types of preparation. (2) A continuous supply of scientifically trained workers is demanded. These include especially physicists, meteorologists, radio engineers, all other types of engineers and medical men. (3) The war industries have definite and immediate need for men with practical technical training. (4) Industry and civil life need a continuous supply of physicists, engineers, doctors, chemists and biologists, both for war production and for essential civilian needs. (5) Agriculture and business must have the continuous services of boys and girls. The more training these young people have the more efficient they become for taking the places usually held by older and more experienced people.

Five pre-induction courses have been presented by the War Department and the U. S. Office of Education in elementary electricity, elementary machines, elementary shopwork, automotive machines and radio. Emphasis on these courses will prepare many students for much-needed work, but some students should prepare to go further while others not suited for work of this type must select other useful fields. It is the business of the high school to classify the students and prepare each for the type of this essential work for which he is best adapted.

The Cooperative Committee on Science Teaching has made a definite study of each of the four great science groups—physics, mathematics, biology and chemistry—and offers suggestions on the best courses for the high schools to pursue to meet the changes demanded by the war. These recommendations are published in the February issue of *School Science and Mathematics*. Copies of the report may be obtained by applying to Robert J. Havighurst, The University of Chicago.

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SCIENTIFIC BOOKS

COMPARATIVE VERTEBRATE ANATOMY

Comparative Vertebrate Anatomy. By LIBBIE HENRIETTA HYMAN. 2nd edition. University of Chicago Press. i–xx, 1–544 pp. 136 figs. 1942. $3.50.

IT is hardly possible to review a book properly without also undertaking some sort of analysis of the purpose for which it was written. This is all the more desirable in the present field, because books for use in comparative anatomy classes have not in the past proved entirely satisfactory.

Comparative anatomy of vertebrates is a broad field that it is really impossible to segregate from embryology. It covers the range of vertebrate variation and necessitates more or less dissection—a time-consuming occupation. In breadth it might well be compared with History. Suppose, in his progress from kindergarten to Ph.D., one had not more than 90 hours to cover the extent of History—Ancient, Roman, English, French and United States combined. And yet the student is usually given in comparative anatomy a breadth of field and a wealth of detail that it would take him years to cover adequately.

The only students needing much detailed knowledge of comparative anatomy are those expecting to make a career of either zoology or medicine. To the very much larger percentage of other students the subject is merely an academic discipline the minutiae of which they will soon forget. For such of these as elect it, the presentation should either be combined with embryology, or in a condensed course of one semester, stressing principles and bearing somewhat the same relation to the topic as the course in physiology and anatomy for trained nurses does to these subjects as offered to the student of medicine. From the standpoint of the medical student, at least, what is desired is a working understanding of the phylogeny of the systems—how the parts of the body get that way—rather than a precise knowledge of the anatomy of dogfish, mud puppy or tortoise.

Miss Hyman is a gifted writer of text-books, as she demonstrated in her "Laboratory Manual for Comparative Vertebrate Anatomy" (1922), a book that has been very widely used. The volume under review is a second edition of this, some 30 per cent. larger, with parts rewritten and amplified, and almost twice as many figures. It is now less frankly a dissecting manual. Few, I think, can find fault with the author's plan of procedure as set forth in her prefaces. She is fully aware of the difficulty in presenting such a broad subject in a limited space, particularly by one whose chief research interests lie in the field of invertebrates. Her approach, from the systemic rather than from the type aspect, is in accordance with progressive ideas generally entertained on the subject.

The dogfish, mud puppy, turtle, rabbit and cat are the forms receiving particular consideration, but some attention is paid to other kinds as well. Birds are omitted, as they are so specialized that they hardly belong in a work of this scope. It is probable that the turtle could also be dropped, with some benefit to the student. Both rabbit and cat, especially the latter, are firmly entrenched in zoological curricula, on the basis of availability. In some respects they are entirely satisfactory, but in others, as skeletal and muscular systems, they are quite specialized. Some col-

leges have already found it decidedly worth while, in spite of increase in cost, to use the macaque monkey exclusively for mammalian dissection. This is so very desirable, from the standpoint of the premedical student, that it would have been a progressive step to substitute this mammal for rabbit and cat.

Workers in the phylogeny of vertebrates, including anatomists and embryologists, have been increasingly aware during recent years that one of the greatest needs in this general field is a scrutiny and revaluation of all the old concepts laid down dogmatically several scores of years ago and copied in one generation of text-books after another. The old masters were most gifted zoologists, but the style then was to build, at all costs, complete evolutional and developmental pictures, filling voids with what they believed to be plausible interpretations. Recent books have far too many old illusions interlarded among proven facts. Although Miss Hyman specifically recognizes this situation, she, nevertheless, has succumbed to the temptation of presenting complete, rule-of-thumb developmental pictures. The temptation is great and I have done the same myself, frequently.

One using this book will, I think, wish for more illustrations of a factual nature. There is a sufficient number of embryological figures, and of some other categories, but still other subjects are scantily pictured. Although the turtle is the reptile stressed, none of its musculature is shown, but instead, that of the tuatara, alligator and reconstructions of extinct reptiles. The student needs facts shown, and of forms that he is able to observe. There is no illustration of the peripheral nerves, although the limb plexuses, for instance, may be much more clearly pictured than described; there are no figures of the eye, *et cetera*. The anatomy of hand and foot is of much importance, and yet consideration of the soft parts of the limbs ends at wrist and ankle.

Much of the criticism that might with justice be aimed at this book would apply to any short treatise on the subject. The fact remains, however, that the author has given us the most useful text-book on comparative vertebrate anatomy so far available in the English language.

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COLLEGE CHEMISTRY

Essentials of College Chemistry. By NORMAN KHARASCH and HELEN S. MACKENZIE. xii + 513 pp. New York: D. Van Nostrand Company, Inc. 1942. $3.50.

UNDER this title the authors, both staff members of the Illinois Institute of Technology, have produced a very readable, well-indexed introduction to general chemistry. Their style is clear, direct and unhurried. The illustrations, consisting of 99 figures and 48 tables, are pertinent and well-balanced. The value of the text is enhanced by the use of large, clear type, non-glossy paper and durable binding.

Faced with the necessity of choosing from the vast accumulation of introductory material, the authors have placed extra emphasis upon the structure of matter, and by their omissions and order of arrangement constantly remind us that success lies around many corners.

Each of the twenty-three chapters includes selected references; twenty of them are followed by exercises and six by summaries. Some of the others could have been similarly treated to advantage. The reference book list records but seven general chemistry texts.

Separate title pages divide the text as follows: Introduction; The States of Matter; The Theory of Ionization; The Non-Metals; The Metals; Introduction to Organic Chemistry; The Ceramic Industries; Appendix; Index. These sections do not necessarily indicate their scope. For example, the section titled "The States of Matter" comprises eight chapters, among them, "Atoms-Molecules-Chemical Changes," "The Velocity of Chemical Reactions" and "The Periodic Classification of the Elements." The appendix includes an "Outline of the History of Chemistry," "Rules of Nomenclature for Inorganic Compounds," "Solubilities of some Salts at 20° C" and "Vapor Pressure of Water." A "Table of International Atomic Weights" appears on the inside back cover. The excellent chapter on "Ceramics" was written by an invited specialist in the field.

Some teachers will object to the compression within a single chapter of oxygen, ozone, hydrogen, hydroxides, oxidation, reduction, endo- and exothermic reactions, the activity series of the metals, valence and chemical equivalents. These 22 pages are busy ones indeed. Other teachers will be delighted to find 20 per cent. of the text devoted to carbon and organic chemistry—trimmed freely with structural formulas for sugar and vitamins and such substances as mercurochrome, alizarine, salvarsan and phenolphthalein.

Strong features of the text are acids, bases, hydrolysis, chemical equilibrium, isomerism and structural formulas. The authors employ delightful analogies and techniques to make their points clear. The same strength does not carry over into the field of applied chemistry. And it is unfortunate that the text should be marred by inaccuracies and inconsistencies.

Explosives and combustible mixtures are confused. "$\triangle$" over an equation is used promiscuously to indicate either endothermic action or elevated temperature. Electrolytic equations are written first $2\,Cl^- - 2\,e \rightarrow 2\,Cl$ and then $2\,Br^- \rightarrow 2\,Br + e$.