in getting his students to understand in a satisfactory way the effects of changes of temperature and pressure upon gases individually and in general, after the student has performed the ordinary elementary experiments upon the principal gases. But turning to this subject in the present hand-book, we find that the student has to study these effects before he has seen or read of any gas whatever, unless we suppose that "the gas" at gas-works, or the air mentioned in earlier chapters, will be retained in the student's mind and applied by him to the rules given. In the questions set on this part of the subject, "a gas" is the vague expression almost always used, for fear, we presume, it should be imagined that the rules given are more intimately connected with oxygen than with hydrogen, &c.

In the early pages the learner is introduced to gases by the statement that gas-holders are "employed at gas-works for holding the gas," and is then instructed, without even the suggestion of an experiment, how to collect gases over water and in other ways, how to transfer gases to the lecture table, how to burn substances in gases, to burn gases themselves, to generate gases when heat is required and when heat is not required, and so on. The student, having got this abstract information in all its minuteness of practical detail, is expected to keep it in his memory, and to work and study through nearly two hundred pages dealing fully with, to him, a vast variety of complex subjects, before he can apply it to practical use in relation to hydrogen. By dint of much searching (for there is no index, and hydrogen does not appear to be mentioned at all in the meagre contents table) we have found a paragraph headed "Hydrogen" at p. 213. In this page no experiments are set down to be done, and the first suggestion of any practical exercise is the statement that "it can be obtained, as has been shown (Experiment 400), by electrolyzing water." The past and future are here confused, for Experiment 400 is twenty-two pages further on. This is apparently an unintentional memory exercise for the student. A few lines below, it is stated that "it is usually obtained by the action of H_2SO_4 or HCl on Zn or on Fe (see note, p. 183)." At this page we find a jar of hydrogen is required for an experiment (to extinguish burning phosphorus with), and in a note a method by which hydrogen "may be prepared" is given, with far too little description for a beginner and far too much for anyone else. We venture to predict that before many students have worked through this volume, one will be found to march off with a jar to the "gas-works" to get it filled with hydrogen, with the full conviction that he is carrying out, if not the specific instructions before him, at least an alternative way set down in the book to get his hydrogen to extinguish his phosphorus with.

There is a large measure of truth in the old saying that "example is better than precept," and this when translated into chemical language tells us that "experiment is better than theory." Theories in chemistry are of no use whatever to the student except as they enable him to remember, classify, and utilize his facts; and if the theories are to be divorced from the facts, or if the facts are only to be introduced as if they were accidental illustrations of the theories, then the study of—so-called—chemistry becomes as useless as the study of the dead languages. We consider that any method of teaching that tends to lead the student of chemistry to regard the theories he has to learn as anything more than suggestions that will be of assistance to him, is calculated to injure whatever of scientific capability he may possess. Good and useful theories have been believed in, and they have had to be modified, enlarged, or rejected as the growing richness of facts has demanded more extensive ideas. To teach the theories without the facts is to teach the fallible side of the science, and to make the theories more important than the facts is to attempt to balance a pyramid upon its apex.

OUR BOOK SHELF.

Treatise on Meteorological Apparatus and Methods. By Cleveland Abbe, A.M. (Washington: Government Printing Office, 1888.)

METEOROLOGICAL observations have been made more or less continuously since the days of Ferdinand II., Grand Duke of Tuscany, who first organized systematic observations in the year 1653. A full account of the progress which has been made since then in securing data of greater accuracy is contained in the book before us, which forms the forty-sixth appendix to the Report of the Chief Signal Officer to the United States Government. There are five different sections, one being devoted to temperature, one to pressure, one to atmospheric movements, one to aqueous vapour, and the last to the measurement of rain and snow. Each section commences with a general statement of the object to be attained, then the formulæ for correction are discussed, and finally there are descriptions of the most accurate instruments which are at present available. Every form of meteorological instrument hitherto conceived seems to find a place in this wonderfully complete treatise. Besides the ordinary instruments, all the self-recording arrangements are described, and their relative merits discussed. Diagrams of most of the instruments are also given. Those who have but a slight acquaintance with the subject will no doubt be surprised at the number of different methods of determining the same data, and at the number of corrections which it is necessary to make before the results can lay claim to scientific accuracy. The methods and standards adopted by the International Bureau of Weights and Measures are fully considered in every case where they are applicable.

The treatise will be invaluable to all meteorologists, and will undoubtedly do a good deal towards extending the usefulness of meteorological observations generally. Other treatises on optics, electricity, and actinometry are to follow.

New Zealand of To-day. By John Bradshaw. (London: Sampson Low, 1888.)

Round about New Zealand. By E. W. Payton. (London: Chapman and Hall, 1888.)

IN each of these books there is a full and interesting account of the present condition of New Zealand. Mr. Bradshaw's indignation has been excited by some of the hasty judgments expressed by Mr. Froude in "Oceana," and "New Zealand of To-day" may be regarded as to some extent an answer to Mr. Froude's criticisms. Mr. Payton's book consists of "notes from a journal of three years' wanderings in the Antipodes," and the impression produced by his narrative is not essentially different from that of Mr. Bradshaw's more polemical work. Both writers believe strongly in the future of New Zealand, and express warm admiration for the great results already achieved by the colonists. Yet it cannot be said that