free ergostetrine base, further work shows that repeated recrystallization finally results in a snow-white product which melts and decomposes at 161 to 163 degrees C., and which is dextro-rotatory in water, alcohol and chloroform. Whether this change in properties is due to simple purification or to an actual change in the molecule is being studied, with emphasis on the relationship of these changes to pharmacological activity.

The issue of SCIENCE for June 21 contains a discussion of the new ergot principle by Kharasch and Legault, in which they state that "The question as to whether ergotocin is an alkaloid seems to us to be essentially meaningless, since there are no definite criteria by which a substance may be characterized as alkaloidal or non-alkaloidal."

From the standpoint of pharmaceutical chemists, to classify a plant or animal substance as an alkaloid is of fundamental importance, immediately identifying the substance as a relatively complex organic chemical entity containing nitrogen, whose free base is alkaline in reaction and capable of neutralizing acids to form salts, whose free base is much less soluble in water than its salts, whose free base is much more soluble in ether, chloroform, benzol, etc., than its salts, and as a substance whose salts in solution release the free base upon the addition of alkalies. Ergotinine, ergotoxine, ergotamine, ergotaminine, pseudo-ergotinine, sensibamine, ergoclavine and ergostetrine have been classified since their discovery as alkaloids and as alkaloids *only*. To state that this classification is essentially meaningless, in the face of its usage in the abundant ergot literature as well as that pertaining to other important drugs is as much as to state that all chemical classifications are meaningless and unessential.

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# SCIENTIFIC BOOKS

## A SOURCE BOOK OF PHYSICS

*A Source-Book in Physics.* By WILLIAM FRANCIS MAGIE, Professor of Physics, Emeritus, Princeton University. McGraw-Hill Book Company, 1935. pp. xiv + 620. Price, $5.00.

THIS is an impressive volume. It leaves the past at the door of the reader. To collect and to put into English dress one hundred and sixteen of the most important contributions to physics that have appeared during the three centuries which intervene between the appearance of Gilbert's "De Magnete" and Planck's "Quantum Theory" is a service of no mean order. It would, in fact, be difficult to overestimate the value of this book for any young man who wishes to put himself *en rapport* with the best that has been said and done in the domain of experimental physics. The omission of mathematical physics—fundamental and important as that branch is—will not be serious for the undergraduate; since the absence of algebraic formulae does not mean the omission of quantitative ideas. The only person likely to forget that modern physics is an experimental science is the young student who observes an indolent lecturer covering the blackboard with equations because this is easier than to cover the lecture table with appropriate experiments.

The space available to the author was presumably determined by the fact that this volume is one of the series of "Source-Books in the History of the Sciences" of which Professor Gregory D. Walcott is the general editor. The manner in which Professor Magie has distributed his six hundred pages is instructive. The first 65 are given to "Mechanics"; the next 50 to "Properties of Matter"; then follow 30 pages covering "Sound"; and 140 devoted to "Heat"; to "Light," 122 pages; while the last 229 pages go to "Magnetism and Electricity."

Each extract is preceded by a brief but well-balanced biographical sketch of the investigator, and the essential feature of his particular contribution to knowledge is pointed out. The value of these editorial notes arises partly from the fact that many of these names are strange to young ears and partly because most of the seventeenth and eighteenth century papers are written in a scientific lingo quite different from our own. On the other hand, one can not fail to be impressed by the remarkable clarity with which the original discoverer of any phenomenon always describes his result. He goes at once directly to the heart of the matter.

Of the translations, some are borrowed and some are by Professor Magie. The man who renders a foreign language into his own is, of course, always attempting the impossible. In physics, especially, he is confronted by two snags: one is the use of a terminology which gives the impression that our ancestors were in possession of ideas which belong only to later times; the other is the use of a nomenclature which is so literal and antiquated that it ceases to be clear or to give the correct impression to the modern mind. Thus, on page 199, the question arises as to whether J. R. Mayer's *Kraft* should be rendered by *force* or *energy.* Carey Foster, in the *Philosophical Magazine,* twenty years after Mayer's publication, translates it into *force.* But the essential truth, as understood by Mayer, certainly calls for *energy.* Again, for example, in the great paper of Helmholtz on the "Conservation of Energy," Professor Magie's own translation would be preferable to that of John Tyndall who, though thoroughly *au courant* with the best physics of his day, was nevertheless using the imperfect nomenclature of 1853. Thus (p. 219) when Helmholtz proceeds to quantify Faraday's discovery of 1831, the first sentence of the translation is "when a magnet moves under the influence of a current, the *vis viva* gained thereby must be furnished by the tensions consumed in the current." Here *vis viva* is Tyndall's rendering of *lebendige Kraft,* a translation which leaves the English reader in doubt as to the factor "1/2": "kinetic energy" would have certainly carried the "1/2" with it. In the phrase "tensions consumed in the current," Helmholtz could scarcely have had in mind anything but what we call "E. M. F. drop." A correct translation depends partly upon the words of the writer, partly upon the vocabulary of the reader, and is therefore a function of time. Owing to rapid changes in scientific nomenclature, a translation which fits one generation may be quite inapt for the next.

A fine perspective is displayed by the author in bringing closely related papers into immediate juxtaposition and in his allotment of space to individual investigators. Ten pages is none too much for Black's account of the phenomena which lead up to the ideas of *specific heat* and *latent heat,* a masterpiece of scientific description. Thirteen well-deserved pages are assigned to Ampère's fundamental work. Seven pages, devoted to the law formulated by Ohm, show us how far he was from our present conception of that law—the one which Weber and Kirchhoff gave us—and yet how skilfully he treated his data and how clearly he expressed his imperfectly understood results in terms of two numerical constants $a$ and $b$.

In these days, when research has become a powerful educational instrument, one might expect a disregard for earlier work and a lack of respect for the past; but the reverse of this appears to be the fact. As one bit of evidence, compare the prices to-day with those of fifty years ago when it comes to acquiring some of the "sources" which are reproduced in this volume.

A few trifling inadvertencies which ought to be considered before a new edition is issued are the following: In the first sentence in the book, Professor Magie has many excellent authorities, such as the Ninth Edition of the Encyclopedia Britannica (corrected in the eleventh), for saying that Galileo was born on the 18th of February. The late Professor Antonio Favaro has, however, established the fact that Galileo was born on the 15th of February and that citizens of Pisa were so anxious "to make the dying of Michelangelo coincide with the borning of Galileo" that they deliberately added three days to this latter date and accordingly engraved the "18th of February" on the marble slab which marks the house where the great Italian is "supposed" to have been born.

On page 398, six years should be added to the date given for du Fay's birth; and in the first line of page 447, ten years should be subtracted from the date given for Ampère's most celebrated paper. A slip of the pen has substituted *Padua* for Pavia in the third line of the biographical sketch of Volta on page 427.

The controlling idea of this volume is identical with that of "Harper's Scientific Memoirs," edited by Professor Joseph S. Ames a generation ago; but here the number of papers reported is much larger and the unimportant details are omitted; nevertheless, the book is one which historians would describe as "abundantly documentated." The collection is one upon which the verdict of scholars has already been passed. For the student who wishes to build upon "the solid ground of nature," its significance is no longer open to question.

HENRY CREW

## X-RAYS

*X-Rays in Theory and Experiment.* By ARTHUR H. COMPTON and SAMUEL K. ALLISON. D. Van Nostrand Company, 1935. vii + 828 pp. $7.50.

X-RAYS in medicine, in crystallography and in engineering are all dependent on x-rays in theory and experiment, and it is in theory and experiment that Compton and Allison have made their great contributions. A book by them devoting all its 835 pages to this field, as indicated by its well-chosen title, is therefore most welcome.

Originally this book was going to be a second edition of Compton's "X-Rays and Electrons," which appeared in 1926, but the rapid progress of x-ray research since that date made it practically a new book. On the theoretical side the greatest changes were of course those due to the new quantum mechanics, while the experimental side was changed partly by the advent of new theoretical predictions to be tested, but at least as much by improvements in technique. Old experimental apparatus, such as Wilson's fog tracks and Robinson's magnetic velocity spectra, were improved and turned to new uses, and among new types of apparatus were Ross's differential filters for spectrum analysis, double-crystal spectrometers, thin targets and x-ray diffraction gratings.

To be sure, even with all these influences for growth, the changes in the science of x-rays in this decade, its fourth, were not nearly so revolutionary as those in its first decade or even in its second; and there is a