

1872, to 3,736,771 in 1883. Trade has more than kept pace with the advance of population and revenue, as the following figures will show: In 1874 the imports were £1,859,095, and in 1883, £3,772,887. In 1874 the exports were £3,480,407, and in 1883, £7,039,525. The relative increase of the imports is somewhat greater than the increase in exports; but, with the balance of trade so strongly in favor of the province, its capacity as a consumer of British manufactures is very imperfectly measured by the actual value of the imports. Again: the comparatively small amount of those imports demonstrates conclusively that upper Burmah has acted as an effectual and insurmountable barrier between the port of Rangoon and those illimitable commercial requirements of western China and the Shan states which it has been the hope of the government and merchants alike to ascertain and to satisfy. Rice represents 80 per cent of the total exports. The other chief exports are teak, cotton, jade, petroleum, spices, tobacco, hides, horns, ivory, India-rubber, shellac, cutch, and drugs. Of these, teak forms 7 per cent of the total exports, and cotton  $2\frac{1}{2}$  per cent.

The statistics of the province show that one of the chief wants is population,—a want which our connection with India and China would make it easy for Madras, Bengal, and China to supply, thus adding materially to the producing capacity and general prosperity of the province.

#### SOME RECENT TEXT-BOOKS ON METHODS IN MICROSCOPIC ANATOMY.

THE rapidity of the improvements recently made in methods devised for carrying on all kinds of zoölogical investigations has resulted in the establishment of journals largely, or even exclusively, devoted to the diffusion of information in technic. The amount of valuable experience already acquired over a field much broader than that covered by the older text-books on histology has rendered it imperative that the sources of this widely scattered information should be systematically reviewed with the purpose of collecting its important and really valuable elements, and putting them into a shape convenient for use both by beginners and by such investigators as are wise enough not to waste time by remaining content with the scanty methods and appliances of twenty, or even ten, years ago.

The value of the text-book which summarizes the present acquisitions in this field will depend upon several things, but principally upon the critical knowledge and experience which its au-

thor brings to bear on the selection of material, and the method of treating his subject.

Since the publication of the first part of Fol's 'Lehrbuch der vergleichenden mikroskopischen anatomie,'<sup>1</sup> in 1884, there have appeared several books having this general purpose in view. The immediate aims of the three mentioned below<sup>2</sup> are not quite identical: each fills a place not fully occupied by either of the others. The first is primarily intended for the beginner, to whom sources of difficulty and their remedies are explained; the third, while intended first of all for 'the instructed anatomist,' also aims to be of use to the beginner; the second takes a middle ground between the other two, in that it does not aim to be 'an exhaustive treatise of the subject in any of its aspects,' but endeavors to meet 'the every-day needs of a zoölogical laboratory.'

In a small pamphlet of about forty pages, Kükenthal has brought together concise practical directions covering the more important of the recent technical methods employed by zoölogists. The statement in the preface that this little book contains nothing essentially new is realized. At the same time, it meets very satisfactorily the needs of a beginner: for the selections made are, on the whole, judicious; and the descriptions, though brief, are intelligible and to the point. About one-third of the book is devoted to the processes (illustrated) of embedding (chloroform-paraffine), sectioning, and affixing sections; but the space devoted to embedding in gum, albumen, and celloidin, is too brief to be of much service. Its compact and unpretending form puts this little pamphlet within easy reach of every beginner, and those to whom German is no impediment will find it serviceable.

Whitman's work is an immediate outgrowth from his editorial labors, in connection with the department of microscopy in the *American naturalist*; but it is much more than a compilation of matter already published there. Although the book is called '*Methods in microscopical anatomy*,' etc., its scope is somewhat broader than that of the two other works, for '*material and methods*' sums up the author's view of the needs of the zoölogical laboratory; and upon both points he aims to be of service.

Part i. deals with general methods, which are

<sup>1</sup> For a review of Fol's book see *Science*, vol. v. p. 510.

<sup>2</sup> *Die mikroskopische technik im zoologischen praktikum.* Von Dr. WILLY KÜKENENTHAL. Jena, Fischer, 1885. 16°.

*Methods of research in microscopical anatomy and embryology.* By CHARLES OTIS WHITMAN. Boston, Cassino, 1885. 8°.

*The microtome's vade-mecum; a hand-book of the methods of microscopic anatomy.* By ARTHUR BOLLES LEE. Philadelphia, Blakiston, 1885. 12°.

introduced by a few pages intended to orient the beginner as to the proper sequence of steps in the more difficult work, and to acquaint him with the facts and underlying reasons connected with killing, hardening, and staining. The chapter on reagents (preservative, macerating, decalcifying, etc.) is followed by methods of staining, metallic impregnations, and bleaching. Microtomes, together with their auxiliaries and methods of embedding (freely illustrated), occupy two chapters, and the remaining three of the first part are devoted to methods of fixing serial sections, to mounting media, etc.

The second part, which occupies about half the volume, contains some matter not previously published. About fifty pages are devoted to 'embryological methods.' This chapter furnishes much valuable information, but the arrangement leaves the impression that it is the result of fortuitous reading rather than a methodical search for the most valuable things within the scope of the topic. The chapter on 'Times and places of ovulation' serves at least to call attention to the desirability of a more extensive compilation of the facts hitherto published on this subject, as a means of aiding less experienced students in their search for embryological material. The methods employed in studying karyokinesis during cell-division and in the preparation of nervous tissue are considered separately from 'Histological methods,' without any very apparent reason. The important methods of reconstructing the object from microscopic sections introduced by His, Born, and others, form the concluding chapter, which is followed by an appendix principally devoted to recent methods of injecting.

Although not exhaustive, nor perhaps symmetrically planned, both the matter and the manner of the book commend it to every advanced and advancing zoologist as well as to beginners; and it is for that very reason that one interested in real scientific progress the more regrets to see a publisher possessed of the idea that his interests demand the production of a book twice as bulky and twice as expensive as it need be.

Lee's book is the outcome of a more pretentious undertaking. The author has desired to produce 'a concise but complete account of all the methods of preparation that have been recommended as useful for the purpose of microscopic anatomy.' Whatever opinion one may entertain about the desirability of a manual framed on so catholic a plan, it must be admitted that the author has brought together an immense amount of material in a compact and handy form, which goes far toward saying it will get used; for the book-maker who makes books for any but people of

superfluous leisure, must make them so that they can be consulted without waste of time.

Notwithstanding a natural prejudice which one experiences when an author declines to use his judgment for the reader's benefit, it must be granted that Lee's work is not edited without discrimination, for the brief but valuable introductions which precede the more important topics show that the author is fully alive to the principles underlying manipulations. The citation of the sources of the formulae gives to the student the requisite opportunity for ready verification and control, and the plan of using serial numbers to indicate the successive sections of the book is economical both for author and reader. The latter would have been spared much time, if a column for page-references had been added in the index.

The 'vade-mecum' is practically without illustrations, and, although supposed to be 'exhaustive,' appears to have ignored the important aids to killing animals in a distended and natural condition which are afforded by certain stupefying reagents, such as nicotine, chloral hydrate, etc.

The author defends the nature of his publication — from which "no process having any claim to scientific status has been rejected, nor any (he trusts) unwittingly omitted" — on the ground that (though "a large proportion of the formulae are quite superseded in modern practice") "some one or other of them may perhaps serve, in some way that cannot now be foreseen, to suggest some new method of value;" and he enforces his opinion by reference to the history of the use of corrosive sublimate. He, however, uses the knife (and how could he fail to?) when he comes to the matter of 'cements and varnishes.' The magnitude of the undertaking has also compelled him to modify his original plan of making the second part traverse the entire field of histology and microscopic zootomy, "giving the student detailed instructions for the examination of all structures that have hitherto been studied, and thus making him entirely independent of all help from a teacher."

The author, therefore, limits himself in the special part to about one-fourth of his four hundred pages, and considers in it 'only very special cases,' such as cell-division, the microtomy of the human brain, etc. The histological part of the field has received much the larger share of attention, — the nervous system, nerve terminations, sense-organs, being very fully treated, — and the embryological only a fragmentary consideration. For this reason and others, the works of Lee and Whitman supplement each other in such a way that no one actively engaged in microscopic work can afford to dispense with either.