

published during 1929. The experiments appear to have been carefully planned and to have been executed in a thoroughly scientific manner. The results may be summarized as follows :

(1) The conditioned stimulus retains for some time a reward value equal to that of the unconditioned stimulus itself, but it soon loses this value in a given setting if it is not reinforced by the unconditioned stimulus. This loss of reward value, however, is concomitant with a loss of, or change in, its character as a conditioned stimulus.

(2) Mental ability (maze learning in rats) is inherited, in part at least, and there is reason to believe that pure lines of bright and dull individuals may be obtained. The results so far obtained are consistent with what would be anticipated if this trait were produced by multiple genetic factors.

(3) Rats run under a non-reward condition learned much more slowly than rats run under a reward condition. This held for both errors and time. Rats previously run under a non-reward condition, when suddenly rewarded made a great improvement. On the first day after the introduction of the reward their drop in mean error was greater than that made by the control group on any single day. This fact seems to indicate that, during the non-reward period, the rats were developing a latent learning of the maze, which they were able to utilize as soon as reward was introduced. The author seems, however, to overlook the fact that there was no special drive for the rat before the introduction of the reward.

(4) Rats preferred a pentagon-maze and still more complicated mazes to a triangular one, but there was no preference between the various mazes of five or more angles.

(5) With different absolute distances the same relative difference of distance yields the same proportion of correct choices. Therefore, it is concluded that Weber's law holds in the discrimination of maze distances by the white rat within the limits of distance investigated in this experiment.

(6) Rewards may be changed without materially affecting the learning curve, provided that the drive is changed so as to maintain an "appropriate" relationship between drive and reward.

A. WOHLGEMUTH.

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*Identity and Reality.* By EMILE MEYERSON. Authorized translation by K. LOEWENBERG. London: Geo. Allen and Unwin, Ltd. Demy 8vo. Pp. 495. Price 16s. net.

This is a massive study, a standard work alike for physicist, psychologist and philosopher. First published in 1908, it has now been made available in English. It is based on pre-electron conceptions of science; but Meyerson's close scrutiny of the gems of thought of Newton, Leibnitz, Kant, Descartes, Carnot, Bergson, Poincaré, Duhem, and countless others, his critical brilliancy

and great erudition, and his own philosophy, are all freshly significant.

The author begins on a psychological note. He observes that psychological processes accompanying visual perception are the same as those of thought. He aims to penetrate the functioning of thought through an analysis of its action in science; and turns for his material to the collective thought of science as shown in its history.

A brief outline of the work is as follows: Comte and Mach have stated that science is utilitarian, serving for pre-vision. Meyerson shows that such a system of "lawfulness" is inadequate. Science tries to *explain* phenomena. Its method is causality. Mechanism, atomic theories, the principles of inertia, and of conservation of matter and energy are shown to be derived *via* the principle of causality; this creates the concept of the unity of matter, ultimately assimilates matter with space, and so continues logically to the very annihilation of the external world. Through mechanism, reality becomes nonentity when this principle of identity of antecedent and consequent is built upon. And yet how readily have the mechanical theories and identities been grasped by the human mind! The principle of identity is indeed the essential form of our thought; only those explanations affirming identity satisfy us as perfect knowledge. Thus it is we ourselves who try to establish identity in nature; we bestow identity upon Nature and suppose it to be hers. We call this understanding and explaining nature.

Now, however, Meyerson asks us to contrast this logical result with the principle of change, of irreversibility, that only made its appearance with Carnot's principle. This, entropy, the end-result a dead thermal uniformity, was given a tardy welcome by science: the principle seemed incomprehensible, for there was here a total absence of identity. Yet Sadi Carnot's principle is a fact, the most important of all science. It saves the real world for science; it shows that the reversibility of mechanism is purely ideal. Causality is only a limiting condition of real phenomena, which are all irreversible at bottom.

Similarly in sensations there is irrationality; mechanism can never explain sensations. Even within the mechanical system there is irrationality, the action of one body on another being ultimately as unintelligible as its action on the senses. So, too, the concepts of common sense are shown to be fashioned as are scientific theories, the causal tendency predominating. Common sense is an expression of the tendency to see our sensations persist in time; the sensations vary unceasingly, and this seems unreasonable to us; they *must* remain, and since they cannot remain in us, we place them outside. Generalized experience (conformity to law) and causality, from the beginning of the operations of our understanding, collaborate; their operations become inextricably entangled.

In a final chapter on conclusions Meyerson returns to review his field. He sees atomism as a concept with its root in our very spirit; our faith in the theory was prior to experimental support for

it. Deductive reasoning has been largely sterile in the past, but the principle of identity has been fecundity itself, and is the vastest principle that we can formulate. It follows that phenomena can never be completely explainable. Kant shows us the true position that agreement between reality and understanding is only partial, scientific knowledge being an admixture of *a priori* and *a posteriori* elements. The admixture is served by the criterion of plausibility—we have a right to speak of things as “explained” in proportion as the mind’s predetermination for rationality is satisfied. Mechanism can thus continue to be a guiding principle, for science has never accomplished finite progress except in the direction of mechanistic explanation, and will always remain separated by an infinite distance from the logical conception towards which it tends (annihilation).

Finally, the author returns to examine the two principles of causality and of “lawfulness.” Each must be considered as functioning separately, although their action is complexly intermingled.

In the above sentences we have scantily reviewed Meyerson’s work. The book has to be read for the depths of its learning and the lucidity of its style to be appreciated. It is not possible to attempt an apportioning of what psychology itself has to say of Meyerson’s theory of knowledge. In some respects the best of modern psychology has rather clarified Meyerson’s theory in its general aspects; but there is a very important lesson to be learned by inference from Meyerson, namely, that our qualitative principles of cognition are themselves based upon the principle of identity, for is not the infallibility of knowing logically reducible to such a principle? So far as Meyerson’s treatment of sensation is concerned, the stark facts are found to be those accepted by psychology; we see sensation many times barred from being reality just as it is. Again, as in physics, so in psychology, the causal untruth in respect of reality does not interfere with rationality—causal relation has been taken to come to awareness eductively.

W. STEPHENSON.

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*The Nature of Knowing.* By R. I. AARON. London: Williams & Norgate, Ltd. Demy 8vo. Pp. 154. Price 7s. 6d. net.

This work is a shortened thesis which embodies results of six years’ epistemological research.

The criterion of knowing of a real world is taken to be infallibility. A search is made for a pure sample of “knowing.” First, in the sensory experiences, naïvism, realism, phenomenalism, idealism are reviewed; in one sentence Aaron doubts that sensation is even one amongst many outlets to reality; in another he finds infallible knowing in even the lowest sensory experiences,