of geology, such as Dr. Hermann Credner's "Elemente der Geologie" and Dr. F. von Hochstetter's "Die Erde nach ihrer Zusammensetzung, ihrem Bau, und ihrer Bildung," the necessity of this term physiography is admitted and its use justified. Like the term "biology," that of "physiography" may not improbably meet with some opposition on its first introduction, but as the importance and connection of the branches of knowledge which it embraces become more widely appreciated, the necessity and convenience of the name will doubtless make themselves very generally felt. In conclusion, we cannot part from the little book which has prompted these remarks without taking the opportunity of congratulating the author on his success in presenting to the public, in a form at once compendious and popular, the outlines of this very important branch of science. J. W. J.

THE LABORATORY GUIDE

A Manual of Practical Chemistry for Colleges and Schools. Specially Arranged for Agricultural Students. By Arthur Herbert Church, M.A., Professor of Chemistry in the Agricultural College, Cirencester. Fourth Edition, revised. (London: John Van Voorst, 1877.)

THE fact that Prof. Church's "Laboratory Guide" has reached a fourth edition is a proof that the work has been found useful by that class of students for whom it is specially arranged. Notwithstanding this fact we cannot regard the book as occupying other than a second-rate position in the literature of applied chemistry. The aim of the "Guide" is (1) to place before the student a series of lessons in chemical manipulation in working through which he shall obtain a practical knowledge of "some of the chief truths learnt during the course of lectures on inorganic or mineral chemistry;" (2) to instruct the student in qualitative analysis with especial reference to the analysis of agricultural products; (3) to lay before the more advanced student a number of processes for the quantitative analysis of agricultural substances, food stuffs, manures, &c. The first part of the work comprises a number of fairly well chosen examples in chemical manipulation, preparation of gases, and examination of solid substances. What we should most object to in this portion of the "Guide" is want of method. A few blowpipe experiments are introduced here and there, followed, perhaps, by a short description of one or two rough experiments illustrative of the manufacture of superphosphates; these are succeeded by desultory tests for sugar in milk, by casual semi-quantitative experiments on bread, and so on. To a student without any knowledge of chemistry such a course as that sketched in the first part of the "Guide" may be of use, although we think more care would require to be shown in the selection of experiments; but the book assumes that the student accompanies his practical work by attendance on lectures; surely then the practical course ought, from its very commencement, to be systematic and progressive. The directions given in each lesson are, as a rule, too meagre; without the constant superintendence of a teacher we doubt whether the beginner in practical work could make much progress. In some cases the directions are so vague and inexact as to be positively misleading: witness the method for detecting alum in bread (p. 43). Part II. treating of qualitative analysis has the same failings as Part I.; it is not exact and definite. The author, in his introduction, especially announces that the work is limited in its aim, so that we cannot find fault with him for not including tests for all the metals; but so far as it goes the information given, and the system of teaching pursued, should have been definite, condensed, and such as would train the student in habits of accuracy. No doubt the reactions detailed are true so far as they go; the schemes of analysis are tolerably good, yet there is about it all a slipshod appearance which stamps the work with an unsatisfactory character.

The processes of quantitative analysis are chiefly such as are required in the examination of agricultural products, and substances used in manufacturing manures, of a few leading food stuffs, of soils, and of waters. As the author has not wished to produce a large work, he has limited himself to a description of methods of analysis "intended only for the particular case mentioned;" these processes "may fail if . . . . other substances be present than those here supposed." We cannot help thinking that this is exactly what he ought not to have done; if the book is to be a guide to the student, if it does not pretend to the place of an encyclopædic reference book, then processes of *general* applicability, should have been selected, processes which would illustrate the application of the general principles of analysis, not processes which the student is to learn by rote, and which he will therefore come to regard in much the same light as that in which the cook views her book of receipts. Many of the processes, regarded simply as prescriptions, are faulty or very meagre. Who would apply the volumetric Uranium method for determining phosphates in the manner described on pp. 157, 158? Aided only by the description of the volumetric method for determining chlorine given on pp. 159, 160, who could ever hope to perform an exact estimation of that element? From what is said on p. 150 one would suppose that "reduced phosphates" can be readily determined with something like accuracy. Th report of the British Association Committee has shown that no method for even approximately determining these phosphates has as yet been introduced.

The processes for the analysis of milk, cheese, and butter are extremely meagre. Now that we are possessed of really good and reliable methods for analysing these food stuffs, the introduction into a manual of vague and sketchy methods is almost worse than the omission of all methods, whether good or bad.

One point there is in which Prof. Church deserves all praise, namely, the employment of a systematic nomenclature. The system adopted is that first employed in the works of Roscoe, and of Harcourt and Madan, and now adopted in the *Journal* of the Chemical Society, in Watts's *Dictionary*, and in most of the modern treatises. This system, although not slavishly bound down by rule—although it allows one to say *sulphate of zinc* as well as *zincic sulphate*—is founded on certain definite ideas, and has, at the same time, shown itself capable of expansion with the needs of an increasing science.

The system is, moreover, nearly identical with that employed by the German chemists. Prof. Church has done well in making use of it.