after the addition of the phenol was completed, the mixture was allowed to stand for an hour and one-half longer, and then treated, as usual, with double its volume of water. The heavy oil that separated out was reddish-brown in color, but invariably transparent and free from sticky or tarry ingredients. The oil was washed two or three times with water and subjected to distillation with steam. The distillate yielded slightly less than 30 grams of a beautiful ortho-nitrophenol (the quantity obtained by Gattermann). The residue was evaporated to less than half its volume, boiled with 20 grams of bone-black, filtered hot, and allowed to crystallize in the cold. Two consecutive operations yielded, respectively, 13.2 and 12.9 grams of pure para-nitrophenol, which is about 18 per cent. of the theoretical yield from 50 grams of phenol. A nitration similarly carried out, but with the temperature kept, not at 25° but at 4°, resulted in 12.8 grams of para-nitrophenol. Below 4° the nitration refused to take place, altogether. Further, a nitration carefuly carried out at 50° yielded 12.5 grams of para-nitrophenol and slighty less of the ortho compound than is usually obtained at lower temperatures.

The temperature thus seems to have but little influence on the yield of both ortho- and para-nitrophenol, and the ordinary temperature of the laboratory is but slightly more propitious than either higher or lower temperatures. Far more important are the vigorous stirring of the solution during nitration and the very gradual addition of the phenol.

R. S. HART.

CLARK UNIVERSITY, WORCESTER, MASS.,
June 18, 1910.

NEW BOOKS.

Radiochemistry. By A. T. CAMERON, M.A., B.Sc., Lecturer in Physiological Chemistry, University of Manitoba. London: J. M. Dent & Sons, Limited. 1910. viii + 174 pp. Price 2 s. 6d. net.

The book, the contents of which are based largely on three articles dealing with the "Transformation of Elements" which appeared in *Science Progress* in 1908, treats selected topics of the subject of radioactivity from the chemical point of view. The physical side is sketched only in sufficient outline to enable the reader who has some knowledge of physics and chemistry to appreciate the chemical results.

Those chapters which recount the properties and chemical behavior of radium emanation are of greatest interest; part of the results represent the author's own work with Sir William Ramsay. Radium emanation is now known in the solid and liquid as well as in the gaseous state. In the latter form it is produced to the extent of 0.1 cm. per day per gram of radium. The liquid emanation has a density of about 5; it boils at

—62°; it is practically colorless, with a marked greenish phosphorescence; the solid glows with great brilliancy like a small steel-blue arc light. It is now fully established that the emanation can bring about numerous purely chemical reactions; "each atom of the emanation, as it disintegrates, produces a certain definite chemical effect." It is also certain that helium is a product of the spontaneous disintegration of the emanation; but the possibility of the transmutation or atomic degradation of common elements under the influence of the emanation is still an open question. In addition to the familiar case of copper and lithium, these supposed transmutations now include the production of neon from the emanation and pure water, argon from a copper solution, and carbon dioxide from each of the elements thorium, zirconium, lead, titanium and silicon. However, the author shows that it is possible that the lithium came from the glass, in which it previously existed and that the neon and argon came from the air, while the carbon dioxide may have been formed by purely chemical changes of traces of carbonates present as impurities. (Although thorium oxalate is by far the least soluble of all oxalates, the reviewer has observed that it is appreciably soluble in a concentrated solution of thorium nitrate. Since thorium is always separated as oxalate in the process of manufacture, it is possible that some oxalate may remain in the otherwise pure nitrate and by subsequent decomposition give carbon dioxide.) The last two chapters are devoted to applications of radioactivity to geology and to medicine; a bibliography of nearly one hundred titles completes the book.

For a greater part of the matter of the second chapter, which treats of radioactive methods as illustrated by the thorium series, acknowledgement is made to Rutherford's *Radioactivity*, second edition. But apparently the author has not read this classic very carefully, if we may judge by pp. 16–18. In explanation of the rise to a maximum of the activity of the Th X separated from Th, it is said that this maximum represents the time when in any given interval as much of the products of Th X is formed as decays in that time. "These products are then said to be in radioactive equilibrium and no longer affect the nature of the curve." Now, as a matter of fact, the maximum *amounts* of the products are not reached until about 40 hours after the start, whereas the maximum *activity* is attained in about 18 hours. Furthermore the decay curve, as measured by the activity, is appreciably affected for three days after the maximum activity is passed and at no time does a state of radioactive equilibrium result. In giving the fundamental equation for the decay of any radioactive substance, p. 17, the author has blindly followed the misprint in Rutherford, p. 222, writing $I_o/I_t = e^{-\lambda t}$, instead of $I_t/I_o = e^{-\lambda t}$. This leads him to the erroneous equation $2 = e^{-\lambda t}$, where t is now the period. On p. 90 the same incorrect funda-

mental equation occurs twice. A number of other errors occur; as p. 26, that the δ rays obey the light laws; p. 39, that U X dissolves in the *ether* layer, in the separation by Crookes' method and p. 55 that thorium occurs chiefly in Ceylon. However, the story of radioactivity is inherently so interesting that, in spite of these errors, the book will not disappoint the reader who wishes to learn the present state of our knowledge of radioactive transformations and suspected transmutations.

HERBERT N. MCCOY.

Outlines of Organic Chemistry. By F. J. MOORE, PH.D., Associate Professor of Organic Chemistry in the Massachusetts Institute of Technology. New York City: John Wiley & Sons. 1910. pp. ix + 315. Cloth, $1.50.

The book is the outgrowth of a series of lectures given to students whose principal work is in Physics, Biology and Sanitary Engineering. It differs from most elementary texts in that a few of the customary subjects are omitted and in those subjects considered only a few compounds are taken up, but these are discussed fully and clearly. Its aim seems to be "to teach not much but well." The almost complete absence of empirical formulas is noticeable.

Typographical errors incident to a first edition are found in formulas on pages 47, 94, 159 and 184. Most teachers of chemistry will object to oxidation or reduction reactions being written with the symbols O_2 or H_4 where ordinary oxidations or reductions are being described, pages 112, 251, 254, 261, 264, 266, 272, 281, 284 and 293. The formula for an isocyanide, page 74, and the spelling of the plural of formula, page 84, should be changed to agree with modern chemical usage.

Organic chemistry is being recognized as a subject of general interest and for the needs of the average students in the short courses, which are being given in increasing numbers by the American colleges and universities, this text will be found to serve excellently.

RALPH H. MCKEE.

Handbuch der landwirtschaftlichen Bakteriologie. By DR. F. LÖHNIS. Berlin; Gebrüder Borntraeger. 8vo. viii+907 pp.

The development of agricultural science, like that of any other science, is marked by the appearance, from time to time, of books that summarize and interpret the data scattered in current publications. The present volume may be deservedly included in this list of important books, both for the unusual richness of the reference material contained in it and for the scholarly interpretation of the almost endless array of facts dealing with some of the agricultural relations of bacteria.

The five divisions of the book are arranged as follows: (1) Occurence and Activities of Microörganisms in Foodstuffs, 97 pp.; (2) Occurrence and Activities of Microörganisms in the Retting of Flax and Hemp and in the Fermentation of Tobacco, 16 pp.; (3) Occurrence and Activities