

the conclusion drawn by me in NATURE of October 22, that Michelson and Morley's repetition of the experiment, when correctly interpreted, is in close agreement with the predictions of the principle of relativity. This being so, it may be worth while to direct attention to certain facts in connection with that experiment which render it quite inconclusive.

(1) On the ground of an experimental device for estimating the pressure gradient at different points of the tube, Michelson and Morley assume that the velocity along the axis is equal to 1.165 times the mean velocity. This is in sharp contradiction with the theory of the flow of liquid in a tube which shows that the axial velocity is twice the mean.

(2) The beam of light which traverses the tubes appears from the figures given to occupy a considerable fraction of the whole area of the tube, and is thus subject to a retardation in phase which varies with the variation of the velocity of the liquid at different distances from the axes. It may be shown that the retardation in phase of the resultant disturbance when brought to a focus is equal to that which would be produced if the velocity of flow were uniform and equal to the mean velocity over the part of the tube occupied. If this were the whole tube the result of applying these corrections would be to increase the result given by Michelson and Morley for the convection coefficient from 0.434 to 0.515. On the other hand, if the diameter of the beam were about 0.93 of the diameter of the tube the mean velocity would be so much greater that the convection-coefficient would be reduced to the theoretical value given by the formula of Lorentz, viz., 0.451. There is thus a possibility of general agreement, but the experiment is quite indecisive.

The announcement that Prof. Zeeman has repeated the experiments with great care and with monochromatic light and has succeeded in observing a dispersive effect is, therefore, of great importance, and his detailed results will be awaited with much interest (Amsterdam Proceedings, September 26).

E. CUNNINGHAM.

St. John's College, Cambridge, October 26.

Flint Fracture.

MR. LEWIS ABBOTT'S letter in NATURE of October 22 is almost entirely irrelevant to the subject of my communication to NATURE of September 24. In this note I dealt solely with one form of flint fracture, viz., the large, flat, non-conchoidal fractures, surfaces which are produced by a certain type of "cleaving" blow, and pointed out how it is possible to determine the nature and direction of the fracturing-agent by the recognition of the fissures of varying size radiating from the point of impact. Mr. Abbott, however, states, these "are certainly not fissures"; but an examination of these markings upon a flint and a reference to the meaning of the word "fissure" in a dictionary will convince anyone that my description is correct.

The major part of Mr. Abbott's letter deals with subjects upon which my former note has no bearing, and though I agree that these are important and need investigation, yet it seems regrettable, if the problems they present were, as Mr. Abbott infers, in process of solution several years ago, that the knowledge already acquired at that time has not up to the present been laid before the scientific world. It is to be hoped that Mr. Abbott may be able to induce the collector who interviewed the late Sir John Evans to do so without delay.

J. REID MOIR.

12 St. Edmund's Road, Ipswich, October 23.

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TOWARDS NATURE-STUDY.¹

(1) PROF. ABBOTT'S aim is to give "a simple statement of the fundamentals of General Biology," both for the general reader and the laboratory student. He deals with both plants and animals, shifting his field so as to get the best illustrations. The main subjects discussed are—living substance, the primary functions, metabolism, growth, differentiation, development, variation and heredity, organic response, species and their origin. The book is well-illustrated and marked by three other qualities—an admirable clearness which points to teaching experience, a pleasant freshness of treatment which is in part due to the numerous references to recent work, and an all-roundness of survey, for almost every aspect of biology is at any rate recognised and illustrated. This third quality lays the book open to the disadvantage of sometimes saying too little, but most introductory books of this sort say far too much. But we should have liked, for instance, to know more about those sea birds which "lay their eggs on the bare rocks and pay no more attention to them thereafter."

(2) Prof. J. R. Ainsworth-Davis is a firm believer in the value of "nature-study" as a factor in increasing efficiency, and his book—an outcome of large experience—is meant to indicate how the subject may be best dealt with, especially in country schools. After clearly indicating how arithmetic, for instance, may be made vital in the country schools by being applied to actual problems, he proceeds to show this is even more essential in connection with nature-study. For this reason the book gives prominence to common plants and animals and familiar physical phenomena. In regard to the part dealing with plants and animals, however, it appears to us that the author falls far short of his counsel, telling too much and suggesting too little. It is good pemmican, but it is pemmican. In his introduction he protests against the "informational obsession," and upholds "the educational ideal";

¹ (1) "The Elementary Principles of General Biology." By Prof. J. F. Abbott. Pp. xvi+529. (New York: The Macmillan Co. London: Macmillan and Co., Ltd., 1914.) Price 6s. 6d.

(2) "The Pursuit of Natural Knowledge." By Prof. J. R. Ainsworth-Davis. Pp. iv+234. (Cheltenham: Norman, Sawyer and Co., Ltd., 1914.) Price 1s. net.

(3) "Animal Life by the Sea-shore." By Drs. G. A. and C. L. Boulenger. Pp. xii+83+plates. (London: Offices of *Country Life*, Ltd., n.d.) Price 5s. net.

(4) "The Naturalist at the Sea-shore." By R. Elmhirst. Pp. viii+86+8 plates. (London: A. and C. Black, 1913.) Price 1s. 6d. net.

(5) "Bird Studies in Twenty-four Lessons." By W. P. Westell. Pp. xii+152. (Cambridge: University Press, 1914.) Price 2s. 6d. net.

(6) "Common British Beetles." By Rev. C. A. Hall. Pp. vii+86. (London: A. and C. Black, 1914.) Price 1s. 6d. net.

(7) "Odd Hours with Nature." By Alexander Urquhart. Pp. 323+plates. (London: T. Fisher Unwin, n.d.) Price 5s. net.

(8) Ernst Haeckel: "Die Natur als Künstlerin." Nebst: Dr. W. Breitenbach; "Formenschatz der Schöpfung." Pp. 114. (Berlin: Ch. Vita, Deutsches Verlagshaus, n.d.)

(9) "A Natural History of Bournemouth and District," including Archaeology, Topography, Municipal Government, Climate, Education, Fauna, Flora and Geology. By the Members of the Bournemouth Natural Science Society. Edited by Sir Daniel Morris. Pp. xiv+400. (Bournemouth: Natural Science Society, 1914.) Price 2s. 6d. net.

(10) "Handbuch der naturgeschichtlichen Technik für Lehrer und Studierende der Naturwissenschaften." Herausgegeben von Prof. Bastian Schmid. Pp. viii+555. (Leipzig and Berlin: B. G. Teubner, 1914.) Price 15 marks.

(11) "Biologen-Kalender." Edited by Prof. B. Schmid und Dr. C. Thesing. Erster Jahrgang. Pp. ix+513. (Leipzig and Berlin: B. G. Teubner, 1914.) Price 7 marks.