

thinking subject, and all schematism or intent of judgment, cannot be described (p. 418).

There is much detail, not noticed herein, in all the chapters. The volume might be expanded to two or three, with yet the same material. Particularly useful are the tables in Appendix I. (pp. 419, 420), and in Appendix II. the reply to criticisms, as throwing light on the author's general position. It is not easy to say which of the author's special views seem to us most important: on the whole, however, we think the dualism of content and control is probably the most fertile contribution. Professor Baldwin says of the dualism of belief and assumption or 'schematic' and general (which corresponds to that of control and content), that it is "one destined to prove the most fruitful in the epistemology of modern times." We agree with him, and feel that every treatment of either the logic or the psychology of cognition should proceed along these two lines. Professor Baldwin has surveyed and mapped a region which should now be settled by the logician

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LOGIC AND IMAGE.

On Material Representations of Deductive Processes. GIOVANNI VAILATI. *Journal of Philos., Psychol., and Sci. Meth.*, 1908, V., 309-316.

This is a contribution to the problem which confronts all who endeavor to explain mental attitudes and operations. Such explanations must, in the nature of language, be made in physical terms and represented by metaphors of a physical character. The author enters this almost unexplored field of research, and quite thoroughly investigates the uses of metaphors in the description of that important phase of mind action employed in the use of deduction.

There are two ways to undertake such a study: Either take a given metaphor used to represent mind activity and see what mind operations pass through such metaphor; or take a mind action and see what the different images are by which it is represented. The author chooses the latter method and takes deduction, making a study of the metaphors used from time to time in describing and explaining the process.

The various types of images used to describe the fact that one affirmation may be deduced from another are three. First, recourse is had to the terms 'supporting' and 'upholding,' as for instance, the conclusion is said to be 'based' upon, or 'founded' on, given premises.

We speak in similar terms when we say the 'basis' of morals or the 'foundation' of geometry. Secondly, metaphors of 'ascending' or 'descending' are used signifying to 'flow' from or being 'retraced' through. We speak of a fact 'flowing' from other facts. Or we say a proposition is 'traceable' to certain premises. 'Spring' from, 'emanate' from, 'drawn' from are other metaphors of similar signification. Thirdly, the conclusion is often said to be 'included' in the premises, 'contained' in them, etc. We often speak of this relation when we say the premises imply the conclusion. Sometimes, as in case of mere explanation, the conclusion is contained in the premises.

Each of these three general types is taken up and the errors into which their careless use has led are pointed out. The first, the 'founded-upon' idea, leads us to this objection to the 'surety' of the conclusion arrived at deductively: being always 'founded' upon a previous fact, we finally in the regress come, of necessity, to the first fact, which is not verified by deduction. So deduction, instead of being a process of arriving at 'sure' conclusions merely increases the number of assertions which participate in the certainty which, independently of any deductive process, 'some of our beliefs already possess.' So deduction is not a means of *producing* certainties but of *distributing* them. A deducer is a retail dealer or jobber in the commodity of certainties, not a producer of such commodity.

The article takes up both of the other general types of metaphorical uses in representation and analyzes and applies them in a manner similar to the above, shows how they fall short, and often how they lead into error. Space, in this summary, forbids full development of them.

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DEVELOPMENT AND HEREDITY.

The Problem of Age, Growth and Death. A Study of Cytomorphosis. CHARLES S. MINOT. New York and London, 1908. Pp. 280.

Heredity. J. ARTHUR THOMSON. New York and London, 1908. Pp. 603.

Two recent biological volumes of Putnam's *Science Series* are of much general interest. Minot's *Age, Growth and Death* discusses that question of acutely personal interest to each of us: Why do organisms grow old and die? The author's investigations have long been directed to the processes of growth and senescence, and no one