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NOTICES OF NEW BOOKS.

L'évolution de la mémoire. By HENRI PIÉRON. Paris, Flammarion, 1910.
—pp. 360.

Henri Piéron and Georges Bohn are the most productive French investigators in the field of 'animal behavior' at the present time. It is to be regretted that a quarrel seems to have arisen between them, for which the differences in their scientific views would appear to furnish insufficient explanation and which wears a rather personal aspect. Bohn last year published an account of his theoretical convictions on comparative psychology in a volume entitled *La naissance de l'intelligence*, and Piéron now follows with a work of generally similar scope. The chief divergence in the points of view of the two men is that while Bohn regards the phylogeny of mind as made up of sharply defined stages, new factors having been introduced by the development of the eye, the cerebral hemispheres, and the human cortex, Piéron lays emphasis on the continuity of the process, and maintains "l'étroite parenté des phénomènes mentaux de l'homme et des animaux."

In accordance with this position the method of the book consists in discussing the various types of phenomena to which the term memory may be applied, and attempting to show that there is no essential difference between them. The result of such a proceeding, despite the author's thorough acquaintance with the facts, to some classes of which he has been an important contributor, is to produce a certain impression of superficiality. The ideal work on the evolution of memory would endeavor not only to show a connection between the various forms of memory, but to explain the differences between them, and to offer suggestions as to how these differences have been developed. It is particularly the psychologist who finds any minimizing of these differences unwelcome, for while to the observer of the objective aspect of animal behavior all cases where the effects of former stimulation are evident may be, to a certain extent, considered under one heading, to one who is interested in their subjective aspect such phenomena as acquired organic rhythms, the slow learning of a labyrinth path, and inferential imitation pointing to the revival of a memory image, are interesting even more through their unlikenesses than through their common elements: they certainly must 'feel' very different to the animal manifesting them. It is therefore in harmony with the general purpose of the book that the author repudiates the subjective point of view, maintaining that introspection can add nothing whatever to our knowledge of the evolution of memory.

In the introduction, the continuity of memory phenomena is carried down even into the inorganic world. By 'inorganic memory' the author designates the various manifestations of inertia: solid bodies retain the effects of past stimulation, a magnetized bar of iron loses its magnetic character at a rate

which lags behind the diminution of the inducing current, and so on. As for organic or biological memory, it is held to differ from inorganic memory only in complexity: the fact that memory in living beings usually displays adaptation to their needs does not constitute an essential difference, for on the one hand the influence of past stimulation is not always favorable to welfare, as when repeated exposure to toxins produces diminished rather than increased resistance to disease ('anaphylaxis'); and on the other hand there are phenomena in the inorganic world which bear an adaptive aspect, as for instance the fact that chloride of silver resists the decomposing action of light by turning red in red light and green in green light. Under the head of psychological memory, the author disposes of the question as to whether associative memory, or the revival of the effects of a stimulus through the medium of another stimulus formerly experienced at the same time, introduces a new factor, by merely pointing out that it is found considerably lower in the scale of animal life than Loeb supposes; and the claims of the memory image to be a new order of phenomenon in the evolutionary process are dismissed with a general denial that the subjective aspect of memory processes is worth investigating. Considerable stress is laid in this section on the fact, pointed out by a pupil of Loeb, Brailsford Robertson, that the curve obtained in Ebbinghaus's experiments on the effectiveness of repetition in memorizing, which shows that such effectiveness increases with the number of repetitions at first slowly, then more rapidly, and then slowly again, is coincident with the curve obtained in chemical processes of 'autocatalysis in monomolecular reactions,' that is, where one of the products of the reaction has an accelerative influence upon the reaction itself. This coincidence is held to indicate that the process of memorizing is a chemical process of the type in question. It is needless to say that Piéron is an emphatic opponent of vitalism.

The three principal divisions of the book deal respectively with rhythmic persistences, with animal memory, and with human memory. The first of these topics is the one to which Piéron's own investigations have contributed most. As an example of rhythmic persistence we may take the fact that sea-anemones, which open in a rising tide and close in a falling tide, continue to open and close at the proper times for a few days when the animals are placed in an aquarium. That this persistence is individually acquired and thus a true memory phenomenon, rather than the expression of an innate rhythmic tendency, is shown by the possibility of varying the rhythm artificially. Book II, treating of animal memory, gives a good account of the results of experimental investigation in this field. In writing of imitation the author seems to ignore the existence of purely instinctive imitation, and repeatedly says that when an animal imitates another it is thereby proved to have a memory image. He also asserts that when an animal rapidly associates a percept and an action, it is shown to recognize the causal relation between them. These two bits of interpretation illustrate amusingly the fact that a writer who makes things easy for himself by saying that he will ignore the

psychic aspect of behavior altogether is usually betrayed into drawing inferences regarding it of a distinctly unguarded character.

The discussion of human memory, finally, contains chapters on the modalities of memory, where the identity of the laws governing human and animal memory is maintained, for instance the law that forgetting is at first rapid and later much slower, and the law that a given number of repetitions is more effective if distributed over a considerable interval than if massed; on the variations of memory, ethnic, individual, ontogenetic, and pathological; and on the utilization of memory, in connection with which the author maintains that intellectual progress consists in a gradual freeing of intelligence from subjection to memory, by various devices, such as scientific laws and mathematical formulæ, which enable experience of the past to be conveniently synthesized.

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An Outline of Logic. By B. H. BODE. New York, Henry Holt & Co., 1910.—pp. 324.

"The aim of this volume is, among other things, to give a concrete discussion of ambiguity, to simplify the study of causal connections, and to treat with greater detail than is usually done the type of inference called circumstantial evidence, the nature of proof, and the postulates of reasoning. The place assigned to the syllogism is relatively small, the subject being presented with a minimum of detail. In the distribution of emphasis, the function of logic as a guide in reasoning has been constantly borne in mind. It is partly for this reason that the illustrations are, as a rule, taken from other sources than the physical sciences because I incline to think that in the past these latter have been relied upon more than is desirable. Finally I have added a chapter on sense perception, in the hope that it will aid in making logic a propædeutic to philosophy" (p. v).

After the introductory chapter we find chapters on "Classification and Class Names," "Ambiguity and Definition," "Some Special Forms of Ambiguity," "The Nature and Interpretation of Propositions," "The Categorical Syllogism," "Hypothetical and Disjunctive Syllogisms," "False Assumption or Begging of the Question," "The Proof of Universal Connections," "The Proof of Causal Connections," "Probability," "Circumstantial Evidence and the Test of Truth," "Observation and Memory," "The Nature of Reasoning," "The Authority and Test of Truth," and "The Problem of Sense Perception."

The discussion first points out that the consciousness of likeness and of difference are the central thought functions in reasoning. Where likeness predominates, classification and class names result. But these change in meaning and are often vague, and ambiguity, one of the two most prevalent errors in reasoning, is the consequence. "An ambiguous argument correctly assumes some resemblance among the members of the class, but it mistakes the nature of the resemblance, and this is the reason why a statement which is