California with fourteen and Columbia with thirteen. Of the Harvard thirty-five, seven are professors in the Medical School.

Allowing for those who may be attached to the Bussey Institution or other exclusively graduate departments of the university, it is safe to say that between twenty and twenty-five of these eminent scientists are members of the Harvard Faculty of Arts and Sciences and are therefore accessible to the undergraduates in Harvard College.

The National Academy of Sciences includes only men engaged in mathematics and the natural sciences, and can, therefore, include only a fraction of the eminent scholars who are members of the Harvard faculties. These figures serve, however, to indicate the kind of opportunity which Harvard as a university-college extends to its undergraduate students. The creative scholarship of the teacher is what makes "higher education" higher than other education. It behooves universities to foster and conserve it, as it behooves students to appreciate it.—*Harvard Alumni Bulletin.*

SCIENTIFIC BOOKS

Die Saeugethiere. Einführung in die Anatomie und Systematik der Recenten und fossilen Mammalia, von MAX WEBER, professor emeritus der Zoologie in Amsterdam. Zweite Auflage. B'd. I, Anatomische-Teil, unter Mitwirkung von Dr. H. M. de Burlet, Prosector a. d. R.-Univ. Utrecht; B'd. II, Systematischer Teil unter Mitwirkung von Dr. Othenio Abel, Prof. d. Paläobiologie a. d. Univ. Wien. Gustav Fischer, publisher, Jena, Vol. I, 1927; Vol. II, 1928.

THE first edition of Weber's text-book on the mammalia was published in 1904, and has been of great value to both teachers and research students. Although dealing primarily with existing mammals, the treatment of extinct forms was exceptionally full and well evaluated. To students of fossil vertebrata it has been indispensable, owing to the clear, concise presentation, free use of tables and diagrams and well-balanced treatment of osteology and "soft" anatomy, taxonomy, distribution and fossil record.

The new edition, revised and enlarged, gives more extended consideration to the paleontology of the mammalia, which has been thoroughly and very ably revised and brought up to date by Professor Abel, whose brilliant researches and text-books have placed him in the forefront of modern vertebrate paleontology. The combination of the sound, conservative judgment and thoroughness of Dr. Weber's treatment of the older phase of the science dealing with modern mammalia, brought well up to date with de Burlet's assistance and the thorough, liberal and sometimes radical review of the fossil evidence and its bearing upon the taxonomy and phylogeny of the mammalia given by Abel, appear to be well suited to the status of these two aspects of the subject. There is much that is new, as Dr. Weber points out, in our acquaintance with modern mammalogy. But its main outlines are fixed and the new evidence serves rather to confirm and settle doubtful points. Paleomammalogy, on the other hand, has been and is still advancing so rapidly and changing so much in major as well as minor features that an adequate treatment of it demands the insight and vision, the tolerance and breadth of view, the ready but provisional acceptance or initiation of new views and concepts, that we find so well displayed in Abel's work.

The student of paleontology will find in the volume an authoritative and accurate statement of what he especially needs to know about modern mammals, and a very complete and critical summary of the recent great advances in our knowledge of fossil mammals. The chapters contributed by Abel will assuredly provoke criticism on various minor and some important points. They are doubtless so intended. Only through such a process can the new knowledge be assimilated to the body of the old.

The first volume of the book, dealing with the anatomy of mammals in general, covers some four hundred pages in addition to bibliography and index. Of these more than half are devoted to the skeleton and skin, nervous and sensory systems. A rather brief treatment is given to the muscles and teeth, the reproductive system is more fully discussed, other features of the anatomy more concisely treated. These proportions are eminently suited to the needs of the paleozoologist, for whom the present reviewer feels qualified to speak. The systematic part forms a volume of 840 pages, preceded by a tabular classification and by lists of the European and North American Tertiary faunas and followed by a bibliography and index. The groups are taken up seriatim with diagnosis and discussion of the characteristic features of each, geographic distribution, taxonomy and past history.

The arrangement of the orders shows some notable differences from the previous edition, reflecting chiefly the better understanding of the relationships of various extinct groups. It is a point of interest that instead of increasing the number of orders Dr. Weber has found it advisable to reduce them from twenty-four to seventeen, making also certain significant shifts in the sequence. The Tubulidentata are wholly dissociated from the Edentate superorder and come

at the end of the ungulate sequence. The Tillodontia are shifted from a position following the rodents to the end of the Insectivora sequence. In the Ungulata we note the disappearance of the artificial Diplarthran group, and an arrangement modified from that of Schlosser, into five orders (1) Subungulata (Hyracoids, Arsinoitheres, Proboscideans and Sirenians), (2) Notoungulata (Toxodonts, Typotheres, Entelonychia and Astrapotheres), (3) Pyrotheria, (4) Artiodaclyta and (5) Mesaxonia (Protungulata = Condylarthra, Perissodactyls, Ancylopoda = Chalicotheriidae, Amblypoda and Litopterna). Numerous changes and additions within each of these larger groups have been occasioned by the paleontological contributions of the last twenty-five years, and with most of them paleontologists in this country will be in agreement, at least as to relative position, although many will be disposed to assign higher rank to some of the groups.

This reviewer is much in sympathy with Weber's conservative attitude as to the scope of taxonomic groups, but would not be disposed to go so far in reducing their rank in several instances. The Multituberculates might at least be granted ordinal rank if indeed they should not be raised to higher standing. A forthcoming article by Granger and Simpson will discuss the evidence on this point. On the other hand, Chalicotheriidae are now generally regarded as a family of Perissodactyla, although Abel has adduced some plausible arguments for maintaining their separate ordinal rank. The substitution of Protungulata for the customary term of Condylarthra is open to criticism, as also the association of Amblypoda with the Mesaxonia group instead of with the Subungulata.

The new edition of *Die Saeugethiere* is cordially commended as a very thorough and up-to-date revision of this most useful text-book.

W. D. MATTHEW

Der Sauerstoff im Eutrophen und Oligotrophen See. By AUGUST THIENEMANN. Bd. IV of Thienemann's "Die Binnengewässer," E. Schweizerbart'sche Verlags-buchhandlung, Stuttgart, 1928. 175 pages, 41 figures.

LIMNOLOGISTS have been making quantitative studies of the dissolved oxygen in lakes for more than three decades, because it is such an important factor in the environment of aquatic organisms. These investigations have yielded an extensive literature on the subject, and the present volume gives a summary and general discussion of the more important results that have been obtained.

Two types of lakes are considered, namely, eutrophic and oligotrophic. Eutrophic lakes are characterized by a marked decrease in the quantity of dissolved oxygen in the lower water (hypolimnion) during the summer period of stagnation; in many lakes belonging to this class only a trace of oxygen or none at all is found in this stratum in late summer. Oligotrophic lakes possess an abundance of oxygen in the lower stratum throughout the summer.

One of the outstanding features of the volume is the development of a formula for the computation of the total oxygen deficiency in eutrophic lakes; the author has made computations for several well-known lakes in order to illustrate his formula. The second chapter deals with the variations that take place in the dissolved oxygen content of lakes during the different seasons of the year; special emphasis is placed upon the changes that take place in the lower water in eutrophic lakes during the summer period of stratification. The variations which are found in the oxygen content of lakes in different years are considered in the third chapter; these annual variations are attributed chiefly to variations in the climatic factor.

In the fourth chapter the author presents the results that have been obtained on lakes that are broken up into bays and separate basins; in several instances cited the different basins of lakes differ very widely in character. The oxygen relations that have been found in the thermocline (mesolimnion) of eutrophic and oligotrophic lakes are discussed in the fifth chapter. In eutrophic lakes there is usually a marked decrease in the quantity of oxygen in the thermocline, but in oligotrophic lakes there is usually very little change in the amount in this stratum.

In the sixth and final chapter the author discusses the causes for the differences in the oxygen relations between eutrophic and oligotrophic lakes. These differences are dependent upon such factors as differences in mean depth, the ratio of the volume of the epilimnion to that of the hypolimnion, the shape of the lake basin and the quantity of organic matter produced by the lake. The bibliography includes fifty-eight titles.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A PHOTOGRAPHIC METHOD OF MEASURING PITCH*

HISTORICALLY there have been five methods used in psycho-physics and physics for determining the frequency of vibration of sound waves in speech and music: (1) Measurements made from graphic or photographic records of sound waves, involving the use of tambours, or such light levers as the Miller

* The term "pitch" is here used in the physical sense.