(3.) A stem of *Wistaria* 1.75 meters long and having seven internodes dropped mercury from seven vessels. Another stem three meters long and containing forty-seven internodes was first killed by heating for an hour in water at 90°, and then dried. This did not let mercury through until it had been shortened to 2.5 meters. Then it dropped pretty fast from four vessels. Reduced to two meters, nine vessels dropped mercury, and out of some it ran rapidly. Another shoot gave nearly the same results. A fresh and very long stem had to be shortened to three meters before mercury came through. Then it dropped from three vessels. Successively shortened, the number of permeable vessels was as follows: 2.5 meters, eleven vessels; two meters, eighteen vessels; 1.5 meter, twenty-seven to twenty-nine vessels. These stems were one to two centimeters thick. *Conclusion:* Some of the vessels in *Wistaria* are quite long, though scarcely more than three meters. Most of the wide vessels are about one meter long.

(4.) A cane of *Vitis Labrusca* 1.2 centimeter thick, which was previously killed by heating for an hour in water at 90° C. and then air-dried, first let mercury through (3 vessels) when shortened to 2.2 meters.

(5.) A shoot of *Aristolochia Sipho* 1.5 centimeters thick, 2.5 meters long, and having fifteen internodes was killed in the same way. This let mercury through fourteen vessels. Another shoot 2.1 meters long let the mercury through many vessels. A fresh stem five meters long, the longest he could get, dropped mercury from five vessels. When successively shortened, more and more vessels dropped mercury. At 3.5 meters twenty-five vessels let it through, and when the stem was cut down to three meters the number of vessels dropping mercury could not be determined. *Conclusion:* In this plant numerous vessels are three meters long, some are five meters long, and a few are probably longer.

In *Aristolochia* the vessels of different annual rings were equally permeable, but in the wistaria, the locust and the oaks the permeable vessels were mostly on the periphery. The records were made in from ten to thirty minutes from the beginning of the pressure, the time depending on the length of the stem. In general the mercury was passed through the stem in the same direction as the ascending water current, but a change of direction did not give contradictory results. These experiments were repeated, using a pressure of forty centimeters, but even this did not rupture any cross-walls. This increased pressure overcame the capillary resistance and forced the mercury through many smaller vessels, but otherwise the results were much the same.

Erwin F. Smith.

Washington.

SCIENTIFIC LITERATURE.

Introduction to Elementary Practical Biology.—By Charles Wright Dodge, M. S.—Harper Bros., New York. 1894.

This book is a laboratory guide for high school and college students. The teacher of biology who is endeavoring to train his students in the best manner is in modern times, amid the abundance of laboratory guides, in very much of a quandary as to the best of two opposite methods. If, on the one hand, he puts a laboratory guide into the hands of the student, the result is apt to be that the student soon learns simply to verify the facts mentioned in the book, and thus loses all stimulus for original observation, which should be the foremost result of practical work in biological science. On the other hand, if the teacher gives to an elementary student a specimen to study without laboratory directions, he is at such complete loss to know how to proceed, what to do, and particularly what points to notice, that a large proportion of his time is wasted through sheer lack of the proper

knowledge of methods. To force a student to invent methods does stimulate indeed observation, but it is a very great waste of time on the part of most students. Between this loss of stimulus to original observation and the loss of time, the instructor is very puzzled how to proceed.

Prof. Dodge of Rochester University in the guide just published has attempted to solve the problem by a new method of direction. The laboratory guide here noticed gives the student some few directions as to methods of dissection and methods of procedure, but beyond this gives him practically no information in regard to his specimens. By a series of skilfully arranged questions it forces the student to make his own observations and to make them in the right direction. Instead of directing the student to observe a certain fact a question is asked which leads him to hunt for a solution, and the result is independent observation. This method of study renders the text book of no value unless the student has the specimen directly in front of him, for there is no possibility of answering these questions in any other way than from the specimen.

The method of teaching here planned is certainly an ideal one and has been quite successfully carried out by Prof. Dodge. It is true that the questions given are sometimes entirely beyond the possibility of the student's solution, and it must also be recognized that this method is one designed to occupy a very great amount of time. Some of the problems which are set before the student will require days for solution, and others have not yet been settled by the observation of scientific investigators. It will therefore take a great amount of time to complete the outline given, for the book is a comprehensive study of biology, including the study of the animal and vegetable cell, on the side of animals, the study of the sponge, hydra, campanularian hydroid, star fish, earthworm, the lobster, locust, clam, and the frog; and on the side of the vegetable kingdom, green felt, stone work, rock weed, mould, mushrooms, liverworts, ferns and flowering plants. Whether the student in the time allotted to the study of general biology even in our best colleges will be able to complete the list by the method outlined in the guide is doubtful, but there can be little doubt that the method of teaching adopted by Prof. Dodge in this book is an ideal one, and for stimulating observation and at the same time enabling the student to do the most work in the smallest amount of time, there is perhaps no laboratory guide in biology yet published which succeeds as well as the one here noticed.

H. W. CONN.

WESLEYAN UNIVERSITY.

Le Grisou [Fire Damp], par H. LE CHATELIER, Ingénieur en Chef des Mines.—Professeur à l'École nationale des Mines.—Paris, Gauthier Villars et Fils, 1894. Pp. 187. Broché 2 fr 50, Cartonné 3 fr.

The rapid extension of technical scientific knowledge, and the increasing call for specialists in every department, is best shown in the literature of the past few years. The discussion of general topics within the limits of a single volume is now possible only in the most elementary works designed for beginners and for the lower classes of our colleges. We have in place of the general text book a rapidly increasing library devoted to special subjects, each presented by specialists in their own field and each treating of some small part of the great sciences formerly considered as a unit. The present volume is of this nature, and, coming from the hand of an engineer of wide reputation, will be of great service to all advanced students of mining whether still within the college confine or employed in the active practice of their profession. 'Fiery' mines are common in our coal fields, and many mines long worked without suspicion of danger, or with