions than on direct present perception. The symbolic judgment differs from the judgment of experience in that it extends our knowledge beyond the field of actual experience. The transcendent judgment is an attempt to extend the field of symbolic judgment beyond the limits of human experience, actual or possible.

Wells (12), in a somewhat controversial article, maintains the thesis that "the biological foundations of belief may be exhibited in two ways. In the first place it may be shown in what manner some of the human instincts, which are the basis of man's emotions and desires actually determine his beliefs. Since the instincts exist as one outcome of the biological struggle for life, so far as beliefs rest upon instincts they rest upon biological foundations. In the second place, attention may be called to the direct survival value the beliefs possess through their 'subjective' effects upon the physical economy of life. . . I contend that beliefs need not always be true to be valuable."

Edgell (5), Fawcett (7), and Johnson (10) have papers in *Mind* for 1918 whose titles suggest psychological contents but whose actual contents do not bear out this suggestion. The titles are respectively "The Implications of Recognition," "Some Observations Touching the Cosmic Imagining and 'Reason,'" and "Analysis of Thinking." The first two of these are out-and-out metaphysical discussions, of interest only to professional metaphysicians, while the third analyses thinking into a host of abstruse verbal distinctions having linguistic rather than psychological implications.

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SPECIAL REVIEWS

Some Questions of Phonetic Theory. WILFRED PERRETT. (Chapter V. The Perception of Sound.) Cambridge: W. Heffer & Sons, 1919. Pp. 39. 2 s.

The reviewer regrets that he has not had access to the previously published chapters of this work. The chapter under review is an argument against the theory of resonance as advanced by Helmholtz. After a brief consideration of the historical antecedents of the Helmholtz theory, the author proceeds to discuss various data from acoustics and phonetics which point to the conclusion that the movements of the internal ear are *dead beat* in their character.

The conception of resonance is replaced by that of *synkinesis*, a kind of sympathetic vibration in which no natural resonance tone is involved. The diaphragm of a telephone or of a phonograph acts synkinetically "being aperiodic in relation to the periods of the vibration transmitted, beginning and ending its vibratory motions accurately with those vibrations, without awaiting any summations of impulses before it can get into its swing—having no swing to get into—and without continuing to execute extra vibrations after the force which moves it has ceased to act."

The chief objection to resonance in the internal ear concerns the continuance of audibility by virtue of this resonance which, according to Helmholtz, must involve some such period of time as that occupied by 9.5 vibrations of the tone. Since it requires a certain summation of vibrations to bring the resonator into its full swing our ability to hear a note beginning at full strength is unexplained. Furthermore a low note would require a longer time than a high note. Two sounds must synchronize to within 1/100 of a second to be perceived as simultaneous, and a single vibration of any bass note below G takes a longer time than that.

The crucial instance advanced by the author in opposition to a theory of resonance concerns the "voiceless occlusives." A graphic record of the word *utter* shows that the time during which the tongue forms the t-closure is shorter than would be demanded by the resonance of the preceding sound. If resonance obtained it would be impossible to distinguish *utter* and *udder* since the distinction rests upon a reduction of the sound to silence between the two

syllables of *utter*, and with a resonating sound no such silence could supervene in the brief period which the voice actually employs. Indeed all voiceless occlusives such as *p*, *t*, and *k* in "stop, please," "not to be" and "book-keeping" would be impossible on the hypothesis of resonance, because internal vibrations must continue the sound for a brief period until damping is effective. "It is precisely the *absence* of resonance that make the voiceless occlusives possible."

The author contends that Helmholtz should have rejected the hypothesis of resonance when in his fourth edition (1877) he ceased to regard the otoliths as the occasion of noise. But some recent investigations, notably those recorded by the physiologist Parker¹ and the physicist Stewart,² have brought forward evidence that perhaps the cochlea is not the only seat of hearing. If noise is not a phenomenon of resonance, a crucial instance for the complete overthrow of the resonance hypothesis must be sought with reference to the sensation of tone.

Perrett's discussion, though seemingly well informed, is marred by flippancy of style and the frequent introduction of "smart" terms of speech. The effectiveness of the argument is thus seriously impaired by an egregious trifling.

R. M. OGDEN

CORNELL UNIVERSITY

Theorie der Konsonanz und Dissonanz. (*Schriften zur Anpassungstheorie des Empfindungsvorganges.* 2 Heft.) JULIUS PIKLER. Leipzig: Barth, 1919. Pp. 34.

In place of the excitation theory (*Erregungstheorie*) of sensation, the author advances a theory of adjustment (*Anpassungstheorie*), in accordance with which the apprehension of sensation involves a relational activity on the part of the mind. In the phenomena of consonance the author traces the effects of an adjustive attitude which is but an expression of the general principle of self-preservation. With this principle as a foundation he proceeds to distinguish sharply the method of apprehension on an arithmetic basis from apprehension on a geometric basis; the latter possessing the natural significance which endows musical consonance with its peculiar effectiveness, since it consists in measuring all tones with reference to a fundamental.

Just as a comparison of lines visualized is furthered and made

¹G. H. PARKER. A Critical Survey of the Sense of Hearing in Fishes. *Proc. Amer. Phil. Soc.*, 1918, 57, 69 ff.

²G. W. STEWART. Binaural Beats. *Psychol. Monog.*, 1918, 25, No. 108, pp. 31 ff.

pleasing whenever one line reappears as a fractional part of the other—so that the one may be said to involve the other—two tones are consonant whenever one of them recurs in the other. This is most notably the case in the octave where the upper note is essentially a doubling of the lower note. But it is also the case in the fifth where the upper note is analysed as the lower note plus one-half ($1 : 1 + \frac{1}{2} = 2 : 3$), and in the major third where the upper note is again the lower note plus one fourth ($1 : 1 + \frac{1}{4} = 4 : 5$). Beyond this the consonance of a single interval does not extend. Although the same principle would seem applicable in the case of the whole tone, $8 : 9$ and the quarter-tone, $16 : 17$, as a matter of experience we fail to hear these intervals geometrically, because with such small differences, an arithmetic means of apprehension appears to be easier. The fourth, although essentially dissonant, may possibly be heard geometrically as half the fall of the higher to the lower tone of the octave; similarly the minor sixth ($5 : 8$) may be apprehended as a fall from the upper to the lower tone diminished by a quarter. The apparent consonance of the minor third and the major sixth are explained with reference to their positions in triads. For example, the minor third, when taken singly is dissonant, but it becomes musically useful in combination with the major third and the fifth where it occurs as a natural consequence of combining these two consonant intervals. It is, however, a mistake to regard the triad as a fundamental element in consonance, for in reality it is only the simplest and most immediate means of resolution for a dissonance.

In order to deal justly with Pikler's theory one should doubtless consult his larger work (*Sinnesphysiologische Untersuchungen*) to which frequent references are made in the pamphlet under review. Unfortunately this book is not yet available to the reviewer, and therefore no extended criticism of the foundations upon which his theory of relational apprehension rests, is here possible. One may venture to say, however, that although the author refers in all cases to the immediate experience of intervals as the basis of his conclusions, and thus even goes so far as to exclude the fourth and the major sixth from the ranks of consonance, although hypothetically they might be justified as representing one third and two-third "doublings" of the fundamental, there is no indication that he has analyzed his tones so as to inform us just what is "doubled" in the octave, or "half-doubled" in the fifth. The analogy with the visual apprehension of straight lines of different lengths is hardly convinc-

ing unless we know what precise dimension or attribute of the tone is under consideration in judgments of consonance. The application of geometrical and arithmetical conceptions is apt to be more confusing than helpful unless it be first grounded upon judgments of liminal variation. And although it has been demonstrated that the discrimination of pitch tends to follow an arithmetical series of vibrational increments while discriminations of volume follow a geometrical series, it by no means follows that either the pitch or volume dimension of the sound can be quantified. While all would agree that the two tones of an octave possess a common quality, to go farther and state that this common feature or *Selbigkeit* is explained by the fact that the upper note doubles the lower one appears to the reviewer somewhat naïve.

R. M. OGDEN

CORNELL UNIVERSITY

The Psychology of Musical Talent. C. E. SEASHORE. Boston: Silver, Burdett, 1919. Pp. xvi + 288.

"This monograph is addressed to students of applied psychology. By content, it appeals directly to those who are interested in music." It is a presentation of "the psychology of musical talent, an account of the musical mind. This subject is treated from both the theoretical and the practical point of view, the aim being to describe and explain the musical mind in such a way as to serve in the recognition, the analysis, the rating, and the guidance of musical talent." "Our approach is that of experimental study."

If we turn to the body of the book, we find that the first chapter gives the following inventory of the factors in musical talent: I. Musical sensitivity, which consists of simple forms of impression,—the senses of pitch, intensity, time, and extensity; and complex forms of appreciation,—the senses of rhythm, timbre, consonance, and volume. II. Musical action,—the natural capacity for skill in accurate and musically expressive production of tones in the control of pitch, intensity, time, rhythm, timbre, and volume. III. Musical memory and imagination, which includes the sub-headings auditory and motor imagery, creative imagination, memory span, and learning power. IV. Musical intellect, consisting of musical free association, musical power of reflection, and general intelligence. V. Musical feeling, comprising musical taste, emotional reaction to music, and emotional self-expression in music. In so far as experimental technique has developed sufficiently,

each of these capacities is measured and recorded for each individual. Graphs are then made which show at a glance how the talents of the particular person under consideration are distributed. This inventory is the nucleus around which the remainder of the book is built. Chapters II-VIII inclusive are devoted to musical sensitivity. Throughout these chapters norms are given for discrimination of differences of pitch, differences of intensity, differences of temporal interval, and differences in degrees of consonance. Instructions are given showing how to convert the records of individual performances into percentile rank-order by means of the ogives which accompany the norms. No norms are shown for rhythm, timbre, extensity, and volume, but methods are suggested for obtaining them in rhythm and timbre. Seashore thinks that norms for extensity are unnecessary because "extensity varies exactly parallel with pitch," and that they are not needed for volume because it is expressed in terms of extensity, intensity, and timbre. But this doctrine takes no account of the limens for pitch and volume, (Seashore's "extent"), reported by Rich¹ which indicate that pitch and volume are not exactly parallel. If the work of Rich is to be accepted, then it would be necessary to establish norms for extensity independent of pitch, and for volume in so far as it is conditioned upon extensity. From this point Seashore goes on to discuss methods of measurement of the highest audible tones and the lowest audible tones and measurement of simple acuity throughout the whole tonal range. The convictions of the author concerning the relations of these fundamental "senses" to age, sex, general intelligence, and training are set forth, with tables in certain cases showing the distribution of the factors under consideration. There are also paragraphs upon the musical significance of these same "senses." The foregoing are the principal systematic discussions, but there remain comments upon the physical basis of pitch, the physiological basis of pitch and intensity, individual differences in pitch discrimination, illusions of pitch, periodicity in sound and other matters which need not be discussed here.

Chapter IX, on voluntary motor control, describes instruments and methods for measuring motility, timed action, reaction time, discriminative action, serial action, precision in movement, and strength and endurance in action. Chapter X, on musical action, shows the relation of the capacities discussed in the foregoing

¹ RICH, G. J. "A Study of Tonal Attributes." *Amer. J. of Psychol.*, 1919, 30, 121-164.

chapter to control of pitch, intensity, time, rhythm, timbre, consonance, and volume. There is a description of the tonoscope and a summary of the results obtained when a singer watches himself sing and uses his eye to correct errors which his ear is not sensitive enough to perceive. Chapter XI contains the presentation of methods for describing and measuring imaginal types. There is an ogive for conversion of ratings into percentile rank. The importance of the role of auditory imagery in music is stressed; and it is emphasized that "auditory imagery is almost inextricably tied up with motor sensations and motor imagery." The chapter ends with descriptions of the types of musical imagination and with a presentation of the significance of imagination as a musical talent. The experimental part of the chapter on musical memory is a graph and an ogive of norms for ranking auditory memory span for pitch. There is also a sketch of the method for obtaining the norms and individual values. The theoretical part suggests a method for measuring retention, one for measuring the rate of learning, and one for measuring absolute pitch. The three final chapters, on musical intellect, musical feeling, and the individual and training in the art, are theoretical.

The author's purpose in this volume is to promote the vocational and avocational guidance of musical talent. It will be granted that the end is praiseworthy. The debate lies in the degree with which this purpose has been fulfilled. It is unsatisfactory to find that questions disputed in the literature are passed over dogmatically, unless such treatment can be justified by the popular nature of the presentation. There is conspicuous difficulty with the systematic significance of the capacities listed as elementary. A capacity is elemental when it "does not vary with training, intelligence, or age after the child is intelligent enough to observe." Not all the capacities which we are told are elemental can qualify under this definition; the sense of time, for instance, varies with intelligence. A more serious difficulty lies in the fact that there is no convincing evidence that the sum of the elementary capacities will combine into musical talent. When the separate capacities are measured, the best that can be said is that the individual measured has proficiency of such and such a degree in capacities that a musician finds useful. The measurements say more nearly that this person could be a performer in music if he had the inclination; but proof is lacking that he is a musician. Although the significance of the results may be questioned, it is true that the

suggestions of method for obtaining more results, and the anticipation of the significance which these results would have when obtained, are positive incentives to complete the author's elaborate program.

H. G. BISHOP

CORNELL UNIVERSITY

Filosofien I. Norden. ANATHON AALL. Kristiania: Jacob Dybwad, 1919. Pp. vi + 378.

In the above work the scientific world is offered for the first time a comprehensive and valuable critical history of "new thought and mental science," in the four countries of the North: Sweden, Denmark, Finland and Norway.

The first chapter of the book deals with modern Swedish philosophy. Here we note contributions to general philosophy made by Swedish thinkers like Rudbeck, Bilberg, Rydelius, Wallerius, Linne, Svedenborg, and especially Chr. J. Boström, who according to Dr. Aall, was for Sweden what Kant was for Germany, Comte for France, and Spencer for England. Among modern Swedish thinkers Dr. Aall mentions H. Larson, Nilson, Vannerus, John Landquist, and others. Much emphasis is placed, however, on modern empiricists and contributors to experimental psychology. Here we get acquainted with scholars like Sjögren, Herlin, the physiologist Oehrwall, Thunberg, Gullstrand, Lundborg, Bjerre, Gadelius, Alrutz, M. Jacobsson, Hammer, Jaederholm, and others.

As to Finland, Dr. Aall finds a similar mental interchange between that country and Sweden as has been existing between England and the U. S. The Finnish contributions show a more exclusive philosophical trend.

In Denmark, a general characteristic of philosophical development is to be found in a never-ending fight against theology, through men like Holberg (Norwegian born), Orsted, Dreier, Kierkegaard, Brochner, G. Brandes, H. Höffding, Buch, and Thomsen.

Dr. Aall gives very interesting original views on Ludvig Holberg, the well-known author who in the latter part of the eighteenth century founded Norwegian Danish individualism. Niels Trenchow and the brothers Orsted are given much consideration, but perhaps the most outstanding silhouette in Danish philosophy is shown to be Sören Kierkegaard (1813-55), the man who fought Hegelianism and founded his own peculiar system of individualism

and whose great influence on Scandinavian and European thought reveals itself more and more clearly the more it is studied. H. Höffding's philosophy is well known in this country, but also here Dr. Aall gives new points of view. For Danish experimental psychologists, the work of Alfr. Lehman and his school (Buch, R. H. Pedersen and others) is well expounded. We learn that Lehman's early investigations on color, for instance, meant an attempt to show that Fechner was right in the fundamental principles of his physiological esthetics. On the whole Lehman stands out for us as a psycho-physicist, of the highest sincerity and originality.

Philosophy and psychology in Norway has a broad place, and has got an interesting treatment on the background of the development of the other sciences and literature, etc., of the country since 1814. Philosophers like Treschow, and "the champion of Hegelianism" Monrad, show that Norwegian scholars up to 1900 were influenced by English, but more strongly by German thought. The reader gets a strong impression of the bearing of Norwegian literary geniuses upon philosophy. The chapter on "Henrik Ibsen, a Norwegian philosopher," furnishes in itself a strong and original thesis. Through A. Löchen and Kr. Birch-Reichenvald Aars, modern experimental psychology got its start in Norway (about 1900). Since then introspective and psycho-physical studies have constantly taken more and more of a foothold, and the author himself has gathered around him a school that takes the strictly empirical and experimental point of view. Quite a series of genuine contributions has appeared, mostly in German. Although it is frequently said that German influence has been predominating in Scandinavia, Dr. Aall's work shows that many inspirations have found their way *into* Germany from the North, and that there has been also a close connection with France and England.

The author gives hundreds of minute references distributed throughout the text; among these American science seems to be drawn in through Pierce, Münsterberg, and William James, who is mentioned twelve times. The hitherto altogether too little mental intercourse between Scandinavia and this country is to be regretted and is perhaps finding its remedy right now, in the growing interchange of students.

With the interest of the scientific North now turning westward as never before, due consideration will speedily come to the great and inspiring work being done in America. Considering the vast-

ness of the field covered, through constant illuminating reference to Western Europe at large, Dr. Aall's work marks a source book for psychologists, philosophers, educators, scholars in literature and art, and others, who desire to get a scholarly view over the Scandinavian field, written by a man who for a lifetime not only has himself given original contributions to psychology and philosophy, but who also has for decades expounded the progress of Scandinavian science through representative European periodicals. No doubt an English translation of Dr. Aall's work would be heartily welcomed by a vast majority of Anglo-Saxon scholars.

MARTIN L. REYMERT

STATE UNIVERSITY OF IOWA

A Study of the Mental Life of the Child. H. VON HUG-HELLMUTH.
(Trans. by J. J. Putnam, & M. Stevens.) Washington: Nerv.
& Ment. Dis. Publ. Co., 1919. Pp. xiii + 154.

This book is interesting and in many ways suggestive to students in child psychology. When Dr. Hellmuth, however, undertakes at the present stage to tell all about the complex "mental life" of the child, in the exclusive light of Freud's psychoanalytical mechanisms, it is a little pretentious. The book is more a philosophical discourse than one which has to do with psychology proper. Child psychology is some decades old; several centuries hence an encyclopedic work like the one Hellmuth has attempted may be written. The chapters comprise among others: "The Functions of the Senses in the Service of the Affective Life of the Infant," "The First Signs of Volitional Activity," "Development of Intellect," "Beginnings of Speech," "Development of Ethical Feelings," "Understanding," "Memory," "Imagination."

The genetic points in the treatise are valuable but offer very little new outside the attempt to get Preyer, Darwin, Shinn, Scupin, Sully and others in under the Freudian view and by drawing examples from these wherever such examples will fit in, a procedure which, according to Dr. Putnam and the author, shall excuse psychoanalysis from the criticism of "using only *ex parte* data"! Miss Hellmuth sees only "The Freudian Child" without reference to the improvements given the psychoanalytical method by Jung, Adler, Ferenczi, and others, through whom the present reviewer has great hope for the future of psychoanalysis, especially within the intricate field of children's emotions. However, psychoanalysis must rid itself of dealing in generalities—of the *a priori* big sweeping

statements—often based on a few selected facts, if it wants to rise from a “method of healing” into an objective science, and Hellmuth’s book offers a new proof of the conclusion that this change seems yet to be far off. It is true that other child psychological methods at present share in this general fallacy—we seem to know all about “the child” and very little about individual differences, which for all our wisdom at this time may outweigh any “general laws”! With behavioristic, psychophysical, introspective, and other methods, psychoanalysis may, by laying bare the individual child, become of great service, but then it must turn from speculations like Hellmuth’s into minute experiments and controlled observations. The German original of the book is not given, so the translation can not be judged. Is it good form that the names of the translators head the pages, instead of that of the original author?

MARTIN L. REYMERT

UNIVERSITY OF IOWA

The Psychology and Pedagogy of Anger. R. F. RICHARDSON.
(Educ. Psychol. Monog. 19.) Baltimore: Warwick & York,
1918. Pp. 100.

This is a study of the conditions, course and consequences of anger as they appear to introspection. Twelve persons, ten of them graduate students of psychology at Clark University, reported daily to the author from notes during a period of three months or more the cases arising in their own experience. Their findings and the author’s comments, together with certain pedagogical applications, make up the volume. As might have been expected a good deal of difference was discovered in different cases in the same individual and in the responses of different individuals according to their temperament and previous training, one important conclusion being that, so far as the reaction is due to individually acquired habits, it is capable of being trained. The chief place of anger itself in education is found in the fact that it is often a stimulus to effort in the desire to vindicate one’s own powers of achievement and win esteem in the sight of others. Would that the author might take the lesson to heart, provoked by the knowledge of the irritation produced in one reader by the looseness of his writing and the carelessness in the proof-reading!

H. N. GARDINER

SMITH COLLEGE

Le subconscient normal: An Experimental Study of the Cognitive and Affective Processes in Retention and Recall. EDOUARD ABRAMOWSKI. Paris: Alcan, 1914. Pp. 442.

This study, printed in 1914 at the declaration of the war, was not issued until 1918.

The experiments in Chapter I show the part that memory plays in the processes of comparison and recognition. A puzzle design, made up of seven colors of irregular and unusual shapes, is presented to the subjects for varying durations and under varying degrees of distraction. The distraction is produced by requiring arithmetical calculations at various stages in the learning and relearning processes. Introspections were required and the types of errors were classified. From these experiments the author concludes that in all presentations after the first, the judgment of identity appears immediately. New details are not perceived as new but as things previously and indistinctly seen. In the series with distraction, the judgment of identity is present even though the details are not discriminated. The mass of undifferentiated details form a "general impression." In addition to the judgment of identity and the general impression, the author describes a third factor, the consciousness that there is "something" below the threshold of consciousness. The subject *knows* that his reproduction is incomplete. The forgotten details lie below the threshold, are near, but nevertheless inaccessible for thought. If the effort to remember is prolonged, a state of irritation or annoyance develops because of their anonymous absence. There is, so to speak, a resistance against accepting tricky or false memories. Genetically, the author regards memory as made up of: (1) An undifferentiated, non-representative, non-cognitive, *affective* factor that can only be described as a consciousness of something missing in the fidelity of the reproduction, and a feeling of familiarity in the recognition. There are four degrees of this affective consciousness: (a) the lowest degree manifests itself as a vague consciousness that something is lacking, (b) a feeling, non-cognitive and immediate, that something specific is lacking, (c) a specific feeling of the familiarity of the design, (d) imagery, highly emotional in tone and having a symbolic reference. (2) A *partial image* that gradually develops under the activity of cognition and which varies with the degree of attention. These partial images which are felt to be symbolic, become vivid when cognition is arrested by an emotional disturbance.

The author regards memory as an affective phenomenon,

partially intellectualized by imagery. Recognition is described as the perception of an object under its non-cognitive aspect.

In Chapter II are reported experiments on the influence of duration on the recognition of forgotten words, immediate memory for words, effects of distraction. Hallucinations, paramnesia, memory illusions, perception, are then interpreted in the light of the results. Three general conclusions seem warranted: (1) In each perception there are two elements, (*a*) the pure impression and its elaboration during the act of attention, (*b*) an affective content, of which the verbal equivalent is the phrase, "There was something." The act of attention transforms this something into an object that may be named, identified, and classified. (2) When a percept is being forgotten, memory of it is reduced to its affective content. (3) Everything that is consciously forgotten, exists in an integrated and affective subconscious condition. This is the self, the individual; a unified continuum persisting through all the variations in the conditions of life, health, and intellect.

In Chapter III are reported experiments designed to show how the normal subconscious is developed. Illustrated post cards with varying number of details were presented with and without distraction. Reproduction followed after controlled intervals. The normal subconscious is described as a selective and integrative unit that presents different degrees of psychical vitality and of dissociation, depending on the original intelligence, and which in its latent condition exhibits two simultaneous but inverse tendencies: one directed toward raising the subconscious elements above the conscious threshold, the other toward depressing them still further below the threshold.

In Chapter IV the experiments are directed toward showing the relation between the resistance against forgetting, and the affective tone of memory. If a series of words is imperfectly memorized, memory gaps will be experienced in reproduction. With respect to cognition these gaps may be blank, but when a false term is suggested for the forgotten term, there is experienced a resistance against the false term. This phenomenon the author designates as the positive resistance of the forgotten. Not only are the memory gaps *felt* but the feeling is more or less specific in the sense that the forgotten element seems to belong to some particular class or group, even though the specific element cannot be recalled. It is this feeling of group or family of a percept that is the cause of the resistance against accepting false substitutes for the terms

actually forgotten. When the forgotten element is emotionally significant, a false suggestion may be accepted as true, and this is described as negative resistance.

In Chapter V the experiments are extended to the tactual and muscular senses with practically the same results.

In Chapter VI, psycho-galvanic measurements are reported and from a consideration of the results the author concludes that the "feeling of the forgotten" varies directly with the degree of affective coloring of the words presented. The effect of doses of alcohol show a decrease in the affective tone.

Chapters VII and VIII are devoted to reproductions of well-known paintings with a view toward investigating the esthetic feelings, the feeling of "strangeness," the nature of telepathy.

In Chapter IX the author formulates a new theory of memory of which the following seem, to the reviewer, to be the salient features: (1) The ordinary state of the total past is a *feeling* of the entire mass of the forgotten, and this is the feeling of individuality. We may regard it as latent memory, the subconscious, or the cryptamnesia that accompanies all consciousness. (2) The group feeling of certain forgotten facts becomes organized around a sensation or around some symbol in some way. It appears in vague affective memories and often in our artistic productions, but we find it also in our ordinary memories as the substratum for the recall of specific periods of our life. The totality of these group feelings make up the "drives" of the subconscious. They play an important part in psychopathology and at the same time they form the basis of the normal association of ideas. (3) The simplest element of latent memory is the group feeling (of a forgotten particular element) that manifests itself in relearning as a feeling of something missing, and in recognition by a resistance against false suggestions. These three aspects of affective memory represent the subconscious part of the mind.

Considered as a whole, the reviewer believes this work will prove of value to the clinical psychologists. The experimental work is ingeniously handled and the applications to psychopathology are carefully worked out. The work may well be designated as an experimental study of the characterology of the "censor." The experimental psychologists will probably maintain that the various factors enumerated by the author have not been reduced to sufficiently simple mental or behavior elements.

A. P. WEISS

De l'inconscient au conscient. GUSTAVE GELEY. Paris: Alcan, 1919. Pp. 346.

In the preface the author calls attention to the fact that in the explanation of life phenomena, *chemical* processes are emphasized when the study is from the lower to the higher forms, but when passing downward from the higher toward the lower, *consciousness* seems most significant. Neither classical biology nor classical psychology has given a satisfactory explanation of the relation between organic and psychical phenomena. Beginning the work with a critical analysis of the theory of evolution, the author concludes that neither the Darwinian nor Lamarkian interpretations of the method of evolution can account for the origin of species, the origin of instincts, the appearance and permanence of mutations. It seems hopeless to regard the individual as being the product of purely physico-chemical processes as these are usually defined. It seems necessary to postulate other forms of energy that exert a directive or creative influence upon the physical and organic world. The laws that govern the physical world are not rigorous and absolute as we have believed. They have a relative value and may be temporarily or accidentally modified or suspended. The author then calls attention to the profound changes that take place in the metamorphosis of an insect through the larva, pupa and imago stages. These changes are too uniform and striking to be regarded as resulting from known physiological processes unless there is a directive determiner of some sort. The analogy of insect metamorphosis is then carried over to some striking materialization phenomena in a medium by the name of Eva. The apparent similarity of these materializations of hands, faces, etc., to embryological development, have led the author to a super-physiology and a super-psychology. As super-psychological problems are mentioned: thought reading, telepathy, visions, spiritism. Super-physiology is the physiology that underlies these phenomena. Both super-physiology and super-psychology condition each other reciprocally. The organic complex, its physiological functions and all vital processes are conditioned by a superior force. The concrete notion of this force should be subsidiary to the abstract idea of its creative or directive capacity.

The classical conception that the self is a synthesis of conscious states, or that it is the functioning of the central nervous system, must be abandoned. The origin of the subconscious capacities are not sensory but originate in inspiration, intuition, genius, and

are entirely independent of learning or acquired capacities. There is in life a psychic force that is not conditioned by the organism and which force constitutes the essential character of the self. This psychic force passes by evolution from the subconscious to the conscious, and instinct is to be regarded as only this subconscious ideoplastic force functioning under favorable conditions. A large part of consciousness normally remains latent, but the psychic force of the subconscious tends to become the psychic force of the conscious. In the final stages of evolution the subconscious will disappear and only consciousness will remain.

The interest of the author would lead the reader to expect the re-interpretations of the various philosophical theories that are found toward the end of the book. Much space is devoted to Bergson, but Schopenhauer and de Hartmann are not neglected. More concrete consideration is given to normal and abnormal psychology, neuropathic conditions, neurasthenia, hysteria, mania, hypnotism, dissociation of personality, mediums.

The reviewer believes that this work will be enthusiastically received by those disposed to follow the works of Conan Doyle, Sir Oliver Lodge, and Professor Hyslop. For the majority of the professional psychologists of America the relation between normal psychology and normal physiology is baffling enough, and the acceptance of a super-physiology and a super-psychology will probably meet, in the words of the author, with considerable positive resistance.

A. P. WEISS

OHIO STATE UNIVERSITY

Experiments in Psychical Research at Leland Stanford University.

J. E. COOVER. Stanford University, 1917. Pp. xxiv + 641.

In 1912 Thomas Welton Stanford, a brother of the founder, made Stanford University a bequest of £10,000 to endow a fellowship for psychical research. The volume under review is the first extensive report of the experimental work which has been undertaken upon this foundation. After a foreword by the Chancellor of the University, David Starr Jordan, and the author's preface, there follows an introduction by Professor Frank Angell, describing the inception of the foundation and its program of work. The body of the volume is divided into five parts, and five appendices.

Part I deals with Thought-Transference. After a statement and discussion of the problem of telepathy, four sets of experiments are detailed. The first consisted in guessing Lotto-Block numbers, 10 to 90. This experiment engaged the writer and one reagent, an advanced student of psychology who entertained a belief in the possibility of thought-transference. The procedure was for the experimenter to sit facing the back of the reagent, and to draw the Lotto-Blocks at random from a bag. If the block appeared with its number-side upwards, the experimenter held the number in some kind of vivid imagery, whose type was carefully recorded. At a signal the reagent indicated his impression, together with introspective details as to his mood of receptivity, his imagery, with its temporal course and spatial attributes; also the subjective certainty of his judgment. In case the block appeared with its blank side upwards, the experimenter refrained from imaging any number, and instead mused "upon an ocean scene."

One thousand experiments were conducted, but no evidence of transfer appeared in the results. They did show, however, frequent experiences of the reagent which he attributed to an objective source. Upon analysis the feeling of certainty in making judgments appeared to attach to the vividness and the behavior of the images entertained; but there was no correlation between the certainty of the guesses and the right cases.

The second experiment was guessing playing cards, and engaged 105 normal reagents, with 97 persons acting as agents. The attitude of the reagent was generally that of belief in some form of telepathic communication. A pack of forty cards, with face-cards omitted, was shuffled and cut by the experimenter, while by a throw of dice he determined whether the card cut was to be observed and imaged or not. The reagent, therefore, guessed a card which might, or might not, be in the mind of the agent. In case the card was imaged, the experimenter held in consciousness a determined attitude of will that the content should reach the reagent. The results of 10,000 guesses revealed no correspondences that were not explained by a statistical treatment, although 73 per cent. of the reagents graded certain of their guesses high with respect to certainty, 18 per cent. of all the guesses being so graded. The "inner experience" of thought-transference is therefore no unusual one. But these experiments bring no evidence either of accomplished thought-transference or "lucidity," *i.e.*, an ability to know the card cut, even if the agent does not know it. The conclusion reached is that such capacities must be very special, if they exist at all.

A supplemental set of experiments in which the reagents were ten "sensitives" brought analogous results. In 1,000 experiments no extra-normal capacity was revealed, although the "psychics" gave evidence of the semi-trance state of receptivity which characterizes their professional conduct, and they frequently regarded their impressions as issuing from an objective source. Of the five complete "hits" that were recorded, although four were with cards imaged by the experimenter, two were estimated at the lowest grade of subjective certainty, and the remaining three were attributed to "guessing" on the part of the reagent.

The "feeling of being stared at" was also investigated by ten reagents who professed a belief in such impressions and their significance. The experimenter seated behind the reagent stared at the back of his head, or refrained from so doing, according to a throw of dice. The results were again negative, so far as any objective influences could be detected; but they demonstrated that such a "feeling" could be genuinely aroused under laboratory conditions. Introspective analysis seems to show that the "feeling" in question rests upon the attribution of objective validity to commonly experienced subjective impressions in the form of imagery, sensation and impulse. The acceptance of suggestions from the total situation is also a frequent factor in determining the impression as being that of some distant influence. Unless carefully avoided, such suggestions may, of course, provide a cue which is truly informative.

Part II records a number of experiments on subliminal influences. The chief experiments employed tachistoscopic impressions of letters and digits, but peripheral impressions, the effect of corneal reflection, whispering, etc., were also tested. With the Wirth tachistoscope 15,441 experiments were performed with 118 reagents. The exposure time varied from 10σ to 2σ , nearly three quarters being made with exposures of less than 3σ . The results show some cause beyond chance working for right cases with regard to the particular character of an object, but none as regards its general character. On the whole there seems to be some experimental evidence for Bergson's "fringe of perceptions, most often unconscious, but all ready to enter into consciousness, and in fact entering in certain exceptional cases, or in certain predisposed subjects."

Part III deals with mental habit and inductive probability. A number of interesting instances are recorded showing the influence of mental habit, particularly in the choice of numbers as recorded

in census reports upon ages, the terms of criminal sentences, estimates of star magnitudes, the grading of students, etc. The application of these habits of mind in so-called thought-transference shows that human choice is never a matter of unrestricted chance. Such habits often operate to produce what upon superficial view might be regarded as very startling coincidences. A study of inductive probability also indicates that the theoretical laws of chance distributions are an adequate explanation of the empirical distributions. "Within our field of observation there is an indefinite number of series of indefinite length in constant process; the infinitesimally probable events in the aggregate of these various series may be expected to occur frequently."

Part IV records 40,500 experiments in sound assimilation with 107 reagents. It was found that in receiving speech-sounds: words, nonsense syllables and mutilated forms, the mind contributes over 85 per cent. from dictaphone records, over 60 per cent. from telephone and distant air communications, and over 25 per cent. when the sounds are heard directly across a table. The author states that "although our students could satisfactorily understand the communications through the dictaphone, the telephone and the air when the sounds came in their accustomed order, and could record all of the sounds without error, they could not hear definitely enough to identify half of the consonantal sounds through the dictaphone, a third of them through the telephone, and a quarter of them through the air." This points to the invalidity of a person's judgment that he has heard and identified "spirit voices."

Part V. consists of three contributions by Professor Lillien J. Martin, republished in whole or in part from the pages of the *Psychological Review* and the *American Journal of Psychology*. The first is a case of pseudo-prophecy, and refers to a poster suggested by a Stanford geologist which depicted the effect of an earthquake upon the Stanford arch, prior to its actual destruction in the great earthquake. The suggestion is shown to have been based upon the geologist's knowledge of the earthquake rift in that locality. The second paper deals with "local ghosts and the projection of visual imagery," and shows the prevalence of hallucinations among those who project their imagery. The third paper shows involuntary or spontaneous imagery to be a rich source for the study of the subconscious. The method is seemingly of equal value to that of automatic writing. Yet no evidences brought to light in these different ways show the subconscious to be any richer in content than the conscious at the higher level of voluntary control.

Among the appendices, the first gives tables of numerical records; the second records some experiments in long distance thought-transference which failed to bring any results not within the range of chance. In Appendix C grounds for scientific caution in the acceptance of "proof" of thought-transference are discussed. A number of well known experiments in psychical research and their results are critically examined, and the conclusion reached that "technical experience in experimental psychology is requisite both for the control of the experiments and for the interpretation of results." Appendix D is the report of an investigation with a "trumpet medium" undertaken by Dr. Coover for the California Psychical Research Society. Measurements of respiration and pulse beat of the psychic taken during the séances indicated that the "automatic," "trumpet" and "independent" voices all issued from the medium. The occurrence of "telekinetic" phenomena was likewise traced to evasive manipulations made under cover of darkness. It is of some interest to note that despite this apparent duplicity the psychic was seemingly conscientious in her attitude, and welcomed the investigation in disregard of its adverse findings. The final appendix is a catalogue of literature in the library of Leland Stanford University relating directly or indirectly to psychical research. The volume also includes an index of names and subjects.

Taken as a whole this formidable work, with its record of minute and painstaking investigations into a realm which most psychologists refuse to enter, is an achievement not to be underestimated. Although the results are uniformly negative as regards any scientific demonstration of the "occult," they will go a long way to relieve the psychologist of the imputation that his prejudice has blinded him to the existence of "psychical" phenomena. Here are elaborate experiments undertaken with unprejudiced zeal, and a frank desire to find evidences for telepathy and spiritism, if such may be had in scientific terms. The manner in which all these results point to chance variations of a natural order, rather than to external influences of supernatural origin, will be reassuring to many who have felt that possibly they were missing important facts of mentality through lack of a sufficiently sympathetic or receptive atmosphere in their laboratory work. At length we have some evidence that all the conditions of intimate "rapport," both with "normals" and with "sensitives," can be readily induced and tested by the most approved laboratory methods, and yet under

these favorable conditions, the indications of any general or persistent psychical influences were altogether absent.

R. M. OGDEN

CORNELL UNIVERSITY

El Psicoanalisis. HONORIO F. DELGADO. Lima: Sanmarti y Ca, 1919. Pp. 58.

The book contains five chapters consisting of the ontogeny of the sexual instinct and the formation and content of the subconscious according to the psychoanalytic conception, an exposition of the mechanism of neuroses and certain psychoses, the technic of their treatment, a criticism of Freud's doctrines with suggestion for modification, and an interpretation of psychodynamics.

The author is an enthusiastic admirer of psychoanalysis and wrote the book in an attempt to spread a knowledge of it in Spanish-speaking countries. It is a creditable work, comprehensive yet concise, and clearly written. He has read very widely on the subject in several languages, but admits his personal experience is limited to a self analysis. He does not confine himself to Freud's theories alone but includes those of Jung and Adler.

"The labor of the analyst as seen from our point of view," he says, "is to unstrangle the pathogenic emotions, facilitating their different expression through speech and to impede the association of reflexes in antagonistic groups, annulling as much as possible—by the creation of a new synthesis—the source or cause of the intrapsychic discord."

The chapter on psychodynamics is perhaps the most interesting. He follows the French in considering emotion as distinct from sensory processes. Emotions are due to the blocking of sensory impulses, which do not pass on into motor acts. This emotional residuum constitutes the unconscious. Otherwise his views are largely those of behavioristic and objective psychology.

DUDLEY WARD FAY

WASHINGTON, D. C.

THE PSYCHOLOGICAL BULLETIN

A METHOD OF CALCULATING THE PEARSON COEFFICIENT OF CORRELATION WITHOUT THE USE OF DEVIATIONS OR CROSS MULTIPLYING¹

BY J. CROSBY CHAPMAN

Yale University

The cross multiplication of variables in determining the coefficient of correlation is a process in which owing to the variability of sign there is great chance for error. In addition the tables for calculating products of two different numbers are much more laborious to use and more difficult to procure than the tables giving squares. In the following method of determining the correlation the product sum process is avoided by substituting a process in which the tables giving squares can be employed.

Suppose the two variables to be X_2 and X_1 , and let their deviations be as usual x_2 and x_1 : also let it be agreed to write the sum of the variables ($x_1 + x_2$) as x_{1+2} .

Now

$$\Sigma x_{1+2}^2 = \Sigma x_1^2 + \Sigma x_2^2 + 2\Sigma x_1x_2.$$

Substituting for Σx_1x_2

$$r = \frac{\Sigma x_{1+2}^2 - \Sigma x_1^2 - \Sigma x_2^2}{2 \sqrt{\Sigma x_1^2} \sqrt{\Sigma x_2^2}}.$$

Replacing deviations from means by deviations from zero.

$$r = \frac{\Sigma X_{1+2}^2 - \Sigma X_1^2 - \Sigma X_2^2 - \frac{1}{n} \{ (\Sigma X_{1+2})^2 - (\Sigma X_1)^2 - (\Sigma X_2)^2 \}}{2 \sqrt{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n}} \sqrt{\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n}}}.$$

¹ See *A Method of Calculating the Pearson Coefficient of Correlation Without the Use of Deviations*, by L. L. THURSTONE, PSYCHOL. BULL., June 15, 1917.

To determine r the following terms must be calculated?—

$$\begin{array}{lll} \Sigma X_1, & \Sigma X_2, & \Sigma X_{1+2}, \\ (\Sigma X_1)^2, & (\Sigma X_2)^2, & (\Sigma X_{1+2})^2, \\ \Sigma X_1^2, & \Sigma X_2^2, & \Sigma X_{1+2}^2. \end{array}$$

Even though the elimination of the cross multiplication introduces higher figures in the terms X_{1+2} in many cases where the variables are reasonably small and the number of cases are not great, this is more than compensated for by the ease with which squares can be obtained from tables and the simplicity of adding operations with the help of a machine. Furthermore in constructing a machine for correlation the absence of cross multiplication is most desirable.

GENERAL REVIEWS AND SUMMARIES

COMPARISON OF THE SEXES IN MENTAL TRAITS

BY LETA S. HOLLINGWORTH

Teachers College, Columbia University

This review intends to cover work published during the year 1919, and also reports which were published in 1918 too late for inclusion in the review of this topic for that year.

Pressey (4) carefully studied 2,544 school children in three Indiana cities, who were tested by a group scale of intelligence, with the purpose of comparing the sexes in (1) central tendency in either general intelligence or special abilities, and (2) variability in either general intelligence or special abilities. The children ranged in chronological age from 8 through 16 years. The investigator found that girls averaged higher than boys on total score, though their excellence varied somewhat from test to test. On three of the ten tests the boys had a higher average score; the girls excelled on the remaining seven tests. The distributions showed greater variability among the boys in every test, and in total score. The sex difference in variability was far from constant in the various tests, however. Three tests showed little difference. The boys varied more from their mode in the direction of inferiority than in the direction of superiority.

Frasier (1) studied the grade location of all the 13-year-olds found in 20 cities, well scattered over the United States. As a result of his study the investigator states: "It is safe to conclude from the study of 62,219 thirteen-year-old boys and girls in 20 cities, that the greater variability claimed for the boys is not present." Both boys and girls were found at both extremes of the distribution; the numbers at extremes were approximately the same; and the range was the same for both sexes.

Terman (7) has given further data on the frequency of extreme degrees of intelligence, as related to sex. In a systematic search for superior children, conducted in the schools of Alameda and elsewhere, there was found a small proportion of children with I.Q. of more than 110. Of those testing between 110 and 135, there were 19 boys and 30 girls. Two groups of children are reported, having

I.Q. of 140 and over. Of the first group of 45 such children, 32 were boys and 13 were girls. The highest of this group were a boy testing at 184 I.Q., and two boys testing at 174 I.Q. Of the second group of 21 such children, 11 were boys and 10 were girls. The highest of this group were a girl testing at 174 I.Q., and a girl testing at 167 I.Q. Terman stresses the waste of mental ability which comes about through vocational maladjustment, and says, "The waste is probably enormous in the case of women, because of the limited number of vocational opportunities open to them."

Whipple (8) in his experimental study of the education of gifted children has also added to the data on the incidence of extremely high intelligence among school children. Of the superior children selected for his experimental class, the majority were girls. These children were not, however, originally selected by objective test, and it is not clear just how the sexes were finally distributed on the basis of objective measurement. The highest I.Q. found by Whipple was 167, and the child in whom it was found was a girl.

Specht (5) has contributed a distribution of very superior children, by sex and by I.Q. Her data were gathered from a boys' school, the girls being selected with difficulty from neighboring schools, and being permitted to attend the boys' special class. Thus the fact that more boys than girls appear in Specht's distribution may merely reflect these conditions. The maximum extreme of intelligence reported in this group was in the case of a girl with I.Q. 164.

Madison and Sylvester (2) report that among the high-school pupils tested by them with the army Alpha tests, the boys made a very slightly higher median score, grade for grade, than did the girls, although the single highest score made by any pupil was made by a girl. The investigators attribute the differences in medians to the fact that the tests were standardized primarily for males, but they note that it is interesting to find it possible to standardize on one sex a test that will be in any degree fair to the other.

Porteus (3) declares that in standardizing his tests, he found "marked differences in sex performances in the tests. Boys, on the average, are in advance of girls up to and including age 11½. The girls then make a remarkable spurt in development during the next 12 months, and pass the boys." It is at times somewhat difficult to follow Porteus in his presentation, since he often designates as a "spurt" an increment of growth no greater than might be expected as a continuation of the general trend of the curve, allowing for fluctuation due to chance factors.

Starch (6) in his chapter on sex differences, emphasizes the distinction between the popular view and the scientific view; concludes from a survey of the available scientific data that "so far as the native abilities involved in school work are concerned, boys and girls might as well pursue the same courses from the first day of school to the last"; and, in commenting upon the frequently alleged variability of the male, remarks that "the theory seems plausible, but has been proposed rather in advance of a convincingly wide range of experimental data."

The year's work yields nothing consistent as a result of the comparison of the sexes in mental traits. In this respect it resembles the work of other years. Pressey finds that girls excel boys in mental tests at all ages, from 8 to 16 years, inclusive; Porteus finds that boys excel girls at nearly all ages. Pressey finds that boys are more variable than girls; Frasier finds that there are no sex differences in variability. In group after group of superior children, the highest intelligence is found now in a boy, now in a girl. Perhaps the logical conclusion to be reached on the basis of these findings is that the custom of perpetuating this review is no longer profitable, and may as well be abandoned.

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TESTS

BY FRANK N. FREEMAN

University of Chicago

The war, and the large measure of success which was attained with the mental tests of soldiers, has stimulated an enormous amount of activity in the organization of new tests,—particularly group tests,—the further standardization or revision of old tests and the application of tests to the problems of education and of vocational guidance. From a general skepticism in regard to the possibility of making practical use of tests, popular opinion is swinging toward an undue faith in them; and it is to be feared that, unless psychologists are able to generate an attitude of caution, a reaction will follow the disappointment of false hopes.

THEORY AND TECHNIQUE

In the midst of the production of new tests or their application to new problems there is some discussion of technique. This is desirable and we need more of it.

The theory which underlies the type of testing which is being so widely used—testing to discover a candidate's fitness for a job, particularly a complex one—is discussed by Thorndike (59). He points out that variations in the degree or amount of a trait which is requisite for a job may not correspond with proportional variations all along the line in the degree of efficiency in the job. The rise in efficiency may follow any one of a number of curves. Furthermore the individual traits in a complex ability may need to be weighted. But an element may contribute to two or more traits, and in this case it should not be weighted more than once. Finally, the value of traits which are interdependent may need to be multiplied rather than added.

The technique of examining the "efficiency" of a group test is illustrated by Pressey (44). The tests are tried out by giving them to three groups of children already widely differentiated by their social reactions—children in a feeble-minded institution, in a specially advanced class and the ordinary children of a public school. On this basis the whole scale is judged reliable and a shorter scale is selected.

The meaning and validity of the intelligence quotient are discussed by Mateer (29) and by Evans and Castle (10). Miss Mateer has followed 15 institutional cases who were seven years

old and had an I.Q. of .93 to .99 at the first test. Some of these have improved and give promise of becoming normal and others have actually retrograded. The significance of these facts seems to be that neuropathic conditions may produce irregularities in the development of intelligence. Evans and Castle (10) made a horizontal comparison between the kinds of achievement in different kinds of tests of 34 individuals, 15 of whom tested at age (by Yerkes-Bridges scale) and 19 above or below, mostly below. The chronologically older children were in general inferior in these other tests, particularly so in opposites, directions, memory for forms and letter squares. In five simpler tests the difference was slight. The authors conclude that the more complex tests are tests of brightness and the simpler ones tests of maturity. It would be more precise to say that the simpler tests (and also the Yerkes-Bridges) are more largely tests of maturity than the complex.

Methods of rendering tests free of error from coaching or from general or special practice are discussed by Thorndike (58). Among the devices of providing alternative forms, dividing non-coachable tests, introducing confusion questions and comparing individuals' records in coachable and non-coachable parts of tests he prefers the first. He recommends fore-exercise and the use of fairly long tests.

The technique of presentation in the Knox Cube Test was studied by Rachofsky (47), who found that errors were fewer with slower presentation up to 2 sec. per tap.

Maxfield (30) gives formulæ by which one may calculate the number of children who may be expected to attain various mental ages from the application of tests for which we know the number at each age level and the frequency with which each is passed by unselected children. Kohs (21) has devised a convenient slide rule for calculating I. Q's.

STUDIES OF OLD TESTS

A rather elaborate study of a number of tests which had previously been worked out as group tests by Pyle is presented by Pintner (35) in *The Mental Survey*. In view of the many ingenious group tests which are being prepared these earlier tests are undoubtedly superseded, but the methods of organizing the results which Pintner elaborates are very useful.

A comparison of the Binet and Yerkes-Bridges scales with 50 high-grade defectives is reported by Lewis (23) but his results are

not very conclusive. Sunne (51) compared the diagnostic value of the individual tests of the Yerkes-Bridges scale with 550 children, two groups of white and two of colored. Large differences in value were found but they varied with the different groups.

The vocabulary test has been studied by Terman (55) and shown to have a rather surprisingly high diagnostic value (in terms of the Stanford revision), the correlation being .91 for children and .81 for adults, and to be little affected by chronological age as compared with mental age. Foreign speaking children test to age above 12 years of age. Porteus (40) finds that his maze test correlates about .7 with the Binet scores on over 600 children. It appears to measure temperament to some extent and he reports that delinquents are particularly deficient in it. Other details are given.

Studies of memory tests are reported by Gates (12) and by King and Homan (20). Gates presents correlations between immediate and delayed recall, between the tests and teachers' estimates and between memory of sense and nonsense material, among others. King and Homan compare correlations of historical, descriptive and narration material and material of different length.

Moon (31) gives a descriptive summary of age scales.

NEW TESTS

The army tests are referred to in an anonymous article in *Science* (1). The most distinctive feature of the main scale, Scale Alpha, is that it is a group test. The army tests represent a coöperative undertaking. The directing head in the organization of these tests was Yerkes, but many psychologists coöperated with him both officially and unofficially. The point-scale organization has direct relation to Yerkes's previous study with Bridges and Hardwick and to the further refinement of the point-scale method by Otis. The content of the tests is derived from many sources, particularly of Scale Alpha, which includes a very simple directions test, arithmetic reasoning, checking best reasons, opposites, completion of number series, analogies, and information. Scale Beta for illiterates, a non-verbal test, contains a number which had been organized by Thorndike. The Stanford Revision, the Yerkes-Bridges test, the Pintner-Paterson performance scale, the Stenquist test, etc., were used for individual examination. In Scale Alpha each test consists of from ten to forty parts graded in difficulty. The mechanics of the response and of scoring are very simple.

The group tests described by Thorndike (57) may be performed

without the use of language. They include the processes of digit-symbol substitution, completing pictures, picture analogies, easy computation, dividing a surface to correspond to separate figures which may be made to fit it, completing rhythmic series of forms and mixed spatial relations. Ten alternate forms are given and little emphasis is put on speed. Various correlations are given in the report.

A point scale very similar to the army Scale Alpha is published by Otis (32). This is a group scale of ten tests, each composed of a number of similar units. There are two parallel forms and the test is designed for the upper grades. The responses required are very simple and the scoring mechanical. A group point scale designed for the high-school level consisting of ten tests, each of a number of units, is described by S. L. and L. W. Pressey (43). There are several novel tests in the series, as logical selection, moral classification and a new form of practical information test. The authors have also another series of tests which require only the response of crossing out one element, and a primer scale which consists of four tests put in pictorial form. Thurstone at Carnegie Institute of Technology has published a test for high-school graduates in which the arrangement of the units of the different tests is spiral. The easy units of all the tests are placed first, then the next harder units, etc. This makes it unnecessary to time each test separately. Thurstone also publishes a clerical examination. Thorndike's intelligence examination for high school graduates is widely known. Its distinctive features are its length and large number of parts designed to overcome the influence of chance errors, the many parallel forms which are provided and the large variety of kinds of tests which include, beside such as are in the army scales, the elaborate information and reading tests.

A very interesting scale of reasoning problems is given by Burt (5). There are 50 problems, many of them of the syllogistic type, arranged by ages, about six to each age. The problems are located according to median performance. A short scale of 17 problems is also designated. Herring's tests (16) also measure reasoning but break it up into various constituent processes, such as the judgment of the value of problems, of the feasibility of solutions, of the accuracy of definitions, of the clarity of statements, etc. They are designed to comprise scientific thinking. Results are not yet presented.

An elaborate study of age progress and of various correlations

in the case of a series of individual tests not organized into a scale is reported by Bickersteth (3). There are two motor tests (one new), tests of discriminative selection (new), three memory tests, the spot pattern test, a dotting test, a test of divided attention, a completion and an analogies test.

Mateer (28) presents an elaborate study of the conditioned reflex adapted to use with young children and used in conjunction with other tests. She believes that the rate of unlearning is a particularly valuable diagnostic indication, better for some cases than any other test.

A number of individual tests have been standardized. This includes in most cases selection and arrangement of new material, careful determination of the technique of presentation and scoring, and calculation of age norms. The following are included in the bibliography: a picture completion test by Shaw (50); another picture completion test by Lindley (24); a drawing completion test and a revised directions test by Pintner and Toops (38, 39); an opposites test in point-scale form by Greene (14); a false definition test by Gerlach (13); a vocabulary test by Brandenburg (4); and an accuracy of movement test by Beeley (2).

A test based on the judgment of character by associates is reported by Robson (48). Pintner (36) throws some light on judgment by a study of physiognomy by having the intelligence of a number of children judged from their photographs. The median correlation from several groups of judges was about .10.

APPLICATIONS OF TESTS

The group of reports on this topic must be treated very briefly. A number of studies have been made dealing with the use of tests to diagnose the ability required to do the work of the school or the college. A valuable summary of a large amount of study of this problem, made under the direction of Terman, is presented in his *Intelligence of School Children* (52). This book gives an impressive array of facts which indicate that "intelligence," or the sort of thing which is measured by tests, is a very large factor in school success. The studies of Cuneo and Terman (9) and of Proctor (45) are among those summarized by Terman. Miss Race (46) reports the rapid progress of a special class, selected by tests. Toops and Pintner (60) report that the distribution of the test ratings of unemployed men corresponds to the distribution of the grades at which they left school. This, however, does not establish a

correlation. Studies on the college level are reported by Haggerty (15), Hill (17), James (18) and King and McCrory (20).

A second type of application deals with the use of tests to diagnose fitness for a vocation. A considerable measure of success in this type of endeavor is reported by Link (25, 26). Pintner and Toops (37) show that lack of success in general in maintaining a permanent economic independence goes with mental deficiency. Flanders (11) however, found practically no correlation between the I.Q.'s of express clerks and their degree of success. Finally, Luckey (27) found that feeble-minded childrens' improvement in the form board correlated well with their rating in industrial improvement.

A comparatively new type of work is represented in the mental survey of whole communities [Pintner (35), Paterson (33), Pressey (42)]. The practical value of this work is still somewhat an open question.

The hereditary and environmental factors in ability constitute the last type of problem. Kornhauser (22) shows that economic position is related to ability in school work. Pintner (34) shows that siblings are slightly more similar than chance groups. L. W. Pressey (41) studied sex differences and found girls slightly superior, but not in all tests, and boys more variable.

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CORRELATION

BY JAMES BURT MINER

Carnegie Institute of Technology

Interpretation of Correlations.—Godfrey H. Thomson in three papers (49, 50, 51) has made a fundamental contribution to the interpretation of correlations from the psychological point of view. The fallacy of reasoning from hierarchies of coefficients to the necessity of Spearman's general common factor has led him to elaborate his earlier suggestion of group factors into a wider theory for the explanation of the correlations of mental activities. "The mind, in carrying out any activity, such as a mental test, has two levels at which it can operate. The elements of activity at the lower level are entirely specific, but those at the higher level are such that they may come into play in different activities. Any activity is a sample of these elements. The elements are assumed to be additive like dice, and each to act on the 'all or none' principle, not being in fact further divisible" (51). On account of the presence of group factors in mental activities a table of intercorrelations tends to take the form of hierarchy as naturally as a frequency distribution of observations takes the form of the normal probability curve. The hierarchy may be due to the sampling of the elements which make up the variates. In mental testing these are not chance samples of the elements but samples chosen to measure different kinds of activities (49). Contrary to Spearman's contention, a hierarchy is proved not even to indicate that a general common factor is the most probable explanation of the relations found.

Attention is called by Thomson in a note (50) to the fact that correlations may be produced otherwise than by overlap. For example, in a hand at whist the number of hearts in my hand correlates positively with the number of spades in my neighbor's hand, although my hand may contain no spades and his no hearts. This needs to be harmonized with the frequent interpretation accepted by Otis (31) that "a coefficient of correlation between two series of values is a measure of the percentage of elemental causes common to both." Common causes seems to be a different concept from overlapping observable factors. A common fallacy in the interpretation of partial correlations is discussed by Thomson (50) at some length. The difference between a total correlation between x and y , of .50 and the partial coefficient of .30 between x and y when z is kept constant, does not tell the extent to which the

connection between x and y is through z . In the illustration, z may account for the difference of .20, but it may not. He gives several examples from the psychological literature on tests in which wrong deductions of this type have been made and he provides a formula for determining, if the correlations are produced by overlapping, whether the relation must be due to a factor common to the three variates. The papers are quite readable for the non-mathematical reader and the diagrams of the possible relations between elements in an activity do much to make the discussion clear.

It seems to be a notable advance in the use of correlation methods that cautions are being more frequently noted and the limitations of the method more often recognized. Thurstone (56) gives an excellent brief restatement of the meaning and limitations of the correlation methods. Besides the usual cautions, he states that the multiple correlation equation does not express a relationship analogous to that of the volume of a box, in which the volume equals a constant times the height, depth and width. The multiple correlation coefficient expresses only the relation of the dependent variable to factors which can be added together. He believes that the condition in which the combined effect of several independent variables on the dependent variable is additive is one which is rarely found. This limitation upon the methods, he thinks, is more serious than non-linear regressions which can be rectified by algebraic artifices. He advocates the larger use of these methods of rectifying non-linear regression curves. In mentioning possible causes of low coefficients, he does not call attention to one common extraneous influence, namely, the fact that the range of the measurements is often much reduced by reason of the selection of the group measured. This may easily reduce the coefficient so decidedly that it will not express at all the true relationship. Stickland (45) gives evidence for the idea that, from successive trials with the same tests, improvement in ability is a factor in the increase of correlations. The interpretations of intercorrelations in relation to the testing of general ability are referred to later in this summary. In using the Spearman method of correlating differences in ranks several investigators are beginning to realize that large coefficients may rather frequently be obtained merely by chance although there is no real relationship involved. Pintner (35), for example, found empirically that chance arrangements, in ten trials, of 12 photographs correlated with each other from $+.43$ to $-.74$, average $-.08$. Reasoning from coefficients obtained from ranking such

small groups must be with extreme caution, unless the results are repeatedly verified or represent averages of numerous coefficients.

Statistical Method.—Ritchie-Scott (40) provides two new methods which are intended to more satisfactorily determine the correlation coefficient when the frequencies are grouped as they often are in psychology into three classes, such as good, indifferent, bad or present, doubtful, absent, in which the extreme cases can be distinguished leaving a middle group in which discriminations are not made. The new equations give what he terms enneachoric r and polychoric r . He makes a number of concrete comparisons of the new method with other methods of treating correlation tables of more than 2×2 and less than 4×4 cells. The actual differences in the coefficients thus calculated seem quite negligible when one considers the size of the errors that must affect the results from the present inaccuracies of methods of human measurement. Isserlis (20) develops a formula for determining the standard deviation of the multiple correlation coefficient which allows for the fact that this coefficient is essentially positive and its frequency distribution unsymmetrical. Pearson and others (32) give tables for finding the product-moment coefficients of the various orders of the normal correlation surface of two variates. Isserlis (19) and Bergström (3) provide formulas which are briefly stated in the titles of their papers. To utilize these statistical papers, the psychologist would naturally call on the mathematician for assistance. Toops (59) makes useful for the less expert statistical worker methods of constructing charts from which may easily be read off values of a dependent third variable when the common representative values of the two independent variables are known, for example, reading the values of Spearman's rank-difference coefficient when the number of cases and the sum of the squares of the differences are known; also for calculating the effects upon such coefficients of apparently aberrant cases. He also gives an illustration of a method for plotting an equation of the second degree ($y = a \cdot x^2$) in such a manner that not only common values, but any value of x may be used. Otis (31) gives us a method for obtaining, without separate calculations, the correlations of each test with the composite of a group of the tests when the intercorrelations of the tests are known. Adams (1) sets forth step by step a method for computing the Pearson product-moment coefficient which saves effort by both avoiding the attention to algebraic signs and reducing the number of arithmetical computations.

Evaluation of Tests.—In a word of caution, Thorndike (52) speaking of prediction from tests says that “if we placed persons in the first tenth, second tenth, third tenth, etc., of men on the basis of a correlation of .80, we should be wrong seventy-three times out of a hundred.” He means wrong in the sense of getting them into the wrong tenth. The importance of recognizing the large error of prediction, especially with small coefficients, had been emphasized before in those correlation summaries. That correlation has only limited value when problems of fixing a borderline are attacked is clearly brought out by the trade test work in the army and in fixing “critical scores” for indicating students who should be dropped from college as Thurstone (55) suggests. In developing point scales for measuring mental ability it is worth noting that reliability coefficients are rejected by Otis (31) as a means of weighting tests since “such procedure practically implies that all the tests aim to measure the same thing. But since they do not, any weighting to compensate for different degrees of reliability, necessarily also emphasizes the effect of certain particular abilities and is to that extent undesirable.” Fretwell’s study (10) is a model example of testing a test using correlation methods. The value of tests in the Yerkes-Bridges Point Scale is given by correlation by Sunne (46), of the Thorndike, Kansas and Starch reading tests by Starch (44); eleven tests are evaluated by Buckner (4). On this topic one should also see Otis (31), Myers (28), and the correlations of certain tests with teachers estimates or school marks as given by Baum, Litchfield and Washburn (2), Chapman (5), Colvin (7), Haggerty (15), Proctor (38), Terman (47), Thurstone (55), Uhl (60). Evaluation of army tests are given by Yerkes (63) and by Thorndike (53). The relations of age and schooling to test records is evaluated by Jones (21) and by Tildesley (57) using correlation, and by McNally (29) without coefficients. The first differentiates between a “stability index” obtained by the correlations of similar activities after long-time intervals and the ordinary reliability coefficients for tests.

Relations to Heredity and Environment.—Popenoe and Johnson (36) and Starch (43) summarize the correlation work on inheritance of abilities; Miner (26) does the same so far as it bears on delinquency. Gordon (13) and Pintner (34) give correlations of siblings for tested mental ability. Kornhauser (23) gives the association between school advancement and economic success measured by having a home telephone. By partial correlation, Tildesley

(57) found that artistic imagination deteriorated less with age of pupils who studied drawing longer, so that it may be the function of education to prevent deterioration of natural high qualities like artistic capacity rather than to develop them *de novo*.

General and Special Abilities.—Thomson's papers referred to at the beginning of this summary are the most important contribution on the question of a General Common Factor. Otis (31) does not believe that "correlational spread" (McCall's term), the sum of the intercorrelations of a test with others, is as good an indication of the extent to which a test measures general ability as would be obtained from a correlation between the test and a measure of the fitness of the individuals to adapt themselves to new conditions and problems of life, if that criterion were available.

In turning to the use of correlation for the analysis of personality two groups of the references may be grouped into those dealing with abilities in practical life and those dealing with character traits. In the latter group Folsom (9) has given the most interesting study of relations of estimated traits of college students. It is the most comprehensive contribution to this field that the writer knows. He suggests two possible general traits; one represents, the relative strength of objective and subjective appeals, the other is general emotionality and energy. An innovation was tried in tracing the relation of traits to the ranking of certain appeals of advertisements and of subjects of study. It is very suggestive as a method for finding objective data on a person's interests and their relations to estimated traits. Objective records of popularity and athletic achievement, physical and strength measurements were also obtained and the relations to traits determined. Robson (41) made a briefer study of estimated traits; Hull and Montgomery (17) trace the relations of handwriting to character. Correlations used in the study of mathematical ability are dealt with by Rogers (42); mathematics and English, by Tolman (58), and by White, May and Washburn (62); for memory, King and Homan (22) and Gates (11); for visualization, Griffitts (14); for learning, the Colburns and Myers (6), Myers (27), Perrin (33), and Pyle (39); for judgment, Gordon (12); for artistic capacity, Tildesley (57); for variability of performance, Buckner (4). Starch (43) summarizes work in the interrelations of abilities.

Turning to the study of the relation of practical abilities to various tests, the most important study is the relation of tests to the engineering profession in Mann's study for the Carnegie Foundation

(25). From the work in the army we have the relation of test levels to success in occupations as well as to officers' estimates of success in the army, given by Yerkes (63), and by Thorndike (53), and with ability in flying by Henmon (16). Link (24) and Porteus (37) give some correlations with success in industry, Oschrein (30) in retail salesmanship, Thurstone (54) in telegraphy; Flanders (8) finds that clerks in an express office were not selectable by intelligence tests. The relation of juvenile delinquency to mental deficiency was measured and reviewed by Miner (26).

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SPECIAL REVIEW

The Don Quixote of Psychiatry. V. ROBINSON. New York: Historico-Medical Press, 1919. Pp. 339. \$2.00.

In all lines of endeavor there are men of high ideals, broad vision, and great energy, who fail of success because of the lack of that characteristic called common sense. Because of their defect their science, or business, or profession, loses in two ways. The individual is unable to accomplish even a small part of what he attempts and is capable of, and many others engaged in the same kind of work are, without trial and to the detriment of their work, misjudged to be equally unpractical, tactless, and visionary.

The only excuse for reviewing, and recommending, this book in a psychological journal is that it is a study in individual psychology, of a type of man not infrequently encountered in the past. The life it portrays is an example of the inefficiency of brilliancy plus versatility. As neurologist and psychiatrist Clevenger published papers of value in those fields, but he also invented a book-typewriter and a shoe-polishing machine. The book recounts events in Clevenger's life, showing him to be a man who had as correspondents and friends the leading scientific men of his day, and who had opportunities placed in his way, but who, because of intense feelings and what we may euphemistically call an uncompromising scientific attitude, failed to make those adjustments necessary to success. The biographer rightly remarks that "Clevenger could have collaborated with Whistler in writing *The Gentle Art of Making Enemies*."

SHEPHERD IVORY FRANZ

NOTES AND NEWS

RECENTLY there was organized a Division of Anthropology and Psychology of the National Research Council. Eighteen members constitute the Division, divided equally between the two sciences. The following were selected by the Council of the American Psychological Association as representatives of that national society: James R. Angell (University of Chicago), Raymond Dodge (Wesleyan University), Walter D. Scott (Northwestern University), C. E. Seashore (University of Iowa), E. L. Thorndike (Columbia University), and G. M. Whipple (Carnegie Institute of Technology). Professor W. V. Bingham (Carnegie Institute of Technology) was elected chairman for the term ending June 30, 1920. Additional psychological representatives were elected members-at-large as follows: Shepherd I. Franz (Government Hospital for the Insane), Lewis M. Terman (Stanford University), and Margaret F. Washburn (Vassar College). The terms of the psychological members of the Division end as follows: June 30, 1920, Messrs. Scott and Thorndike, and Miss Washburn; June 30, 1921, Messrs. Angell, Dodge, and Franz; June 30, 1922, Messrs. Seashore, Terman, and Whipple. Beyond the present membership in the Division the terms will be three years, each year two members being elected by the American Psychological Association, and one member being selected by the Division as a representative-at-large for psychology. Following are the names and terms of service of the representatives for anthropology: (1920) Messrs. Boas, Hrdlička, and Wissler; (1921) Messrs. Fewkes, Goddard, and Tozzer; (1922) Messrs. Dixon, Kroeber, and Laufer.

THE present number of the BULLETIN has been prepared under the editorial direction of Professor R. S. Woodworth, of Columbia University.

THE September number of the BULLETIN was prepared under the editorial supervision of Professor B. T. Baldwin, of the State University of Iowa.

ANNOUNCEMENT has been made of the following appointments at Harvard University: Professor William McDougall, of Oxford University, is appointed professor of psychology; Professor H. S.

Langfeld is appointed permanent director of the psychological laboratory; Dr. Floyd H. Allport is appointed instructor in psychology.

THE following items have been taken from the press:

DR. R. H. SYLVESTER has been selected as chief of the health center at Des Moines.

DR. MORTON PRINCE, of Boston, has been decorated with the Cross of the Legion of Honor.

ANNOUNCEMENT is made of the death of Dr. C. A. Mercier, well-known for his contributions to psychiatry and psychology.

DR. HERMAN M. ADLER, formerly of Harvard Medical School and the Boston Psychopathic Hospital, has been appointed professor of criminology at the University of Illinois.

PROFESSOR A. E. DAVIES, of Ohio State University, has been appointed professor of philosophy and psychology in Colorado College.

It is proposed to change the present relations of psychology in the A. A. A. S. by having a section of Psychology and Philosophy.

PROFESSOR HARRY WOODBURN CHASE, of the University of North Carolina, has been elected president of that institution.

PROFESSOR FRANK E. MORRIS, of the Connecticut College for Women, has returned to his duties at the college.

DR. GRACE E. BIRD, psychologist at the Rhode Island Normal School, has been appointed professor of educational psychology at the Rhode Island State College.

MISS JOSEPHINE P. SIMRALL, professor of psychology at Sweet Briar College, has accepted the position of dean of women at the State University of Kentucky.

ANNOUNCEMENT is made of the death of Dr. Taizo Nakajima, professor of psychology at Waseda University, Tokio, Japan.

DR. H. O. RUGG, of the University of Chicago, has been appointed educational psychologist at the Lincoln School of Teachers College, Columbia University.

EDITORIAL NOTE

OWING to an error in binding the final two pages of the October number of the BULLETIN were not mailed to subscribers. They will be found in the present issue.

THE PSYCHOLOGICAL BULLETIN

A NOTE ON SOCIAL INHERITANCE

BY HORACE B. ENGLISH

Wellesley College

Social psychologists are coming more and more to realize the importance of social as well as biological inheritance. As well attempt to study man without considering the instinctive bases of his conduct as without considering the influence upon him of the *mores* of his group. Indeed it is only by a genetic study that the social inheritance of the adult is to be distinguished from the biological. Traditional motivations are knit into the texture of our minds with equal firmness to the instinctive or innate, determining thought and conduct with the same certainty and with the same subjective characters of immediacy and self-evidence.

Among the factors in social inheritance, the family name plays an important and neglected part. It is the carrier of family tradition. In almost direct proportion to the fixity of the community, the individual is conscious of his family and of the family characteristics which are his. But which are his family characteristics? Those largely of the male line from which he derives his name.

To be sure, the child is much more with his mother and in a measure with his maternal relatives. Hence of his immediate ancestors, the maternal may well play a preponderating part. Naturally too, where the mother's family is the more distinguished, the child will be taught to regard himself as belonging to the strain of—his mother's father.

I do not mean to underestimate the part played by the mother in the education of the child, nor to deny to her her established position as the conservator of tradition. Just as color-blindness is inherited through the female, evidenced however in the male, so may family tradition, or social inheritances in general, be handed down through the mother. But the mother no less than others is subject to the influence of a persisting family name.

Over how many generations does such influence last? Especially in modern society, the amount of oral tradition is limited by forgetfulness. Herein lies the advantage of the family name as the conservator of family traditions. Whatever other inheritance the father leaves his son, he leaves him his name. About this cluster those parts of family tradition which are most hardy. The individual is thought of and thinks of himself as a Johnson, a Smith, a Warren, as the successor of the long line of those bearing his name. He may have learned from a genealogically inclined mother considerably more of his maternal than of his paternal ancestors. Yet in the absence of very strong contrary influences (which of course are often present) the traditions which will be remembered, preserved, and handed down will be those which cluster about his family name.

In a recent story in *The Atlantic*, the central figure is made to reincarnate in experience and thoughts one of his ancestors.¹ With the theory of inheritance thus implied we need not trouble ourselves, since the author would doubtless disclaim any intention of presenting a serious scientific position. But his choice of an ancestor to be reincarnated is significant—it was one whose name the hero bore.

It is not alone that the individual is thus one-sidedly aware of his family tradition. In the *Education of Henry Adams* is revealed, somewhat pathetically, the pressure exercised upon one's life by bearing an historic name. Surely it is not unfair to urge that the importance of the Adams family in American life is due, not solely to inherited ability (i.e., biologically inherited ability) but to the popular ascription to them of traditional Adams ability. Each is in his turn "The Adams" or at least "An Adams" as truly as the head of a Scotch sept is "The MacGregor." Descendents on the female line are not Adamses; they are merely descended from John Adams.

No doubt this is an extreme case, yet one which serves to throw into clear light, a tendency to which we are all in greater or less degree subject. Primogeniture and inheritance of property exclusively by males has practically died out but in large measure our social inheritance is dominated by the family name; in even larger measure is what we shall transmit thus dominated. The increasing activity of women in the life of the community may be expected to modify this to a certain extent, but so long as that is the source of his name, every child will be in a peculiar sense the son of his father. Words yet exercise, even in modern society, their wonder working, magic power, and of all words none is so potent as *The Name*.

¹ WILSON FOLLETT. The Div. *Atlantic Mon.*, Dec., 1919.

GENERAL REVIEW AND SUMMARY

INSTINCT, IMITATION, PLAY

BY E. N. HENDERSON

Adelphi College

The study of instinct in recent years may be said to have followed four general lines: (1) Attempts to analyze instinctive activities and to develop a mechanical or psychological theory to explain them; (2) proposed classifications of instincts; (3) studies of particular instincts in man and the brutes; (4) comparison of the relative strength of the various instincts.

1. Swindle (19) analyzes the nest-building activities of birds into an interplay of "instinct groups." Instinct groups are defined as "series of innately associated activities of an organism." The instinct group thus affords the unit, and it is comparatively invariable in nature. Such an activity as nest-building, however, Swindle finds to be far from unvarying. On the contrary, it involves a great number of movements which, though instinctive, are frequently ill adapted to the situation as a whole. Each instinct group may be in itself suggested by the appropriate stimulus, but the successive groups are not coördinated in an economical and efficient manner. Material brought to the nests may be dropped and not recovered. Nests may be left half built. Even outside the mating season birds may partially build nests. Multiple nests may be constructed, as fast as one is completed another being begun. Good nest builders have greater "excess of useful over useless movements" than poor ones. Further, Swindle (20) finds in the activity of peristalsis a basis for the instinct group, which in this connection he defines as "a number of qualitatively very similar movements which are innately associated and which accordingly induce or condition one another in the particular temporal order in which they occur." Such a group maintains its identity in different environments because it occurred more frequently as a whole than as fragments of a whole. It may thus be transferred from one situation to another, appearing in a variety of complexes. The method of the raven in cleaning its beak was probably, Swindle (18) thinks, transferred from the method and rhythm of tugging and

jerking the beak to right and left when it is tearing the flesh from the body of its prey.

Bock (1) makes a study of what happens when his subjects beat out certain rhythms under the control of marginal attention. The beats fall in groups. The numbers of beats in the larger groups are multiples of those in the smaller ones, or they are related to each other as are small integers. A similar relation holds among the tempos of the different beatings. However, the tempos and the number of the beats in the groups vary independently. Instinctive activities similarly involve, Bock thinks, two variables, while reflexes involve only one.

These studies may be said to be concerned in the mechanical analysis of the instinctive activity. Craig (4), on the other hand, emphasizes the importance of an inner psychical factor, appetite or aversion, in guiding the progress of the instinctive activity. In consequence of this guidance it is not merely a chain reflex. Appetites or aversions are satisfied by final consummatory reactions. Such consummatory reactions may be provoked by the intensity of the appetites in conditions where they can not successfully be completed. Thus one may start eating movements from hunger though food be absent. In that event the consummatory reaction will be only half executed, but its initiation is evidence that the instinctive activity is not, like the reflex, purely under external control. Inner control rather than mere chance "excess of useful over useless movements" as suggested by Swindle may lie back of successful nest building.

Internal control of combinations of instinct groups is obviously, however, far from being conscious of its ends, or even a steady and certain influence toward realizing them. Such revealing experiments as those of Fabre (8) bring out the blindness of the insect in following the suggestions that provoke the successive reflexes which make up instinctive activity. The caterpillar known as the pine processionary follows the leader by picking up the trail of thread left by it. Thus they travel in processions. Such a procession was noted by Fabre to get started about the rim of a palm vase. When the circuit was completed the leader encountered the original trail and became a follower of it. Thus the procession was started on an endless path. For days it kept on the circuit though at times frost and hunger threatened to disintegrate the procession. It is notable that the stimulus of a warm day rather than the discouragement of cold and hunger ultimately provoked a

more daring spirit and a wandering from the circle so long pursued. The burying beetles, thought by some to possess a power of dealing with new situations approximating nearly to reasoning, are shown by Fabre's experiments to be confined pretty closely to purely reflex responses to a narrow range of stimuli.

2. In reference to the classification of instincts Watson and Morgan (23) hold that, while Thorndike is "too prodigal in his list of original reactions, Freud is too parsimonious." The Freudians put sex instinct in the dominant position. Watson and Morgan would make fear and rage equally important. They distinguish four original stimuli of fear and seven native reactions to it. For rage they discover only one natural stimulus and five or six reactions. All other seeming reflexes except those of love they regard as conditioned reflexes—*i.e.*, reflexes aroused not by their original stimuli but by conditions associated with these. Thus the larger part of the great list of original instinctive reactions suggested by Thorndike they regard as developed by education. Similarly Burnham (3) lays great stress on the conditioned reflexes. That the natural reflexes should be brought under the control of the proper stimuli, and that they should not be aroused where they are not in place he holds to be a prime condition of mental health. The ability to form conditioned reflexes is a good test of intelligence and the proper control of them a leading aim in education.

The importance of recognizing the various instinctive tendencies and of determining their consequences and their force is apparent when we deal with any practical phase of life where the drive of these tendencies constitutes the cause with which we have to deal. Hence applied psychology, whether it treats of pathological, legal, commercial and industrial, or educational problems, must needs distinguish the instincts and how they can be utilized and controlled for the better realization of the ends it has in view. Thus Hollingworth and Poffenberger (12), Strayer and Norsworthy, (17) Gordon (11), and Freeman (9) give us classifications of original tendencies and formulate views in regard to them which get their bias from the problems which these writers are concerned in solving. All agree with Thorndike that it is in the interest of clarity to substitute for older classifications of instincts a detailed list of the original sensori-motor reactions which a species can make, yet all, either with apologies for the imperfection of our knowledge, or, perhaps, with some attempt at justification of their procedure go on to give lists of instincts of the old-fashioned sort. Strayer and

Norsworthy, while not attempting to give a catalogue of all the native tendencies, distinguish a number of special importance in education. These are the tendencies to physical and mental activity, manipulation, collecting, rivalry, fighting, gregariousness, motherliness, kindliness, approval and scorn. Gordon adds sleep to the list of instinctive tendencies, and treats as of special importance in education fear, collecting and play. Freeman distinguishes between life-preservative instincts—including feeding, defense, mating, home-building and care of young—and secondary instinctive activities which are of special educational value. These are play, which includes manipulation, curiosity and social responses. The latter comprise imitation, competition, social coöperation and the like. Out from these secondary instinctive activities grow the social, artistic and intellectual impulses which make up the motives of the educated man. Later these are supplemented by the vocational impulses which are fostered by the contact of youth with adult life.

Any one dealing with any aspect of dynamic psychology finds it not only convenient but necessary to group instinctive activities in these larger classifications based upon their functions. This is because the transformations which the teacher, the psychiatrist or the salesman wishes to make consist in breaking up original sensori-motor connections and the formation of new conditioned reflexes and habits. The motives that guide the process must be found within the one subjected to it. They are instincts, cravings, or fears, the appetites or aversions of Craig, the second variable of Bock. The significance of these may be vague or clear to their possessor, yet none the less they constitute a controlling force over him. They are the internal factor which prompts the instinctive act and without which, as Jennings long ago demonstrated, the incitement of the external stimulus would ordinarily be of no avail. When instinctive reactions to these cravings fail, new ones are sought. When we have analyzed the inherited behavior of the individual into an enormous number of specific sensori-motor reactions, there remains the study of the inner demands which these activities satisfy. Such functional cravings constitute the guidance to the process of learning. The observations of Swindle on nest-building show that this guidance may be very fitful and may be upset by external distractions very easily. Yet its presence would seem the only explanation of that "excess of useful over useless reactions" which we can scarcely ascribe merely to chance.

On this matter Freeman's view is of interest. He holds that we may gain from classifying together all the forms of activity that gain a common end. His reason therefor is in part because they "come to be classed together more or less closely in the mind of the person who acts, when he becomes conscious of the goal which is unconsciously aimed at in the simple, mechanical, instinctive responses." If this end is "unconsciously *aimed at*," it plainly guides the process by which the apparently mechanical activities of original nature are transformed into the consciously adaptive activities of the trained adult.

Another interesting characteristic of the treatment of original nature on the part of those interested in applications of psychology is their tendency to follow Woodworth in recognizing the capacities of sensation, attention, memory, muscular activity and the like as themselves a source of "drive" akin to what we have called the instincts. It is instinctive to crave to use any power one may possess, and education flourishes because of this source of energy.

Finally, on the question of classification we may note Warren's (22) preliminary outline of an arrangement to be later used in a book on *Human Psychology*. He attempts a complete catalogue to human reflexes, instincts, instinctive tendencies, emotions, and dispositions. The reflexes are classified from the point of view of presence or absence of control by experience. The instincts are divided into nutritive, reproductive, defensive, aggressive and social. The emotions and dispositions are similarly classified, except that for nutritive is substituted expressive, and a sixth special class added in each case. The instinctive tendencies include play, imitation, curiosity, dextrality, esthetic expression and communication. The author offers his table for criticism.

3. Among special instincts that have been treated we find most attention paid to fear. According to Bonnier (2) fear, which is the instinct of preservation, is merely an outgrowth of the striving to last which is the essence of living matter. From this primal tendency, as life becomes individuated, springs the fear of individual death, involving the distinction between undying spirit and matter which is subject to change. The fear of individual death is, however, somewhat pathological, since the individual is by nature mortal, and living matter as such alone undying. Similarly phobias develop in reference to various organic functions of the individual. Freud (10) looks upon the hostility to death as springing from resentment at the death of kindred, since we can not imagine our own

extinction. To compensate for the fact of death we develop the idea of spirit, which is supposed not to die. However, in the future life spirit may suffer worse than in this. Hence to kill is felt to involve blood guilt. Civilization thus cloaks over the fact of death in others, and we refrain from speaking or even thinking of it. War removes these restraints. We kill without sense of blood guilt and familiarly talk and think of death. Dupuis (7) attacks the view of Dugas, Nietzsche and others that bashfulness springs from a desire for more complete sympathy, and maintains that it is a form of fear, especially fear of ridicule.

The great war has provoked much discussion of herd instincts. Trotter (21) analyses all instincts into four groups. Three are pre-social—self-preservation, nutrition and sex. The other, gregariousness, evolves with society. Herd life favors the gregarious individual, who displays homogeneity with his fellows, who is more insensitive to experience than he is to group opinion, and who is hostile to all opposition to the herd tendency. However, the opposition of herd interests to the earlier instincts and also the progress of intelligence create conflicts. There are two classes of men with reference to these conflicts. One, the mentally stable, reconcile themselves with the herd life by ignoring or explaining away all opposing considerations. The other, more unstable, are skeptical about herd suggestions. Our society is governed by the mentally stable. The unstable, however, while less forceful, are more adaptable, and the herd should find some way of utilizing their sensitivity to conflicts without driving them into extreme and helpless opposition. Thus only can stagnation be avoided. The social habit in man is still very imperfect—indeed, grossly inefficient. War, so far from being biologically necessary, prevents progress by destroying the numbers and the variations which are indispensable to progress. Three types of herd life exist, the defensive herd, the aggressive herd, and the socialized herd. Germany is an aggressive wolf-like herd—not an enduring kind. England tends more to the socialized bee-like type, which if properly developed has promise for the future.

Howerth (14) like Trotter sees in patriotism an instinctive herd emotion which leads nations to unite in the presence of danger. Herds are kept together by instinct rather than by reason. They are susceptible to suggestion and are docile in the hands of leaders. In the great war all nations showed the herd characteristics, although there were individual differences—Germany, for example, being

dominated by militarism. The only basis for world unity Howerth finds in reason rather than instinct.

Mrs. Hollingworth (13) contributes an interesting study of the bearing of echolalia in idiots upon instinctive imitation. It has been contended by some, notably Thorndike, that the sensori-motor association involved in imitation is probably acquired, not inborn. In echolalia the patient does not answer words addressed to him but repeats them. Such echoing may persist in spite of punishment. Hence, Mrs. Hollingworth surmises, it may be due to inborn auditory-motor associations which remain strong in the idiot even when education does its best to root them out. Barr's imbecile could echo words in nine different languages with none of which he was familiar. The unlikelihood that the associations that lead to echolalia are acquired is strong evidence for instinctive imitation.

(4) When we consider the importance of the instincts as affording the "drive" in mental life we may expect that the new applied or dynamic psychology should be interested not only in analyzing out these sources of energy, but also in measuring their force. Moore (15) essays the task of finding their relative strength. He declares that current tests of mental ability are not a proper measure of the efficiency of the individual because they study only power of discrimination, memory, reasoning and the like, and neglect the instinctive forces which are quite as important a factor in achievement. To measure the strength of the instincts he uses the methods of association and distraction. Taking ten of the instincts in McDougall's catalogue he compiles lists of words relating to each. These words are used as cues in association tests, and the relative strength of the various instincts is determined from both the character of the words that are suggested and the reaction times. In the distraction experiments (16) problems are set and the distracting effects upon their solution of stimuli exciting fear, anger, embarrassment, sex interest, and repulsion are estimated. The relative effect of these various stimuli as distractions was in the order in which they have just been enumerated. Individual differences were greatest in reference to anger and embarrassment and least with sex interest and repulsion.

On the subject of play Curtis (6) has gathered together the experience of many years in a book characterized mainly by its excellent discussions of the ways in which play can be utilized in education. The rise of the play-ground movement is sketched and

explained. Five play movements are distinguished: (1) to provide play-grounds, particularly for city children; (2) to introduce organized play as a regular feature of school life, as in the Gary system; (3) to afford adequate opportunities for out of door play for children below school age; (4) to give the public generally more opportunity for free recreation; (5) to develop a wholesome play spirit among the people.

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SPECIAL REVIEWS

Logic. BENEDETTO GROCE (Trans. by Douglas Ainslie.) New York: Macmillan, 1917. Pp. xxxiii + 606. \$3.50.

This book forms the third volume in Groce's *Philosophy of the Spirit*, the *Æsthetic* and the *Philosophy of the Practical* having preceded it. In the opinion of the translator "this Logic will come to be recognized as a masterpiece, in the sense that it supplants and supersedes all Logics that have gone before, especially those known as formal Logics. . . . Indeed, one of the chief boons conferred by this book will be the freeing of the student from that confusion of thought and word that is the essence of all formal Logic."

This book is not a text in logic for the undergraduate but a critique of logic for the mature student of philosophy. Logic is defined as the science of the pure concept, and by the pure concept is meant a universal idea, or a true generalization. The treatment is inexcusably abstract, yet, in spite of this defect, the merits of the book are so great that no student of philosophy can afford to overlook it. Groce has already entrenched himself in the front lines of philosophical thought and this book materially strengthens his position.

W. C. RUEDIGER

GEORGE WASHINGTON UNIVERSITY

Schriften zur Anpassungstheorie des Empfindungsvorganges. Erstes Heft: Hypothesenfreie Theorie der Gegenfarben. J. PIKLER. Leipzig: Barth, 1919. Pp. viii + 104.

This volume is one of a series of writings which offer a restatement of the entire theory of sensation in terms of modes of active adjustment (*Anpassung*) of the organism to stimulus situations, replacing the current interpretation of sensation as a passive consequence of "excitation." The conceptions which are employed are of a general, psycho-biological nature, but probably are best regarded as referring to central nervous processes. The reasoning is always ingenious but seldom convincing, since it completely neglects the data of modern nerve physiology and draws but little

upon established principles of psychology. This work upon the visual sensations would have been a great credit to Plato or even to Aristotle, but is only partly comprehensible to a twentieth century reader, and especially to a non-Teutonic one. Nevertheless, the patient student may find it suggestive of defects in our present view of the mechanism of sensation.

The first part of the book deals with the *achromatic visual qualities*. Hering's notion that different members of the gray series consist of fusions in various proportions of two components, black and white, is rejected and replaced by the idea of an algebraic quality scale—with a natural reference point at the mid-gray—involving a single variable, increments of which are expressed as whiteness or brightness and decrements as blackness or darkness. The degree of brightness or darkness of any achromatic quality is correctly designated as the difference between it and the mid-gray. Darkness is not a mere absence of visual sensation although it demands a cessation of the activity which is responsible for brightness.

Hering's theory of the physiological basis of the grays in various proportions of concomitant anabolic and catabolic change is found not to be consistent with the qualitative unity of the gray series, thus indicated. Instead, we must regard the achromatic sensations as the psychical counterparts of a series of graded adjustments of the organism to a set of stimuli which threaten, with progressively varying forces, to disturb its poise. All sensations are attributable to specific adjustments of this sort, which have as their absolute starting point the condition of *sleep*, with respect to which condition they depart by the development of various degrees of tension (*Anspannung*) and towards which they return by a process of relaxation (*Entspannung*). Any waking state involves a definite adjustment tension in this sense, and in the case of vision the normal waking tension is high, since the retinas are constantly subject to stimulation. This normal visual tension corresponds with our consciousness of the general level of illumination, and forms a secondary reference standard with respect to which temporary or local stimulus intensities are evaluated. It is the relaxation from this dominant adjustment which arouses the sensation of darkness as a positive experience. Local "corrections" of the same adjustment, either by increase or decrease of tension, account for the awareness of the specially light and dark regions of space which constitute achromatic visual objects, or local variations in illumina-

tion. The application of this theory to vision is compared with that to other departments of sensation.

According to Pikler, adaptation (in the usual sense) to different levels of brightness or illumination is not to be attributed to changes in the excitability of the retina, but to a shifting in position of the secondary reference standard, with respect to which "correcting" adjustments are made. Sometimes this shift results merely from expectation and precedes objective changes in illumination. Complete dark adaptation involves a return to the absolute zero of visual "tension" as a reference point. Analogous effects are found not only in other departments of sensation but in phenomena of perception. The results of Piper's experiments on monocular adaptation and binocular summation of brightness under various conditions of adaptation are explained by supposing that there can be different reference standards for the two eyes, and that the central nervous system neglects a blindfolded eye in brightness but not in darkness adaptation. The quality of the reference standard is attached to the space which intervenes between the eye and any object, objects being seen as bright or dark according to their relation with the brightness of space. This explains the approximate constancy of visual objects in changing illuminations, a fact not adequately accounted for by previously propounded views, such as those of Helmholtz, Hering, Jaensch, and Katz, which are criticized.

Simultaneous contrast is explained as a further result of changes in the reference standard, since this latter tends to correspond with the *average* brightness of the visual field. The introduction of a bright contrast area raises the standard, thus depressing relatively a darker, constant area. The positive after-image is due to inertia of the adjustment activity of the organism, and the negative after-image to an over-shooting of this process, both effects being expressive of the truth that sensation is due not to the stimulus itself but to an intrinsic vital action. The "fatigue" theory of the negative after-image is inconsistent with the phenomenon of its oscillation with the positive image. Simultaneous induction is attributed to the lapse of local "corrections" of adjustment—with respect to the reference standard—under conditions of difficult vision. *Nahe-, Grenz-, and Umgebungscontrast* are due to an exaggeration of adjacent "corrections," at boundaries where they would otherwise tend to neutralize one another. The idio-retinal light, seen in the absence of any stimulus, represents a very low level of adjustment

tension of the visual system, which is unstable because it has no actual function. In comparison with the deep black derived from over-shooting or contrast processes it has a false brightness. The organism readily produces erroneous adjustments, when stimulus conditions are ambiguous or its own mechanisms disordered.

A brief review is given at this point of some of the fundamental conceptions of Pikler's general psycho-physical theory. The state of sleep, the absolute reference point of all "adjustments," is in itself an adjustment to the absence of all stimuli. Departure from this state is due to a waking instinct (*Wachtrieb*), which hungers for stimuli with respect to which to make adjustments. Prolonged deprivation of sleep however results in aberrations of perception attributable to a cumulative loss of direction of the adjustment activities, which are reoriented by the sleeping state. In sleep the Ego shrinks within itself and becomes reacquainted with its own nature!

The second part of the book discusses the *chromatic visual qualities*. The chromatic aspects of vision are attributed to specific conflicts between two simultaneously operative adjustment tendencies. Esthetic analogies are employed to show that a single stimulus may call forth inconsistent tendencies which result in a compromise form of consciousness exhibiting a new quality. The organism overcomes the erroneous tendency, but this *Ueberwindung* is reflected in the nature of the resulting sensation. In the case of color vision the conflicting impulses result from separate reactions to the *frequency* and the *intensity* of the stimulus. The high intensity of the "yellow" spectral rays makes for white, but their low frequency suggests black. Similarly, the low intensity of the "blue" rays indicates black but their high frequency suggests white. Yellow thus becomes a chromatic white while blue is a chromatic black, and the internal conflicts which are responsible for their chromaticities are opposite in direction. Similarly, red and green are chromatic grays, the former with a resisted tendency towards black and the latter with a resisted tendency in the direction of white.

An experimental verification of this fantastic, although ingenious, theory is sought in such phenomena as "Fechner's colors," in which appropriate pairs of achromatic stimuli are arranged so as to "conflict" with one another. Pikler finds that the colors thus produced are in harmony with his views; black followed by white gives yellow and *vice versa* blue, while black followed by gray yields

red and *vice versa* green. The familiar "*farbige Abklingen der Nachbilder*" is also used as evidence, together with color effects resulting from strong simultaneous achromatic contrasts.

The complementary or opponent relations of yellow to blue, and of red to green are easily accounted for by the above theory, since the resisted, internal tendencies of these color pairs—which are alone responsible for their chromaticity—are opposite in direction, and hence neutralize each other. This neutralization may be only partial, yielding intermediate tones or unsaturated colors. The relations of the theory to three-color mixture phenomena and to the doctrine of "color quality" as defended by Stumpf are discussed. Color blindness is a consequence of the total or partial inability to resist (*ueberwinden*) the impulses to specific kinds of achromatic vision aroused by stimulus frequencies, the low frequencies tending to produce black or darkness and the high ones white or brightness. Similar considerations apply to the color blindness of the retinal rods and the periphery of the visual field. In partial color blindness the red and green drop out before the blue and yellow because the conflict processes in the former pair are less violent than in the latter. Phenomena of chromatic contrast are explained along lines similar to those applied to achromatic contrast.

The reviewer is confident that the above brief summary provides as thorough a knowledge of Pikler's "hypothesis-free" theory of the visual process as any serious student of these problems will find useful.

LEONARD THOMPSON TROLAND

HARVARD UNIVERSITY

The Autonomic Functions and the Personality. EDWARD J. KEMPF.
Washington: Nerv. & Ment. Dis. Publ. Co., 1918. P. 151. \$2.00.

Dr. Kempf has set forth in this book a theory of the biological entity as an organism that develops and functions for one purpose only—to preserve and prolong, in the most satisfying manner possible, its existence, either in its own body or projected into its offspring.

The great contribution of his work is the assigning to the autonomic nervous system the chief rôle in the life and development of that which we call an individual or a personality. This, and not the brain, dominates the organism. It is from affective states primarily arising in the autonomic system that all distinctive behavior, normal or pathological, arises. The upholders of the "Soul" in

psychology might imagine that the author took a malicious pleasure in bringing the seat of the unrest which is the source of action down among the humblest of the body's organs. Psychological data are brought forward to demonstrate the dominance of the autonomic system in all integrative action, and to support the theory that emotions, those fundamental urges to action, have a "peripheral origin in the autonomic functions," that is, the emotion, as one is aware of it, is an awareness (in some cases not a full conscious awareness) of disturbances in various visceral segments, these disturbances being constituted by changes of the muscular activities, particularly changes in the tensions of the viscera which stimulate local sense organs. On this simple theory of postural tonus of muscles, or visceral tension which is always being modified by the action of peripheral stimuli, and being restored, or neutralized, by procurement of counter-stimuli, the whole of human behavior is built up. The discussion of the influence of these affective functions, cravings or emotions, upon behavior forms a major and a most interesting portion of the work. It is believed that there is no such thing as absence of an affective state, and that all affective processes are always characterized by acquisitive tendencies toward certain stimuli and avertive tendencies toward other stimuli. Out of this ambivalent relationship toward the environment, creating an ambitendency in the organism, arise conflict and repression, the phenomena described by Freud and here given a physiological basis. In the light of the theory that makes visceral tensions the originators of both emotions and actions the unconscious finds a natural and legitimate place in psychology. The trends of the personality, the moods, affects, or emotions are the result of the autonomic pressure for satisfaction of the organic needs. Character is the final result of the various compromises, more or less successful, which are struck in the general tendency of the several organic needs to find a balanced, integrated, expression.

The fundamental contentions of the book, which are the priority of the autonomic system, the peripheral origin of the emotions, and the physiological explanation of all psychological phenomena by the concept of visceral tensions constituting cravings and their readjustment, will certainly not pass unchallenged. It may be said that we do not know enough of neurology yet, and certainly not of endocrinology, to grant to the autonomic system all the functions claimed for it. We may find it difficult to conceive of its all-sufficiency in our more complex functionings. Kempf offers his

conception as a working theory and the attempt to apply it, well worth while, will expose its weaknesses in time. If it leaves many moot points of psychology still unsolved, it at least presents a most stimulating conception, which those who deal directly with problems of human psychology, whether in psychopathology and psychiatry, or in the psychological laboratory, may take as a working basis, to build upon and re-cast as new knowledge is added.

L. DOOLEY

ST. ELIZABETHS HOSPITAL,
WASHINGTON, D. C.

The Erotic Motive in Literature. A. MORDELL. New York: Boni & Liveright, 1919. Pp. v + 250.

Besides the introduction and the conclusion, this book contains sixteen chapters, devoted to the psychoanalysis of various authors from Homer to Kipling. Special chapters are devoted to the analysis of Keats, Shelley, Poe, and Hearn. In several chapters Freud's views and explanations are discussed, and in the introduction the author proclaims his allegiance to Freud rather than to Adler, Jung, and others, who do not adhere to strict Freudian interpretations. The term "unconscious," we are told, is almost synonymous with "erotic." Other authors use "sexual" where Mordell uses "erotic," the former term being used when there is no necessary sex object, while "erotic" is a term of special sex appeal. Those who are acquainted with the specific or the general trends of psychoanalysis do not need detailed accounts of the contents of the book, others are referred to it as an introduction to, or as a primer of, the Freudian doctrines and methods of interpretation. Psychoanalysis is based upon the assumption of the transmission of acquired characteristics.

Every book, he claims, is planned because of the "erotic" of the author, and the only part that shows conscious traces is the composition. As a criticism and review, we might use the method of psychoanalysis upon his own work. By the application of fixed symbolism and a liberal use of "I think" we may refer the book to the unconscious (or the erotic) wishes of the author, for of all books he says "the very choice of the subject apart from the internal treatment furnishes the proof he [the author] could not help but choose that which interested him most because of some experience in his own life." Moreover, we might be forced to interpret Mordell's statement that he can psychoanalyze all literary works

as an example of a "conscious" feeling of superiority acting as a compensation for a real inferiority, the nature of which the reviewer has not time to determine analytically, and about which he hesitates to speculate.

SHEPHERD IVORY FRANZ

Psychic Tendencies of To-Day. A. W. MARTIN. New York: Appleton, 1918. Pp. viii + 161.

The author, a clergyman, points out that he is not an adherent of any of the current cults or occultism, but without formal recognition of Freud's teachings and explanations of the psychopathology of everyday life, he adopts the latter mode of explanation of many of the conditions with which he deals. Compensation is one of the principles he uses. Tolerance indicates "a certain offensive superiority," only a part of our mental life "gets completely rationalized," and of a critic of one of the cults with which the author deals he says the heated terms used describe the critic's "own irritation, impotence and unworthiness."

New Thought is dealt with in a chapter in which there is also some consideration of Christian Science. Each of these movements is shown to be exclusive. Each is the know-all and the be-all. Their adherents are "simply extremists, people who in their reaction from that limited medical science of sixty years ago, which disregarded the power of mind, have gone over to the opposite extreme." Martin would not have these cults legislated out of existence, for he considers that we do not know everything. What has been proven should guide our conduct, and we should, for examples, resort to the reporting of infectious diseases, to the killing of rats to prevent plague, and to the extermination of mosquitoes. So long as the mental scientists do not kill people, and do not retard the efforts to healthful living they are harmless in most particulars, and in a few particulars they are valuable antidotes to a strict materialism. The reaction against materialism is what has given force to the occultism of certain types now rampant. "Sir Oliver Lodge and the Objective evidence for Life After Death" is thus explained, and we are advised to suspend judgment in the matter by the conclusion that "it may be that with fuller investigation of (a) the medium's mind and (b) the mind of the sitter, of (c) thought-transference, of (d) subliminal activity, that the spiritistic hypothesis will prove superfluous." The final chapter of the book, *Modern Materialism and Rebirth of the Immortal Hope*, is largely a thrust at crass materialism and an exposition and advocacy of sane ethics.

The book should do much to make a certain class of the thinking public take a better view of some of the vagaries of the present moment, but to the adherents of special cults it will doubtless have little appeal.

SHEPHERD IVORY FRANZ

Vegetative Neurology. HEINRICH HIGIER. (Trans. by W. M. Kraus.) New York: Nerv. & Ment. Dis. Publ. Co., 1919. Pp. vii + 144.

The sub-title of this monograph is "The Anatomy, Physiology, Pharmacodynamics and Pathology of the Sympathetic and Autonomic Nervous Systems," which gives a better idea of the contents than the general title. The diversity of topics makes it impossible to give an abstract of the book, but in general it may be said that it contains much that should interest the psychologist who has leaning towards physiological explanations, or concomitant observations, of mental things. The part played by the sympathetic nervous system, or preferably the whole autonomic system, in the activities of the individual is very large. This system has not until recently received the attention it deserves, in its effects upon the modification of behavior, but with the allied endocrine organs we know that it is a determinant in emotional states and in emotional expression. Many so-called mental disturbances are now being understood to be dependent upon, if not caused by, deficiencies or exaggerations of activity of the glands of internal secretion and of the sympathetic system. Many can be "cured" by overcoming the disturbances of function.

About 300 titles are noted in the bibliography. Two of these are in English, and two are in French. The remainder do not indicate the predominance of the German mind in this field, but probably only the feeling of nationality of the author.

SHEPHERD IVORY FRANZ

Achievement Examination in Reading. (Sigma I For grades 1-3.)
An Intelligence Examination. (Delta I—For grades 1-3,
Delta II—For grades 3-9.) M. E. HAGGERTY. Yonkers-on-Hudson: World Book Company.

This publication comprises three tests which Haggerty has devised and which were used in the State Survey of Virginia. As indicated in the titles, the first test is primarily a test of reading, and the second and third of intelligence. Delta I is a simplification

of the army test for the lower grades and Delta II is an adaption of the army test for intermediate and upper grades. The tests are all group tests and are accompanied by a full manual of direction and by scoring sheets. They are carefully worked out and constitute as well developed group tests as are available. The price of each test is approximately six cents per pupil, with a little in addition for scoring keys. A few more detailed comments by way of criticism may be made.

There are in the judgment of the writer somewhat too large a number of the *yes and no* type of test. Such a test, of course, can be passed with a score of fifty per cent. by mere guessing. It is, therefore, necessary to make a deduction from the score for errors. The formula for the scores of such tests is *rights minus errors*. This assumes that all errors are of the same sort and it practically results in a good many cases in negative scores. Another detailed aspect of the tests which might be further refined consists in the relative weight of the individual tests in a composite test. Each individual test has a maximum score determined by the number of parts. In Delta I, one test has ten parts and another forty-eight. This gives the latter test about five times the weight of the former. In Delta II the extremes are sixteen and forty. While it may be difficult to prove that the equalization of such differences would give a more reliable score, it would be theoretically preferable to equalize the scores of the different tests. Testing experience has shown that the refinement of technique has improved the reliability of the tests in general. It, therefore, seems worth while even at the cost of a little additional labor to adopt the theoretically best technique.

In Sigma I there is a general criticism which applies to a number of the questions as, for example, numbers 11, 13, 14, 17, and 18. The answers to these questions could readily be guessed by the child from the picture without reading the text. For example, above question 11 is a picture of a wolf, a pig and a kettle, and the question requires the child to put a line under the animal which is about to eat the pig. Any child who could not answer that question from looking at the picture, would be under suspicion.

Another comment has to do with the norms. The norms were undoubtedly obtained by a careful formulation of results, but there must be some source of error if we are considering the application to the average school system. Reference is made to the relationship between the grade norms and the age norms. They do not cor-

respond. The grade norms are high in comparison with the age norms. In order to get at the facts the writer has calculated the average age of the pupils of the various grades as obtained from the reports of Cleveland, Ohio, and Springfield, Mass. Take only a single instance. The average age of 8th grade pupils in these cities is 13.66 and 13.53 respectively and the norm for children of 13 given by Haggerty is 87, and for children of 14 it is 100. This would bring the norm for children averaging 13.6 years at 95. The norm which Haggerty gives for the eighth grade is 120, which is 25 points higher. This can only mean that either the age norms or the grade norms must be modified before they can be applied to the average city school system.

In the present edition only one form of the test is published. This will somewhat limit their usefulness in cases in which the tests are to be given repeatedly to the same children. In spite of this criticism, the tests are worked out with care and ingenuity and constitute one of our best sets of group tests.

FRANK N. FREEMAN

UNIVERSITY OF CHICAGO

EDITORIAL NOTE

We are pleased to announce the appointment of Professor Samuel W. Fernberger as assistant editor of the *BULLETIN*. Professor Fernberger will assume his editorial duties beginning with the January number.

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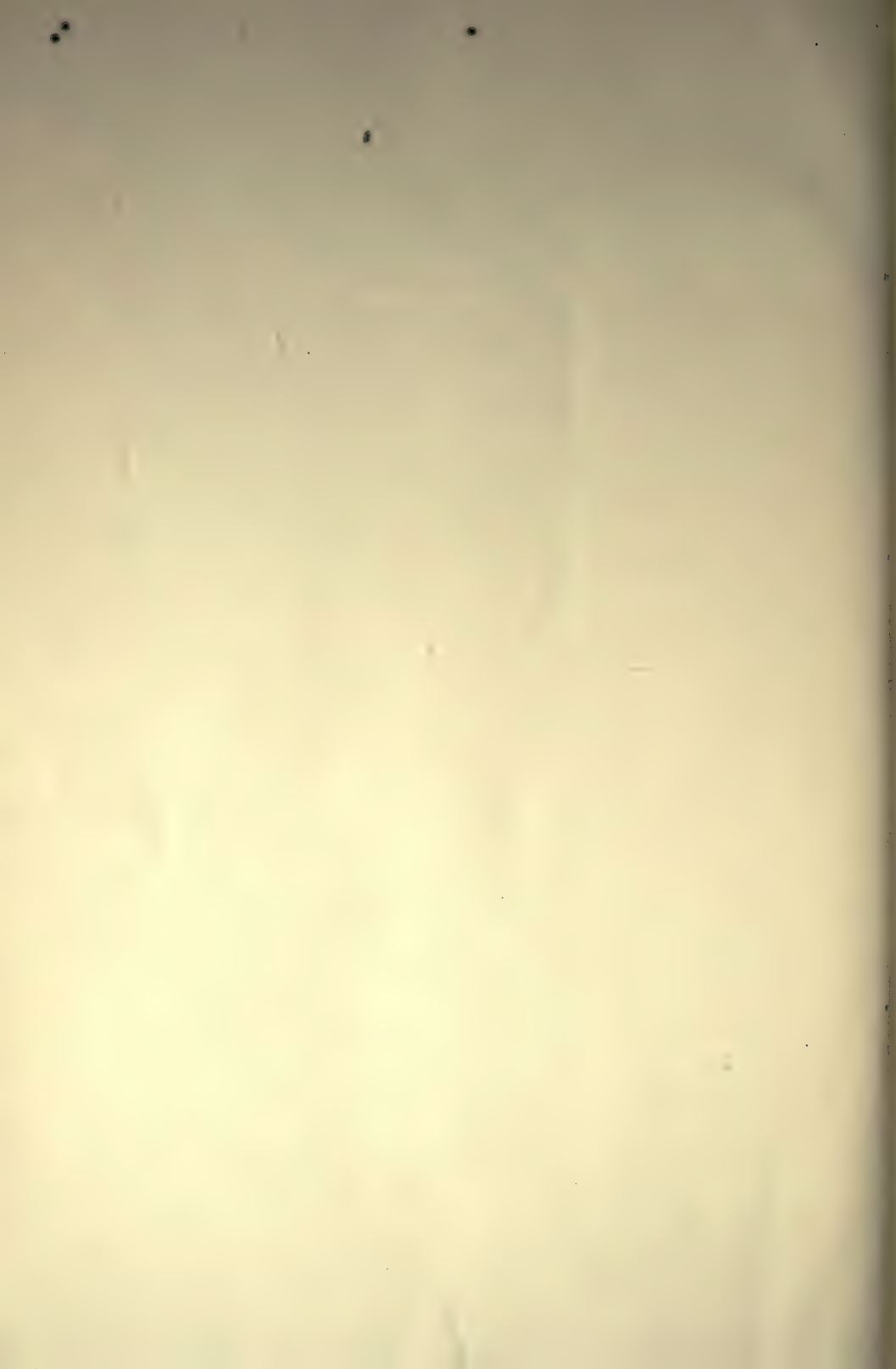
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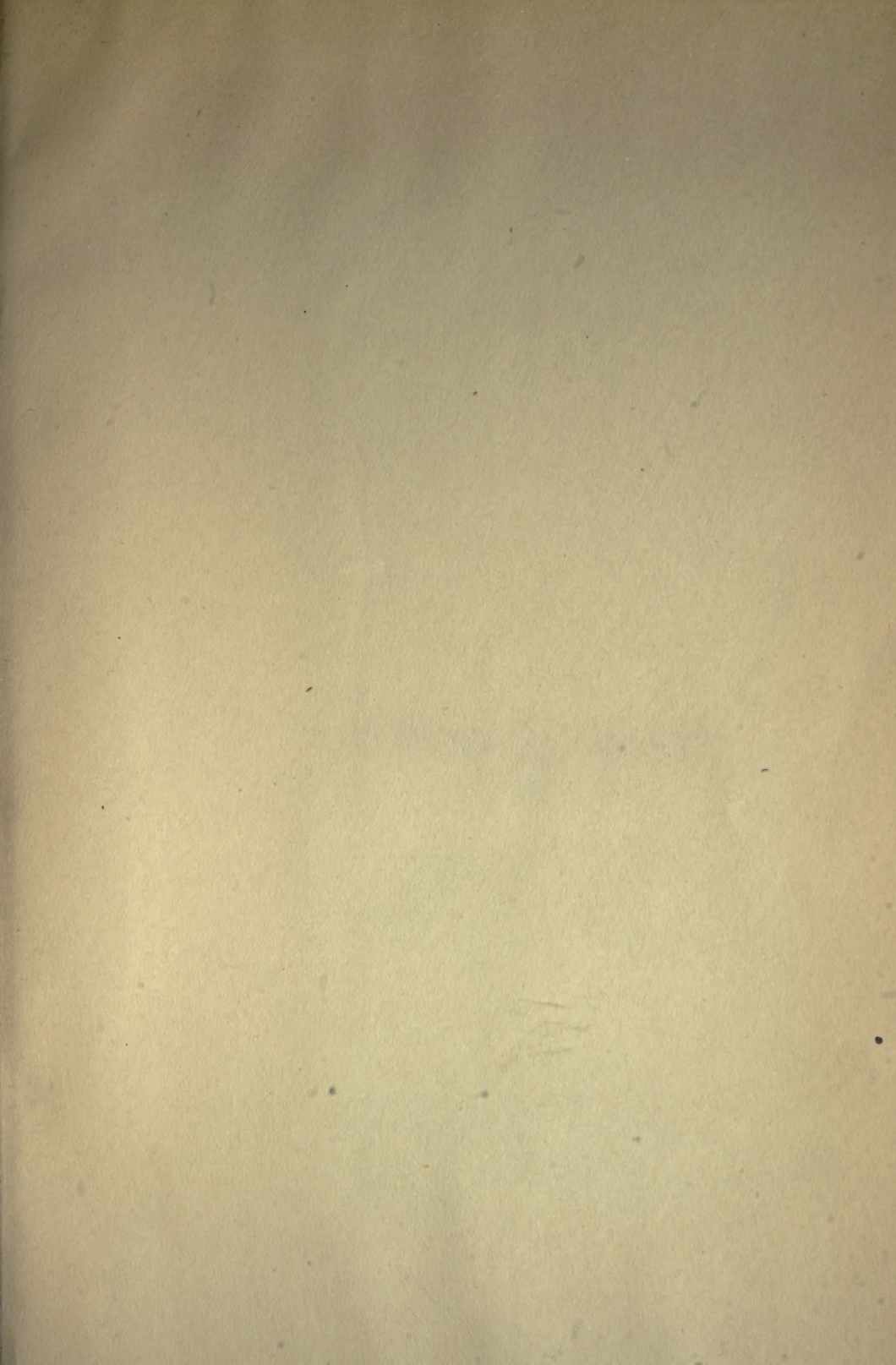
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