cocksureness there displayed, nor is the reviewer vindicated in his certainty that the author intended to force a 'psychological connection' here, or ought to have made out one there. If Dr. Boas, remembering that all writers have not reached that eminence of synthesis and systematization on which he so conspicuously dwells, will once more peruse the the volume he will discover that neither in its claims nor in its execution does it traverse those sound principles of the comparative method of which a peculiar interpretation belongs to him. In these the writer believes as thoroughly as does the reviewer. But, as to the exact manner and method of determining where a 'psychological connection' exists, or what phenomena are 'derived psychologically or historically from common causes,' a great deal of reasonable difference in opinion exists, and this the author has not ignored. The reviewer has throughout attributed to the writer a much more ambitious thesis than he really attempted, and has apparently seen efforts at connection and comparison where none such existed or were thought of. That the author has completed the task he set himself, other reviewers have perceived and acknowledged; to have accomplished the task the reviewer sets him, he had needs be the reviewer himself.

ALEX. F. CHAMBERLAIN.
WORCESTER, MASS., May 15, 1896.

'THAT GREAT LAW OF LOGIC.'

IN a recent number of this JOURNAL (p. 668 above) I ventured to criticise Professor Brooks for using ambiguously the phrase 'test of truth,' and for not appreciating the force of a letter by M. M., calling attention to this. I then pointed out what seemed to me an analogous confusion in regard to the material and the efficient causes of evolution, saying that I did this at the risk of being accused of irrelevancy by Professor Brooks. I did not at all intend to include Professor Brooks with those who have confused material and efficient causes, and his reply (p. 779 above) should have been directed to Professor Cunningham who in the May number of *Natural Science* makes, I think incorrectly, this charge.

Professor Brooks is mistaken in saying that I did not specify anyone who seems to me to use the word 'cause' ambiguously. It is, indeed, easy to adduce other eminent naturalists in addition to the one to whom I referred. Thus Professor Weismann writes in his most recent paper (*On Germinal Selection*, authorized translation: Chicago, 1896): "The protective coloring * * * * arose not because it was a constitutional necessity of the animal's organism that here a red and there a white, black, or yellow spot should be produced, but because it was advantageous, because it was necessary for the animal." Weismann's state of mind seems to be similar to that of the little boy who was watching at a hole for a woodchuck to come out, and when asked how he knew there was a woodchuck in the hole said "because we have company for dinner and there is no meat in the house."

While Professor Brooks replies to a question in which we agree he neither defends nor retracts the statement which I think is guilty of an analogous blunder, and it seems as though he does not appreciate the point raised by M. M. It is, perhaps, merely a matter of words, but when words are used ambiguously arguments become fallacious. When Professor Brooks writes advocating "that great law of logic, '*the test of truth is evidence and not conceivability*,'" does he mean to deny that conceivability is a sufficient proof of truth or to deny that conceivability is a necessary condition of truth, and what does he mean by conceivability?

In the curious history of thought we have had inconceivability urged as a proof of truth, but not, so far as I am aware, conceivability; no one holds that the situations in the modern realistic novel have occurred because they are conceivable. It has, however, been claimed that conceivability is a necessary condition of truth, and by one who holds this position (as Mr. Herbert Spencer) Professor Brooks' statement could neither be affirmed nor denied any more than he could answer yes or no to the question "Did you hold the lantern when your father robbed the stagecoach?"

Then Professor Brooks' 'great law of logic' is doubly illogical because he also uses the word 'conceivability' ambiguously. When he writes

that he 'cannot conceive of the antipodes' he uses the word differently from Huxley in the sentences he quotes, for Huxley only says that he believes that something will be accomplished, though he cannot conceive how. It happens that J. S. Mill uses Professor Brooks' example to explain the proper use of the word, writing (*Logic*, II., p. 321): "Antipodes were really, not ficticiously, inconceivable to our ancestors: they are, indeed, conceivable to us." Everyone will agree that conceivability in Professor Brooks' sense is not a necessary condition of truth, but this does not concern his subsequent argument.

Professor Brooks states in his last letter that Aristotle held "that our business in this world is to learn all we can of the *order* of nature, leaving to more lofty minds the attempt to find out what it is that 'produces anything and makes it what it is.'" Yet very curiously in his previous article to which he refers (SCIENCE N. S., Vol. I., p. 126) he wrote: "I should like to see hung on the walls of every laboratory * * * the older teaching of the Father of Zoölogy [Aristotle] that the essence of a living thing is not what it is made of, nor what it does, but why it does it." Professor Brooks seems to have proceeded from the *ignoramus* of his preceding paper to *ignorabimus* now, but he is not justified in taking Aristotle with him.

J. MCKEEN CATTELL.

COLUMBIA UNIVERSITY.

SCIENTIFIC LITERATURE.

A Text-book of Gas Manufacture for Students: By JOHN HORNBY, F. S. C. 12mo, pp. 261; 6 plates. London, 1896, Bell & Sons. New York, Macmillan & Co., 66 Fifth Ave. $1.50.

A concise little book setting forth the chief points in gas manufacture in a manner that students can readily grasp has been a desideratum. The manufacture of coal gas, with its attendant by-products, is very extensively developed in England; hence to that country we look for excellent treatises on this subject, and this 'Text-book' meets the requirements.

After a short consideration of the properties and value of various coals for gas making, the author discusses carbonization; the construction and setting of retorts and furnaces; the various appliances usually found in the retort house; the effect of temperature on the quantity and quality of the gas and on the by-products; condensation of tar; removal of ammonia and the elimination of other impurities; methods of testing purity and illuminating power; the various problems incidental to the distribution of gas to the consumers, and the construction of meters and burners. In Chap. XX., on the Composition of Coal Gas, is shown the effect of the various components of gas on its illuminating power.

The American reader will notice the slight attention given to water gas. Very little of this is used in England, it having been developed within the last fifteen years, while in most cases the English coal-gas works, with their plants for saving by-products, have been established much longer. A short description of the Lowe process, together with a plate, is given.

The author divides the water-gas process into 'continuous,' in which the reaction between carbon and steam takes place in an externally heated retort, and 'intermittent,' in which the carbon is raised to incandescence by an air blast, and then steam is blown into the hot mass. He adds that the continuous process has not proved a success. But in this country the term 'continuous' is applied to those processes in which a non-luminous water gas is made in a generator and stored in a gasometer, being afterwards carburetted in externally heated retorts. Processes of this character, notably that of Wilkinson, have proved very successful here for large works.

A short description of Peeble's gas-enriching process is followed by a chapter on sulphate of ammonia, which closes the book.

The print and plates are excellent and the illustrations are generally good, excepting two indistinct views of mechanical charging and drawing apparatus. FRANK H. THORP.

Repetitorium der Chemie: DR. CARL ARNOLD, Professor der Chemie an der Köngl. Tierärzlichen Hochschule zu Hannover. Siebente Auflage, Verlag von Leopold Voss, Hamburg und Leipzig. 1896.