Thus it appears even in the present necessarily superficial summary of the progress of physics within one hundred years, that, curiously enough, just as the nineteenth century began with dynamics and closed with electricity, so the twentieth century begins anew with dynamics to reach a goal the magnitude of which the human mind can only await with awe. If no Lagrange stands toweringly at the threshold of the era now fully begun, superior workmen abound in continually increasing numbers, endowed with insight, adroitness, audacity and resources, in a way far transcending the early visions of the wonderful century which has just closed.

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SCIENTIFIC BOOKS.

Civil Engineering, A Text-book for a Short Course. By Lieut.-Col. G. J. FIEBERGER, U. S. Army, Professor of Engineering, U. S. Military Academy, M. Am. Soc. C. E.

It is not easy to rate the book under discussion at its true value. The tendency of engineering education of the present day is towards elaborate presentation of the several phases of engineering practise and if there is any reaction from the excessive development of so-called specialties, it shows itself in a greater concentration on elementary mechanics and other fundamentals.

When engineering education was in its infancy and when the science was being formulated, Rankine, in his famous and classic book, developed and put together all that was known on the subject. Since then, the science and knowledge of engineering have grown so rapidly and extensively that, in spite of a generous appreciation of the work of Rankine, one is startled at a present-day attempt to compress modern engineering knowledge into a single volume of less than six hundred pages.

The author explains that the book is intended to give the military cadets, who have to master many sciences and languages as well as military science and tactics, an elementary knowledge of civil engineering. To properly rate the value of the book, for its avowed purpose, this condition must be kept in mind and any comparison with other separate volumes, used in technical schools, must be carefully avoided.

About one third of the book is devoted to the mechanics of materials, and all ordinary problems of strength in flexure, tension, compression and torsion are given. Fifty numerical problems, about one to every four pages, are given to fix the principles stated, and additional illustrative problems are said to be used in the class room.

Thirty-four pages are given to hydraulics and seventy pages to bridge stresses, making one half of the book devoted to fundamental theory. While this theory is admirably presented, the principles and hypotheses carefully stated, however condensed, the writer can not help feeling that the average student mind is too immature to successfully assimilate such highly concentrated food, and further, he believes that much fundamental theory has been omitted. For example, in hydraulics no problems involving the time of emptying locks or reservoirs are given, no formulæ for velocity of approach for weirs and no discussion of submerged weirs. Yet space is taken for full algebraic development of equations of moment for continuous beams over four and even five supports.

Materials of construction, stone, cement, steel, iron, etc., are discussed to the extent of sixty pages. It is surprising, in view of the thousands of tons of Bessemer steel used annually in buildings, to read that 'open hearth steel is preferred by engineers for structural work,' while 'Bessemer steel is largely used for steel railway rails,' and further that 'cast-iron struts in the form of hollow columns are employed in structures not subjected to the shocks of suddenly applied loads.' In the description of brick, but ten lines are devoted to paving brick and the young officers are there told that paving brick are tested in a rattler used for castings or by dropping the brick repeatedly on a hard floor. It would have required so few additional lines to have

given the dimensions of the standard rattler, the standard charge and the percentage loss of good approved brick, that the omission seems strange.

The second half of the book is devoted to engineering construction proper, to foundations, the discussion of which is particularly good, to bridges (thirty-nine pages), to highways, to water supply and sewerage. These subjects are necessarily but briefly taken up and probably no two educators, in carrying out the difficult task of presenting only the essentials, would agree on what should be excluded. It is, therefore, futile to compare these chapters with those of other authors or to weigh the values of the separate paragraphs of the present book. The lists of text-books given at the end of each chapter serve to refer the young officers, at need, to the proper sources of information and are a most important part of the book. H. N. Ogden.

Cornell University.

Morphology and Anthropology, a Handbook for Students. By W. L. H. Duckworth, M.A., University Lecturer on Physical Anthropology, etc. Cambridge, at the University Press, 1904. The Macmillan Company. $4.50 net.

This is a very good hand-book for the use of students, containing a great deal in moderate compass. It makes little pretense to be anything more than a compilation, except in so far as the author gives us the benefit of his own judgment on disputed points. To present a compilation so as to be most available is a task of more than average difficulty. We think the author has in this been very successful. He first considers man's position in the animal series in the light of comparative anatomy; which implies a general review of the anatomy of the primates. Special attention is devoted to certain parts, especially the skull and the teeth. The presentation of the various views concerning the latter is particularly interesting.

We quote the words with which the second section of the book opens as the simplest way of showing the author's plan:

> The foregoing chapters have as their aim the demonstration of the fact that man is associated in a natural zoological classification with certain other mammals of the order Primates. It is now suitable to take up the second subject proposed for consideration in these notes, and to endeavor to ascertain something of man's ancestral history, that is, of the path of evolution traced by man. The means available for carrying out this enquiry are, in the present day, threefold: (1) Embryology, (2) comparative morphology of the various human races, and (3) paleontology.

The book then continues on these lines. The author introduces the embryological portion with the remark that its importance depends on the generalization that ontology repeats phylogeny. Since this book appeared this generalization has received a severe blow by Bardeen's researches on the development of the human spine, and, indeed, the author is ready to point out facts which do not agree with it. Long ago Marshall remarked that the record was a very imperfect one. It may now be questioned whether it will serve even as a working hypothesis. Be this as it may, Duckworth's observations strike us in the main very favorably, as both candid and judicious. It is not necessary to follow his work in detail.

We have purposely avoided the section on variations, not because we do not like it, but because the discussion would carry us too far. We will say in passing that the author does not seem to have freed himself from the widespread error, fostered by writers of the class of Wiedersheim and Testut, that resemblance is evidence of relationship. This slipshod method of thought has been so long condoned by those who should have been outspoken that it is doubly pleasant to read Osborn's address on the 'Present Problems of Paleontology.' Though our present author does not seem, as we have said, to have freed himself from this delusion, yet one suspects that he does not feel quite comfortable in its meshes. The reader will find in this part of the book a very convenient account of many methods used in practical anthropology.

A considerable part of the division of paleontology is given to the discussion of the