

which carries you on, in spite of a knowledge that the writer is 'on very thin ice' a great deal of the time. The off-hand way in which some rather serious problems are treated is hardly fair, even if we should agree with the sarcasm of some of her criticisms of isolated cases. For example, much space is devoted to the discussion of the subject of the need of proper training for the natives. And where the mission schools go to work along the lines of tailoring, printing, bookbinding, etc., many of which West Africa is certainly not in the most urgent need of, we should agree that they could employ their time much better upon such subjects as smithwork, carpentering or, best of all, agriculture. Our young lady, however, is never tired of quoting Dr. Nassau, for his great learning on the subject of the blacks, and then pokes fun at his efforts and those of some of his colleagues, forgetting that the seamy side of the garment of civilization as applied to the West Coast is probably just as apparent to them as to her, during her rather picnic-like excursions into these regions.

As an example, "even sewing, washing and ironing are a little ahead of time. When the girl goes back to her husband with her two dresses she will soon be reduced to a single dirty rag, which will answer for dress, sheet, towel and dish cloth, and then think of the envy and jealousy of the other wives, and the state of feeling induced by such style. Washing and ironing become parlor accomplishments when your husband does not wear a shirt, and when household linen is non-existent." One might ask the question, What is the use of trying to do anything?

Some of the writer's conclusions form very interesting reading. One of the new reasons given for polygamy is that the man of the house is liable to 'get enough to eat.' But when, after getting fast on a sand bank, and trying to haul off by fastening a line to the trees on the main bank, and succeeding in pulling away the bank, trees and all, she reaches the conclusion that 'Africa is a rotten Continent,' we cannot help but admire the stoical cheerfulness which is certainly the prime requisite for a good traveller.

One of her 'hints to travellers' is worthy

of a wide circulation, namely, to always learn the word or words meaning 'I don't know!' as instances are given where four villages and two rivers have been graced with words bearing this interpretation, which does not tend to geographical clearness. Another feature might be added, drawn from the fact that rivers are sometimes called by one name going up, and by another going down the current.

The really valuable portion of the book is that devoted to the subject of fetichism. Here the inspiration of Dr. Nassau is plainly visible, though there is a great deal of clear insight and common sense used in the interpretation of some of these difficult problems. It is a valuable contribution to our knowledge of the subject.

There are five appendices to the work. The first two are by the authoress upon Trade and Labor on the West Coast and upon Labor. These are followed by a chapter by Dr. Günther describing her collection of fish and reptiles. Appendix IV. is by Mr. Kirby, of the British Museum, on the insects obtained from the Ogowe region. The last is a legend of the origin of the cloth loom.

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*The Microscope and Microscopical Methods.* By SIMON HENRY GAGE. Sixth edition. Rewritten, greatly enlarged. Comstock Publishing Company, Ithaca, New York. 1896. Octavo; pp. xii+237; 165 figures, 1 plate.

The appearance of a new edition of Professor Gage's work on 'The Microscope' calls for notice, since the addition of a large number of figures and about 90 pages of new material have made it practically a new book. As stated in the preface, the plan of the work is: 'Actual experiments carried on by the student himself;' and in this respect the book is probably unique in its field, and, it is needless to say, thoroughly in accord with the modern scientific method. In the preparation of the book Professor Gage has drawn upon his long experience and numerous publications on microscopic technique, and in particular subjects has taken pains to consult specialists whose authority would not be questioned and to whom due acknowledg-

ment is made in various places. The extensive scope of the book is well shown by an outline of the various chapters: (1) The microscope and its parts. (2) The manipulation of the same. (3) The interpretation of images. (4) Magnification and measurement. (5) Drawing. (6) Micro-spectroscope and polariscope. (7) Technique of the object. (8) Photo-micrography.

To these are added a copious appendix on methods of testing and on preparing figures for publication, while the whole is terminated by an extensive bibliographical list and by a good index. The bibliography is to be especially commended for its accuracy and completeness. A careful review of its five pages of closely printed type discloses only one omission, though that is rather a striking one, the *Zeitschrift für angewandte Mikroskopie*.

The book is full of valuable information, not only for the student, but for those of considerable experience in microscopic technique, and the number of good hints which are given is very large. Of course, every man has his own ideas with reference to details of technique, and undoubtedly no one would agree with the exact plan outlined by the author. For instance, some would undoubtedly criticise the statements that balsam mounts should be sealed, as also that collodion is the most generally available imbedding material. Many will find fault with the detail of instruction given for the use of the mathematical tables. These are, however, particulars in which the manual is suited to the course given by Professor Gage, and easily capable of omission by those who use the book with other ideas in mind.

It may be fairly questioned whether the amount of space given to the microscope and its accessories from an optical standpoint is not excessive; as compared with Behrens, Kossel & Schiefferdecker, for instance, the extent of space devoted to this branch of the topic is rather striking. In the latter work about 30 per cent. of the space is devoted to the instrument, while 50 per cent. is spent in the consideration of the preparation of the object. In Professor Gage's book the microscope and its accessories occupy about 80 per cent. of the entire work; and even when one considers that some parts are discussed here more fully in the

light of recent development in certain branches of the subject, it is still questionable whether the technique of the object has not been slighted in favor of the technique of the instrument. As the reviewer has pointed out elsewhere, it is undoubtedly by the development in the manipulation of the object that recent years have advanced so far, and it is to this advance that we are indebted for our rapidly growing knowledge with reference to more fundamental phenomena of biological science. Some years ago in his address, 'A Plea for Physiological Histology,' Professor Gage himself emphasized this side of the question. The various methods of reconstruction are, in the opinion of the reviewer, of much greater general importance to the student in every branch of biological science than some of the difficult mathematical discussions of optics which are treated at length in the book, and yet the topic of reconstruction has not even been mentioned. This is all the more striking when one recalls that we are indebted to Mrs. Gage for a most admirable and inexpensive method of reconstruction, and when the various methods have been so largely applied both by her and by the author in their various researches.

The treatment of the microscope as an optical instrument, with its various accessories, is exceedingly complete; so much so that Professor Gage gives us fourteen full pages of cuts of microscopes, in which good, bad and indifferent stands are mixed with rare impartiality. There is no discussion of the principles on which the construction of the various types is based, and no choice expressed with reference to which are the most reliable or would best perform certain sorts of work. The beginner, or even a student of some experience, would sit dazed before this collection of figures in his efforts to decide which he needed. The inclusion of so many cuts was, perhaps, a necessity of the case, seeing that the electrotypes were donated by the manufacturers and it would have been unwise to have slighted any particular firm; and yet it might have helped a little to have discussed briefly the general principles of construction involved.

Among minor defects one might mention a lack of care in type-reading, which shows itself

in the use of both m.m. and mm. several times on the same page, and in the recurrence of various misspelled names. It is certainly amusing to learn that an article can easily be made by a *tin smith*. One notices, also, an occasional slip of the pen, as a result of which figure and text do not always agree. Thus, the mechanical stage, shown in figure 69, does not possess verniers, despite the statement in the description of the cut, and the absence of this feature is undoubtedly a serious defect in the construction of the stage as compared with that of another maker which is shown in the adjacent figure. The excessive number and length of the foot-notes in the book mar the beauty of the page, and many of them might easily have been incorporated in the text. It is further true that the constant use of vulgar fractions, which have no place in a scientific text-book, is another point to be justly criticised. Their employment also is not limited to such as are difficult to translate into decimal figures, but  $\frac{1}{10}$ ,  $\frac{5}{100}$  mm., etc., are of constant occurrence.

While it would be manifestly unfair to give an idea of the book based merely on these criticisms of minor details, it is evidently impossible to do more than hint at some of the many advantageous features which it contains. The synopses of the steps in the preparation of paraffin and collodion sections are of exceeding value to any student and will doubtless save much time and many errors. Throughout the book one finds very complete cross references and satisfactory bibliographical notes which will be of constant use to the worker. Every topic is completely and concisely discussed; the order is clear and logical, and one is at a loss to suggest points that have been overlooked.

The chapter on Photo-micrography deserves especial mention. It includes much that cannot be found elsewhere and is altogether the best concise statement of the subject which is accessible. This chapter is worth more than the price of the entire work. Like the rest of the book, it is copiously illustrated; the figures are exceptionally well chosen, and among them are a couple of splendid photo-micrographs from the work of Mrs. Gage, who also drew all the original figures by which the work is illustrated.

As a whole, the work is a useful and valuable addition to the manuals accessible to the American teacher and is destined to be widely and generally used.

HENRY BALDWIN WARD.

*The Chances of Death and other Studies in Evolution.* KARL PEARSON. Edward Arnold, London and New York. Vol. I., pp. ix+388; vol. II., pp. 460. \$8.00.

Professor Pearson's essays and lectures fall into three groups. One of these is concerned with the theory of deviations from the mean in its application to vital and social phenomena, another with a criticism of certain popular writers who have exploited science for the benefit of religion and politics, and the third with studies in folk-lore and folk-customs, viewed from the light they cast on the evolution of society. All of the essays are of great contemporary interest, and have to a considerable degree the unity claimed by the author, 'the endeavor to see all phenomena, physical and social, as a connected growth, and describe them as such in the briefest formula possible.'

The essays on variation in this volume, and the series of papers on the mathematical theory of evolution published in the *Transactions and Proceedings* of the Royal Society since 1894, represent a scientific advance of great importance. Modern science pursues two main methods; it is either quantitative or genetic. The exact sciences have found in measurement a method of description so efficient, economical and universal that it must be regarded as the goal of those sciences in which description is only qualitative. The genetic method has, however, since the publication of the 'Origin of Species by Means of Natural Selection,' demonstrated its validity. Could we add to the genetic method of natural science the quantitative method of exact science a great advance would be assured.

It is not possible to describe in a few words what has in fact been accomplished since Quetelet applied the Gauss theory of the distribution of errors to vital phenomena. If any trait, such as the height of men, depends on a great number of small causes, some tending to make them smaller and an equal number tending to