

times perfectly delightful. Take, for example, the analogy given to illustrate the perception of sensation on p. 61:—

"An errand boy pulls a bell handle (he stimulates a sense organ); the pull is conveyed up the wire (an impulse travels to the central organ); the bell rings (a sensation is produced); the maid-servant hears the bell (the sensation is perceived); she decides that a person has pulled the bell handle (passes a sensory judgment). Perhaps she is able to infer, from the violence of the ring, that it was a telegraph boy who pulled the handle. Probably she goes to the door and opens it—this is equivalent to translating sensation into action with the acquiescence of consciousness."

There is a touch of genuine humour, perhaps unconsciously given, in the use of the word "probably" in the concluding sentence of this fine description.

Finally, it may be said that few will read Mr. Hill's little primer, with its great wealth of popular allusions and applications, without learning something new, even if they be trained physiologists, although it is somewhat doubtful whether the book is not a little too condensed for a beginner.

The illustrations, like the text, are original, and are in every respect worthy of it. Attention may here be drawn especially to the great simplicity of the diagrams of a sphygmograph on p. 20 and of the pendulum myograph on p. 33.

B. MOORE.

A PROTEST AGAINST VITALISM.

Mechanismus und Vitalismus. By O. Bütschli. Pp. 107. (Leipzig: W. Engelmann, 1901.) Price 1s. 9d.

THE work before us is a reprint of an address delivered before the International Congress of Zoology at Berlin in 1901, amplified by the addition of a preface and of explanatory and supplementary notes, which exceed considerably in bulk the original lecture. The author takes as his theme the most fundamental problem of biology, namely, the relation of life and living things to the inorganic world. With regard to this question, biologists fall, consciously or unconsciously, into two camps—on the one hand the vitalists, who do not believe that an ultimate explanation of the phenomena of life can be given in terms of the not-living; on the other hand, the "mechanists," as they are here named, who "consider it possible, even though feasible only to the most limited extent at the present time, to comprehend vital forms and vital phenomena on the basis of complicated physico-chemical conditions" (p. 8).

Prof. Bütschli, whose researches on the structure and properties of protoplasm have brought him into the closest contact with the problem of the nature of living matter in its simplest and most elementary form, approaches the question as a partisan of the mechanistic school of thought, and seeks to vindicate this position against the recent revival of vitalism which has been so prominent of late years, especially amongst physiologists. He commences with a brief exposition of his philosophical standpoint, and expresses himself "of the opinion that sen-

sations (Empfindungen) accompany the processes (Vorgänge) of the entire world, but that consciousness, or conscious sensation, on the other hand, has come about through the building up of the nervous system, and consequently of memory, which is the foundation and cornerstone of the conscious object, or of the Ego" (p. 6). Memory is not to be regarded as a property of the living substance as such, but as possible only with a complicated nervous apparatus (p. 52). The author proceeds next to define the mechanistic position and especially to distinguish "Mechanismus" from Materialism, with which it has been confounded by Bunge and other vitalists. "The mechanistic conception does not imply that the psychical can be explained by the physical; to it these two fields appear separate, though not unconnected" (p. 8). This leads to brief discussions as to what is meant by "causal dependence," and as to how far it is possible to speak of an "explanation" of natural phenomena, after which the author passes on to review and criticise the objections raised by neo-vitalists to the possibility of explaining vital phenomena from a physicochemical standpoint.

It is not possible here to follow the author into the details of his arguments upon this abstruse theme, for which we must refer the reader to the original. Suffice it to say that the lecture makes interesting reading, but by no means of a light order, since almost every sentence requires to be pondered over before it can be assimilated, and we imagine that the inevitable butterfly element amongst the professor's audience must have found it difficult to gather honey from such very solid mental food. Perhaps the difference between the mechanists and the vitalists is nowhere brought out better than on p. 17. A neo-vitalist, Cossmann, having asserted that an artificially manufactured body, of the same materials and of the same structure as a plant, would nevertheless not be an organism, Bütschli replies that "a body, built up in exactly the same way, both as regards structure and material, as a given plant, cannot, under suitable external conditions, behave otherwise than would the plant in question, *i.e.*, it would live like it." So long as this ideal artificial organism has not been put together, it seems a little difficult for an unbiassed critic (if there be any such) to assert confidently, either with the mechanist, that it would behave as a living body, or with the vitalist, that it would be in the condition of a dead one. Incidentally, Bütschli declares his belief that the Darwinian theory of evolution, in spite of the many recent attacks upon it, remains the most probable of the various attempts at explanation, and "contains the possible general solution of the problem," especially if combined with the hypothesis of germinal variations, which alone are capable of being inherited (pp. 33 and 89). In conclusion, the author claims that, in vital phenomena, "only that can be comprehended which can be physico-chemically explained." As regards the merits of the vitalistic and mechanistic points of view, he is content to declare, "By their fruits shall ye know them!"

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