The reader is not supposed to have any advanced technical knowledge, and everything seems done to help him to appreciate the important notions which the last few years have developed.

Among the subjects treated are the meaning of definitions, axioms, and postulates; the elementary properties of classes, and of transfinite ordinal and cardinal numbers; negative and complex numbers; the three possible geometries in three-dimensional space; spaces of more than three dimensions; variable, function, and limit.

As an indication of the upper limit that is reached, it may be noted that we have Cantor's proofs that the numerical continuum is not denumerable, and that the class of algebraic numbers is; correspondence between points of a line segment and those of a square; and a brief account of quaternions.

In the more strictly geometrical part, Hilbert's axioms are discussed in considerable detail, an illustration is given (after Klein) of a system for which Archimedes' axiom is not satisfied, and an account is given of Pieri's kinematical theory. This last is comparatively novel, and will perhaps appeal to some more vividly than Hilbert's.

There are a few controversial points to which attention may be directed. On p. 43 we are told that "the only test for the consistency of a body of propositions is that which connects with the abstract theory a concrete representation of it." Even allowing the widest sense to the term "concrete," this does not seem justifiable. Weierstrass proved that ordinary complex algebra could *not* be consistently extended to a linear algebra of three or more dimensions, and his proof was as abstract as possible. The fact seems to be, as Prof. Young practically admits elsewhere, that there is no absolute test of consistency for any set of assumptions; all we can say is that, after applying them in myriads of ways, we have not found any inconsistency.

Then there is the question of the term, "the class of ordinary classes" (p. 219). Prof. Young takes the view, which seems the right one, that this term is intrinsically nonsensical, and involves a vicious circle.

On p. 81 the symbol ω is unfortunately used for the *cardinal* number of all denumerable sets. It is much better to keep it as the *ordinal* number of the natural scale, and use a for the corresponding cardinal.

Finally, with regard to the author's pedagogic attitude. He emphasises rightly, more than once, that with young pupils no attempt should be made to treat the subject with logical rigour. On the contrary, a large number of assumptions will be made, and everyday experience constantly appealed to. This is a sufficient answer to those who think that the "logicians," as a body, wish to reduce mathematics to dry bones. At the same time, a teacher ought to know something about these logical methods, just in order to avoid making dogmatic assertions which have been shown to be false, and also that he may answer inquiries without implanting erroneous ideas. For this purpose Prof. Young's book may be heartily recommended; it is one more of the many good educational works on mathematics produced in the United States.

G. B. M.

OUR BOOK SHELF.

Contemporary Chemistry: a Survey of the Present State, Methods, and Tendencies of Chemical Science. By E. E. Fournier d'Albe. Pp. xvi + 180. (London: Constable and Co., Ltd., 1911.) Price 4s. net.

IF the author of this book had been content to give it a more modest title, the task of the reviewer would have been a pleasanter one. Mr. Fournier d'Albe undoubtedly possesses a gift of expression, and his breezy style is attractive and interesting. Moreover, due praise must be given to him for his effort to popularise the fascinating phases of modern chemistry. Yet it is just here where the difficulty comes in. If the present book is intended for the general reader, the author's semi-journalistic "lightning sketches" assume too much, and are too lacking in coherence, to convey any definite impression. On the other hand, the serious student of chemistry will find the author's fare, if appetising, rather scrappy and unsatisfying.

The book indeed fails to give any rational and connected account of the main lines of contemporary chemical science. Let us take, for example, the chapter on "Affinity," where the author gives us little more than a couple of hazardous calculations on the attraction of electrical charges. Not a word is said about the real work of to-day, namely, the numerous experimental methods of measuring chemical affinity, and the collation and comparison of the vast amount of data already obtained. We cannot have our Newton before our Tycho Brahe and Kepler.

A closer examination of the book reveals in many cases the author's want of familiarity with chemistry, whereof a few instances may be noted. On pp. 21–22 we hear about de Broglie, but no hint is given of the work of Perrin, Svedberg, or Henri. On p. 36, it is stated that "a single phase has therefore two independent variabilities." On p. 38 there is a complete confusion between passivity to change and Le Chatelier's theorem. The calculation on p. 55 appears to the reviewer to be quite absurd. On p. 56 there occurs a misleading confusion between ordinary and electrolytic dissociation, whilst on p. 57 the use of the expression "specific conductivity" instead of molar conductivity leads to dire results. P. 59 opens with the sentence, "It might seem at first difficult to prove that metallic sodium and uncombined chlorine exist in a dilute solution of hydrochloric acid." Apart from the obvious misprint, this is truly a case of "save us from our friends." The cup is full when, on reaching p. 92, the author says, "Yet to-day we believe not only that metallic sodium exists in sea water," &c. One wonders what the author's theory of the metallic state would be like. Other slips of a similar nature might be quoted, but it would be ungracious to multiply instances.

As a survey of the present state, methods, and tendencies of contemporary chemistry, the book is indeed very inadequate. But as a crisply written and readable sketch of many interesting things it may stimulate interest where many a more ponderous and more accurate volume would fail. F. G. D.

Outlines of Biology. By Dr. P. Chalmers Mitchell, F.R.S. Revised and supplemented by George P. Mudge. Third edition, revised. Pp. xv + 348. (London: Methuen and Co., Ltd., 1911.) Price 6s. net.

THIS is a book which, as its author and reviser say in their opening remarks, is intended to "cover the ground of the student working for the First Examination of the Conjoint Board of Surgeons and Physicians, London," and also as an elementary text-book for