

discrimination tests and in reading, the functional significance of *imagery* seems to be diminished in many cases.

On the positive side there are the following conclusions: (1) At points where percepts would be of great assistance non-verbal imagery seems very important. (2) Where thinking is baffled, *i.e.*, in the genuinely problematic situations, imagery is most abundantly present.

The specific bearings of this paper on current discussion have probably been indicated sufficiently in the course of the review. We would only add the general suggestion that all conclusions be scrutinized most carefully in the light of the data on which they are based. We can accordingly agree with the author most heartily in his assertion that "the section of descriptive and dynamic psychology which deals with mental imagery needs rewriting with the aim of better definitions of terms and functions and a better weighing of values."

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PSYCHOLOGY OF THINKING.

The Psychology of Thinking. IRVING ELGAR MILLER, Ph.D.
New York, Macmillan, 1909. Pp. xxv + 303. \$1.25 net.

Instructors in introductory psychology, logic and education will find this an exceptionally useful supplementary text for teaching the biological conception of the mind and the functional view of the thought processes. The book is especially timely because teachers are feeling more keenly the importance of a better introduction to the organic conception of the mind than is to be found in the usual general texts in psychology, and are recognizing also that the treatment of the higher mental functions from the evolutionary point of view has been wholly inadequate. The author states that the main outline of his book was developed in connection with his teaching of psychology and pedagogy at the State Normal at Milwaukee, Wis., where he was also supervisor of practice teaching. His interest in the reasoning process, however, began when he was teaching mathematics in a New England academy. It is fitting that he should have had the opportunity to present the essentials of his book at the summer school of the College of Education at the University of Chicago, for one recognizes throughout the 'seed thoughts' of Professor John Dewey, to which the author acknowledges his indebtedness. In proposing to treat only the thought process the author naturally restricts the field of the book so that it could hardly be used as an exclusive text in the

usual courses of study. Its form is essentially that of a text and its arrangement is especially well adapted for instructional purposes. With this as a beginning it should be possible in time to have an additional introductory course devoted to the process of adjustment through thinking, a psychology of logic. The reviewer would welcome such a course as a forward step in the science.

Three aims are apparent in the subject matter: to present the biological view of the mind, to develop that view in connection with the process of thinking, and to suggest how this better understanding of the thought process bears upon the problems of pedagogy and mental development.

1. The book opens with a presentation of the biological point of view. For students who are not specializing in genetic psychology, this general account of the place of the mind in evolution is probably the most useful to be found anywhere. Much of the student's difficulty with functional psychology is due to his not clearly understanding the biological view. Dr. Miller helpfully starts him by describing the general nature of an organism and of the process of adaptation. He then points out how certain essentials of an organism are found in the mind. In this connection he mentions the mutual dependence of the processes of consciousness acting in the adjustment of the organism and its environment, and the law of self-determination. He might well have brought together at this point a more complete description of the organic nature of the mind including the two prominent features of development and inheritance. The students fail lamentably to recognize the characteristics of an organism in consciousness, so that it is unfortunate that Dr. Miller has not attempted to summarize them more thoroughly. The general treatment of the significance of consciousness as the factor of variation, reconstruction and individual control in evolution, and especially of the conditions and functions of thinking compared with other modes of adjustment is ably carried out. It is very gratifying to find that in his general attitude toward evolution Dr. Miller is not satisfied with an interpretation which makes physical existence the end of the process as is too common in animal and plant biology. In fact, he does not hesitate to reverse the formula of Spencer by showing that man, instead of aiming only at adaptation to his environment, is, in his higher development, attempting to bring his environment into adjustment with his own ideals.

2. In elaborating the functional view of thinking, the author discusses four fundamental processes: imagination, conception, judgment and reasoning. The central idea of this discussion, which forms

the body of the book, is that from the implicit, unreflective form of thinking, typical in the trial and success method of learning, to the explicit form of reasoning there is an identity of function, but with a growing perfection of the tools of thought: the image, the concept and the judgment. It is in its improved account of the building up and use of the technique of thinking that this book will do much to make conception, judgment and reasoning more vital to the students. The author criticizes the traditional accounts of these functions which are merely descriptions of the results of the processes. Such static descriptions neither show the needs out of which the processes arose nor the functions which they serve. The traditional account of conception, for example, does not show its relation to any need. It supposes that we start with a lot of given individuals, that we compare them and select all the common characteristics, which we combine and hold before the mind, ignoring the others. This is faulty in that we do not start with given individuals, but with a vague, often unreflective, general notion which fails to meet a particular situation, and we observe, compare, and generalize not all the common characteristics but certain characteristics which bear upon our problem and help us to solve it. This concept we then use in similar situations until it again needs reconstruction. In deduction the movement of thought is in the direction of using our tools of thought, or concepts, while in induction it is in the direction of refining or perfecting these tools. Judgment arises from the need of evaluating an experience. Both judgment and conception are discussed in their explicit forms and as functioning in implicit, unreflective forms. The explicit forms are characterized by definite technique. The term reasoning he restricts to its explicit form, although he points out its resemblance in function to the unreflective type of thinking. It is not part of the author's intention to seek for the details of the thought process in its development as a work on genetic logic like Baldwin's *Thought and Things* does for advanced students. Dr. Miller, however, recognizes the heart of the difficulty of distinguishing the higher mental processes when he seeks to discover the locus of the specific problem which each process meets. That he has formulated descriptions of these problematic situations which will become orthodox for psychology is perhaps too much to expect, but he has certainly made some of the main distinctions clearer for undergraduates.

3. The practical application of the results of psychological analysis one feels is too often a neglected part of psychological texts. In making his applications, which the author does by extended illustra-

tions and by separate chapters, he has frequent opportunities to comment vitally upon various fallacious pedagogical ideas. The advantage of manual training, for example, is not in acquired motor skill, but in the fact that it gives the opportunity for a complete process of adjustment arising in a situation in which the child feels the demand for refining his activity and finds immediate use for his refined skill in producing results which he values. The author frequently points to the fallacy of isolating mental functions which are mutually dependent. When we have conceptual activity so cut off from the exercise of the imagination that the child cannot associate the word symbols of reading, for example, with concrete images, we have a sin against the organic nature of conscious processes. By understanding how concepts arise, if they are vital, one appreciates the uselessness of those that are given to the child ready made in the form of tenets of religious faith and moral precepts. So one understands better the advantage of postponing the learning of technical concepts so long as the vague unreflective notions of the child are adequate for the situations he can appreciate, also the value of the Socratic recitations in leading the pupil to realize the need of refining his general notions, and the importance of giving the pupils more opportunity for applying their new tools of thought. In making these applications the author is practicing what he preaches in a way that is thoroughly refreshing. There is no attempt to work out specific methods in education, but the bearing of the ideas is suggested sufficiently to let the reader feel that he is obtaining a refinement of his notions of the mind which is worth while.

In some of the psychological details there have been slight changes from the customary treatment, but on the whole the conceptions of the author seem to be thoroughly orthodox. The reviewer is inclined to approve the attempt to restrict the term *instinct* to specific tendencies for reaction, while *impulse* expresses both specific tendencies and such general tendencies as play, imitation, etc. We need a new word restricted to general hereditary tendencies. Perhaps a little too much confidence is shown in locating reflexes, automatic acts, instincts and habits in various levels of the nervous system. The idea of different levels of adjustment (unconscious, organic, and intellectual) with corresponding types of sensori-motor circuit, while it is in accord with good usage, lacks the evidence from neurology which we should like before asserting that the process of organizing habits without volition, as in the trial and success method of learning, goes on through the nervous mechanism of the subcortical centers (p. 82). In making a distinction between the stages in the develop-

ment of a concept the terms 'unreflective' and 'reflective' seem to be more definite and descriptive than 'psychological' and 'logical' concepts which the author uses for general headings. Logical concepts might also be regarded as psychological when the ordinary meaning of the words is taken.

On the whole the text takes from the pragmatic school of thought what is perhaps best in it, its refined psychological description of the way the thought process works. This form of description has been splendidly adapted to the use of students by a lucid style replete with illustrations. There is enough of originality to make it a real contribution to the teaching of introductory psychology and logic. When compared with other elementary biological treatments of thinking, such as are to be found in Angell, Thorndike, Judd, Bagley, O'Shea and others, one feels that this elaboration of the description and functional explanation of the thought processes will do much to clarify and make accurate the student's ideas of the higher mental functions and to show how this new understanding of the mind is valuable for explaining conscious action and for controlling adjustment.

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RHYTHM.

Experimental-Untersuchungen zur Lehre vom Rhythmus. KURT KOFFKA. *Zeitschrift für Psychologie*, LII., 1-109.

In order to obtain material for an analysis of the phenomenon of rhythm, the author has made a series of experiments upon twenty observers, employing the subjective method and visual stimuli.

Koffka finds the advantage of using a visual instead of an auditory stimulus to lie in the fact that the subject, being unacquainted with this form of rhythm, is better able to observe and analyze the different stages of its development than he would be in the case of auditory rhythm.

In the first part of the experiments, the stimulus consisted of a black strip, which was seen through an opening in a gray screen. One of ten discs, provided with openings of different sizes and different interspaces, was rotated behind the opening in the screen. The strip thus appeared intermittently, and by changing the discs and their rate of rotation many different forms of rhythm could be produced. By a skillful arrangement of the Schumann Zeitsinnapparat, batteries and induction, a Geissler tube was made to flash intermittently behind the ground-glass window of a dark box. By different combinations