delimiting plant communities on purely objective grounds and the bearing of this upon the classification of vegetation.

Although one chapter gives examples of correlations between vegetation and the level of environmental factors, the book is not primarily concerned with ecology in the usual sense of the word—the relation between organisms and their environment—or with the quantitative study of these relations as estimated, for example, by weighing, counting or measuring. To this extent the title is a misnomer. It is, indeed, in the reviewer's estimation the only part of the book open to real criticism.

Although ecologists dealing with vegetation have usually accepted the simplest descriptive units which could be clearly defined (hence often a species) as the quantitative basis for correlations between vegetation and environment, most of them at some time have also wished for larger units with objective biological significance. Long ago this was the initial attraction of the methods of the Upsala school, though in that case, as so often since, the hope was soon dispelled. This ideal the author of this work keeps clearly in mind and the great merit of the book is that it discusses at frequent intervals the basic problems which have to be faced in arriving at suitable underlying concepts. It indicates how, in the author's opinion, solutions might be found. While the reader may find himself at times unable to agree with the author, he will certainly also find the discussions thoughtful and stimulating, though, as is often the case in such matters, it is not possible to convey their interest in a short review.

This is a useful and timely book : useful, because it collects most of the pertinent arguments and statistical methods in one volume ; timely, because it tries to integrate the large recent accessions of literature in this field and also because it presents and unifies ideas and thus will undoubtedly form a basis for further advances.

W. H. Pearsall

SCIENCE FOR STUDENTS OF THE HUMANITIES

Harvard Case Histories in Experimental Science

Edited by James Bryant Conant and Leonard K. Nash. Vol. 1. Pp. xvi+322. Vol. 2. Pp. v+323–639. (Cambridge, Mass. : Harvard University Press ; London : Oxford University Press, 1957.) 80*s*. net the set.

THE case histories in experimental science introduced to Harvard by J. B. Conant have become widely known as representing an interesting experiment in the teaching of science to non-scientists. The collection of eight of these case histories into two volumes, under Conant's editorship, has now made them easily available to English readers. The 'cases' are concerned with : Boyle's experiments in pneumatics ; the overthrow of the phlogiston theory ; the early development of the concepts of temperature and heat ; the atomic–molecular theory ; plants and the atmosphere ; Pasteur's study of fermentation ; Pasteur's and Tyndall's study of spontaneous generation ; the development of the concept of electric charge.

Each 'case' is in the form of a self-contained essay aimed at bringing the reader into the frame of mind of the earlier experimenters and at showing him how difficult it often was for investigators to make a break with tradition and to start thinking along new lines. It is shown how the change in point of view depended jointly on experimentation and on imaginative conjecture, and how the approach was seldom direct, but when seen from our more enlightened point of view seems often to have been roundabout and tortuous. To bring the reader more closely into contact with the mental attitude of the original investigators, skilful use is made of quotations from original papers.

It is difficult for a scientist to assess how far a non-scientist would find these essays interesting or instructive. For that it is best to rely on experience in the United States, where, at Harvard and elsewhere, they have been highly successful, in the hands of skilled teachers, in transmitting something of the principles of scientific investigation to those whose main studies were in the humanities.

To a scientist, however, there is no doubt at all that the essays provide an excellent account of how a series of discoveries came about, and the reader finds himself sharing in the excitement of the early investigators. Most scientists will find much that is new, even in the history of their own subject. I learnt for the first time, for example, how Hauksbee's experiments led him by curiously devious routes from the study of the flash of light which sometimes occurs in the space above the mercury when a barometer tube is shaken, to the discovery of several new phenomena in electrostatics and, in particular, to that of electrostatic induction.

Most degree courses in science are so concerned with imparting the maximum of 'useful' knowledge that neither teachers nor learners often find time to inquire just how some of the concepts they take for granted really arose. It is difficult to avoid being swept along with this rushing stream of education and discovery ; but if it is to be education in the true sense, and not just the acquiring of technical knowledge which will 'work' when one has to solve a problem, it is necessary to pause at intervals and ask how some of our present-day scientific concepts first arose.

These volumes will provide quiet backwaters into which the research worker or teacher can turn and linger for a short time to study what has happened to the streams of discovery before he joined it, and before he joins it again in his headlong rush to make those advances in knowledge which will form the subject of 'case histories' in the future.

J. A. Ratcliffe

THEORETICAL OPTICS

Geometrical and Physical Optics

By Dr. R. S. Longhurst. Pp. xvi+534. (London and New York : Longmans, Green and Co., Ltd., 1957.) 60*s*. net.

WITHOUT necessarily asking too much from the reader of limited mathematical attainment, Dr. Longhurst has given a most comprehensive account of geometrical and physical optics at degree standard which should be widely welcomed. For the pass or general degree student, the treatment is taken as far as possible along elementary lines. The more difficult mathematical work is grouped into separate sections, for those who have to read more deeply ; and modern experimental work, and practical applications of optical techniques, are discussed