complained of is as follows: "The student of science may fairly ask whether, when twelve doctorates are conferred in zoology and but three in Latin and Greek combined, this means that there is less demand for teachers of the classics or that a less exacting preparation is required." It seems difficult to interpret this in any other way than to the effect that if fewer doctorates are conferred in the classics than in the sciences then it follows that there are fewer adequately prepared teachers of the classics than of the sciences. We should not like to publish an unsigned note disparaging the classics—least of all the admirable instruction given in the classical languages at the University of Chicago—but it is proper for a scientific journal to call attention to the fact that more well-trained teachers and students have been sent out from the University of Chicago in zoology than in any other subject.—Ed. Science.]

INFORMATION DESIRED.

I shall be greatly indebted to any reader of Science who will inform me of the whereabouts of a partial cranium of *Bison antiquus*, figured in the *Kansas University Quarterly* for July, 1897, and stated to be 'in a high school in Illinois.'

F. A. Lucas.

Washington, D. C.

SCIENTIFIC LITERATURE.

A Text-Book of General Lichenology, with descriptions and figures of the genera occurring in the northeastern United States. By Albert Schneider, M.S., M.D., Fellow in Botany, Columbia University, 1894–1896. Binghamton, N. Y., Willard N. Clute & Company. 1897. 8vo. Pp. xvii+230. Pl. 76.

It is now several months since this important work first appeared, and doubtless many American botanists are already familiar with its contents. The author intended it primarily as a text-book for the use of students in colleges and universities, and it is not too much to say that, with all its faults, it is the only modern work of its kind in the English language. The first chapter is devoted to the history of lichenology, in which seven periods are recognized, viz.: I. Theophrastus (circa 300 B. C.) to Tournefort (A. D. 1694). II. Tournefort to Micheli (1729). III. Micheli to Weber (1779). IV. Weber to Wallroth and Meyer (1825). V. Wallroth and Meyer to Schwendener (1868). VI. Schwendener to Reinke (1894). VII. Reinke to the close of 1896. This historical summary will be of interest to students, especially those who do not have access to the older works, which are conveniently cited in numerous footnotes. In this historical treatment the author has quite needlessly separated the last three years, a procedure due to his adherence to Reinke's somewhat confusing views as to the nature of lichens.

The second chapter deals with the subject of Symbiosis, including (*a*) antagonistic and (*b*) mutualistic symbiosis, the latter only, according to our author, occurring in lichens. This view, again, is inspired by Reinke.

The third, fourth and fifth chapters are devoted to the structure, growth and reproduction of lichens. To our mind this is the best part of the book, and the student who goes over these chapters carefully, while studying the plants themselves in the laboratory, will obtain a very good idea of the subject they treat, especially if, at the same time, he makes use of the text and plates of Part II., dealing with classification and special morphology. Regarding the latter it may be said that the text is far better than the plates for the purpose for which the book was prepared. The figures are almost entirely diagrammatic, in spite of the statement on page 110 that they were 'made from hand sections mounted in water (C. ocular, 1-5 objective, and camera lucida).' The student who is led to suppose that he may obtain sections like these will find himself sadly mistaken after making the attempt. As diagrams these figures will be helpful, but they should not be placed before the student as camera lucida drawings of actual sections. The text of this portion of the book possesses the merit of clear and direct statement, which is more than can be said of lichen litera-

ture in general. Whether it will prove to be full enough and sufficiently accurate to be quite helpful we are not able to say, not having as yet had the opportunity of giving it a prolonged trial in the laboratory, but a somewhat careful examination of the pages pertaining to a few of the familiar genera has impressed us favorably.

The chapter on phylogeny brings out the author's views as to the nature of lichens, views which, as stated above, are essentially those of Reinke. He holds with the Schwendenerians that the fungal symbionts of the Ascolichens are derived from the Ascomycetes, and these represent different groups of fungi, *e. g.*, Pezizaceæ, Patellariaceæ, Phacidiaceæ, Stictidaceæ, Sphæriaceæ. With Schwendener also, he refers the 'gonidia' to various algal types. By returning to the second chapter we learn that the relation between fungi and algæ is considered to be the highest form of mutualistic symbiosis, which he terms individualism. This requires "that one of the symbionts be absolutely dependent upon the mutual relationship." In lichens, our author says: "We find the nutritive interdependence so marked that a new individual is formed, which in its morphology and physiology is wholly different from any of the symbionts." Again: "From the very nature of individualism it is evident that the resulting structure is a morphological unit in the full sense of the word—that is, a lichen is neither a fungus nor an alga, but a new individual which should be given a definite position in the vegetable kingdom. It is an independent individual, because we find that on separating the symbionts the individual is destroyed, as has already been indicated." We have thus a new kind of taxonomic unit, consisting of two organisms—(*a*) that derived from fungal ancestors, and (*b*) that derived from algal ancestors. This dual thing is the lichen. Hence, lichens, being entirely unlike anything else under the sun, are to be regarded as constituting a distinct class! We have thus a nominal restoration of the Class Lichenes, for which the lichenologists have been fighting for a quarter of a century. But what a restoration! A lichen is no longer a single organism, comparable to a Fucus, a Polysiphonia or a Marchantia, but a compound of two organisms, and these admitted to be of fungal and algal origin. When it comes to this, the autonomists might as well surrender and come at once into the Schwendenerian camp.

It but remains for us to say that this book, with all its shortcomings, will be useful, and that the publishers have done well in their selection of type and paper, and have furthermore given it a substantial binding.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

Organic Chemistry for the Laboratory. By W. A. NOYES, PH.D. Easton, Pa., Chemical Publishing Co. 1897. 12mo. Pp. xi+257. Price, $1.50.

Two purposes have been kept in view by the author in writing a new book on organic preparations. "The first has been to furnish the beginner with sufficiently full and accurate directions, and clear, concise, theoretical explanations of processes which have been found successful in practical laboratory experience. The second object has been to furnish the more advanced student and practical worker with a guide which will aid him in the selection of processes which are likely to be successful for the preparation of compounds which he may desire to use." The book is divided into eleven chapters, in which is described the preparation of the various classes of organic compounds, namely: Acids; derivatives of acids; halogen compounds; nitro compounds; amines; hydrazo, azo, and diazo compounds, etc.; alcohols and phenols; aldehydes, ketones and their derivatives; sulphonic acids and sulphine compounds; hydrocarbons, and miscellaneous compounds. At the beginning of each chapter is a discussion of the chemical reactions involved in the different methods of preparation. This is followed by directions for the preparation of a compound illustrating each method. For example, in the first chapter twelve pages are given up to a general discussion of acids and nineteen preparations are described. In all cases the theoretical explanations and experimental details are clear and full. A particularly valuable chapter is devoted to the qualitative identification of organic compounds. The usual tests