function, within certain limits, I believe the state university combined with the normal schools can perform. The department of education in the state university organizing the resources of the state university for this particular purpose may bring to bear upon the educational problems and upon the educational needs of the state, an expert opinion which it is not possible to find in any other department of the state administration.

This function, it may be said, is not performed by the university in its capacity as a civil service academy, preparing teachers for the educational service of the state. It is larger and wider than this. It is a recognition of the university as one of the organs created by the state for determining, within certain limits, the policy of the state in the great field of education.

And thus I might proceed with a summary of other great things that are waiting for the state university if it only knows the day of its visitation; if it only measures itself up to its opportunities; if it only performs faithfully and simply the duties which the state thrusts upon it.

But time presses and I must draw these considerations to a close. I have left untouched many things you may have expected me to discuss, not because I do not consider them as important, but either because I regard them as so fundamental that we should all agree upon them or because the limitation of time does not permit even their mention. You will have gathered from what I have said my conception in general of the function and future of the state university.

It may be defined in brief as supplementary to the great system of higher education which private beneficence and church activity have reared, and it is to be hoped will continue to rear. It is corrective rather than directive; it is cooperative rather than monopolistic; it is adapted for leadership in certain departments, but must look to the non-state institution for leadership in others. It should be as universal as the American democracy—as broad, as liberal, as sympathetic, as comprehensive—ready to take up into itself all the educational forces of the state, giving recognition for good work wherever done, and unifying, tying together all the multiform strands of educational activity into one great cable whose future strength no man may measure.

Edmund Janes James.
University of Illinois.

SCIENTIFIC BOOKS.

Structural and Field Geology, for Students in Pure and Applied Science. By James Geikie, LL.D., D.C.L., F.R.S., etc., Murchison Professor of Geology and Mineralogy in the University of Edinburgh, formerly of H. M. Geological Survey, author of 'The Great Ice Age,' 'Prehistoric Europe,' 'Earth Sculpture,' etc. New York, D. Van Nostrand Company. 1905.

This is a well-made and attractive volume of just the maximum size which long experience has shown to be the largest permissible for a handbook. It is of exactly the same dimensions as the first volume of Chamberlin and Salisbury, and although by the choice of a thinner paper the American book numbers two hundred more pages, it contains so many more figures that the text of the two is of about the same length.

Although the two books take opposite points of view, the one describing structures with little explanation, the other discussing processes with brief illustration, it is interesting to compare them. The Scotch book is as conservative as Edinburgh, the American as radical as Chicago. The former proceeds along the ancient ways with a leisurely fullness that is very attractive to a veteran, and recalls the time when he devoured Jukes or Nauman. The rock-forming minerals are described in detail, and the rocks with even greater fullness. The word petrography, with

all its synonyms, is omitted with much of the complex nomenclature and special doctrines of this new and aspiring science, while the American authors present a grand chapter on the 'Origin and Descent of Rocks,' starting with a molten magma (but discrediting a molten globe), and presenting the new quantitative classification of Iddings and Washington.

Fossils are next treated with great brevity in an excellent chapter of twelve pages. Much is omitted here that appears in Pennell, Cole and Keilhack and might have been expected in a manual of field geology. The book is rather planned for an advanced course in geology in Scotland with some field work, and it is interesting to note the classes for which it is intended according to the enumeration in the preface, viz., mining engineers, civil engineers, architects, agriculturists and public health officers.

There follow chapters written with great fullness and clearness upon the main geological structures, stratification, concretions, folding, joints and faults, the structure of eruptive rocks, and ore formations. The book is here at its best. The illustrations are abundant, well chosen and clear and the plan of printing many of the important figures as separate plates is used with especially good effect and several of the landscapes combine the highest artistic beauty with the greatest illustrative value. Several companion plates are very effective, for instance the field data of a complex area are presented on one plate and the completed map on an opposite plate. Again the tracings of thrust planes are given on a photograph of a mountainside and a section of the intricate geology of the mountain is given on a plate facing the first.

The chapter on metamorphism is brief. The Archæan is dismissed with a half page, and the line of treatment is not greatly influenced by the remarkable attempts to apply the laws of physical chemistry to the problem made by Van Hise, Grubenmann and Becke.

Then follows a chapter of fifty-four pages on geological surveying, which, as it is largely given up to the description of structural features, and, indeed, contains the only discussion of the glacial formation, offers only rather brief and general directions for field work.

The economic aspects of geological structure are then taken up in a very detailed and interesting way, full of practical suggestions for the application of the ideas developed in the preceding chapters.

The book closes with a brief chapter of thirty pages covering the whole subject of denudation and the evolution of all the surface features of the earth, and there is no suggestion of the survey or special field study of these subjects. The contrast between the two books comes out strongly here. The American book devotes 355 pages to the work on air and water and 38 to structural geology. The other gives 30 pages to erosion and 166 to structure. The author shows a great and, in the main, wise conservatism in the employment of new terms. Peneplain does not appear, nor any of the superabundant and largely anthropomorphic terms used especially in America in the description of topographic forms and the cycle of their growth. At the same time he gives with brevity a clear description of the river cycle. The author is, perhaps, not quite consistent as he uses the new or rare word 'phacoids' for 'augen,' which is fully as bad as phenocryst. He seems to wish here to avoid the German, but in another connection uses lee-seite and stoss-seite, when lee-side and stoss-side are good English. In still another connection the word hornfelses has an unattractive look.

In this large book, given up almost entirely to the presentation of facts, the reviewer has wished to criticize only one minor statement. It is said (p. 51) "Tachylite is altered to a yellowish or reddish substance known as Palagonite." Palagonite is certainly an original volcanic glass which has cooled with its present large content of water. A certain uncertainty inherent in the subject may be noted in the treatment of amphibolite and hornblende schist. The two volumes thus supplement each other in a valuable way, the one being a full and well-considered hand-book for use in the sober work of geological surveying or economic investigation, in a country like Scotland, where there are no active volcanoes,

earthquakes or glaciers; the other a bold and stimulating guide in every branch of research concerning the evolution of the earth.

B. K. Emerson.

Amherst, Mass.

The Students' Laboratory Manual of Physical Geography. By Albert Perry Brigham. New York, Appleton. 1904.

This is an expansion of the 'Teachers' Guide and Laboratory Exercises' published in 1903, and like it designed to accompany Gilbert and Brigham's 'Introduction to Physical Geography,' to which it is very closely adjusted. It is about half as large again as the 'Teachers' Guide,' but omits the lists of books. It is purely for the student and implies the additional use of the guide by the instructor.

Any one using the text referred to will find this an admirable guide for its illustration by map and exercise. It contains many suggestive questions that must help the inexperienced teacher toward modern points of view. This is particularly true of the questions on map reading, which are good and abundant, as they ought to be. For class use they may need some selection apart from selection of exercises, if thorough work by the student himself is to be done. Thus the exercise numbered 13, contoured maps, has material for three one hour exercises with pupils in the 'early stages of the high-school course,' if the reviewer's experience is to be trusted. Drawing a section for the first time, for instance, is no side issue, but quite a task in itself. Alongside this exercise 263b, C. S. Chart No. 3,089 is wonderfully short and easy, though for students well advanced toward the end of their course. The practical exercises are still further from definite form. It would be a hardship to put this book into the hands of the ordinary teacher of the subject, who is almost invariably too crowded for time and too incompetent in the subject matter to rearrange the exercises in practical form, and require her to use it with her classes. No doubt the class would get advantage of it.

It might be supposed that the wide use of laboratory manuals for physics and chemistry might guide us in some measure in preparing one for physical geography. Many of these are models in their clear statement of what materials to use, what to do with them and how to do it. This definiteness is of great importance. First-year pupils in a high school will find the latitude exercise in this volume, with its generalities, its principle, its geometry and trigonometry, very discouraging.

The description of field exercises for use in unknown localities has generality and vagueness imposed on it by necessity. It is difficult to conceive of satisfactory accounts being written for such work. Professor Brigham has gathered together some excellent suggestions, and that is all that can be done. The variety of the local fields forbids adequate general treatment. The point of view of the work is modern and scientific, as would be expected of its author. Teachers will find it a safe guide to open their eyes and those of their pupils to the real world about them. Altogether we are left still awaiting an adequate laboratory manual for physical geography, but in the present volume is much material that ought to figure in the book when it is written, much material that ought to be in the hands of teachers attempting laboratory work or wishing to know how to do it.

Mark S. W. Jefferson.

Ypsilanti, Mich.,
September 19, 1905.

Elements of Applied Microscopy. A Textbook for Beginners. By Charles-Edward Amory Winslow, Instructor in Industrial Microscopy and Sanitary Biology in the Massachusetts Institute of Technology. Pp. 183, with 60 text figures. New York, John Wiley and Sons. 1905.

This manual is an excellent example of a book prepared for a definite purpose and as the result of experience in an institution where independent work and special ideas have a prominent place.

As the author states in his preface the book does not profess to compete, on the one hand, with monographs or on the other with the popular works on microscopy. It is, however, specifically intended for the class in industrial