

pose, aim or object, then the definition slides toward objectivity and becomes:

Science is the accumulation of data on the relations between things; between states; and between events: and on relations between things, states and events.

If one wishes to introduce the pragmatic element, the definition becomes still more objective and is:

Science is the accumulation and application of data on the relations between things; between states; and between events: and on relations between things, states and events.

And finally if one wishes to be both pragmatic and humanistic the definition becomes completely subjective and is:

Science is the accumulation and application of data on the relations between things; between states; and between events: and on relations between things, states and events, for the benefit of mankind.

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## SCIENTIFIC BOOKS

### ALGEBRAIC THEORIES

*Introduction to Algebraic Theories.* By A. ADRIAN ALBERT. viii + 137 pp.; index. Chicago: The University of Chicago Press. 1941. \$1.75.

DOUBTLESS the greatest hurdle which a student of mathematics in the United States has to take is the adjustment between undergraduate and graduate work. The amateur student has been replaced by the professional, drill in mechanical skills has been replaced by rigorous thinking, and the attitude that "the proof of this theorem is too hard for us so we shall assume it without proof" is gone forever.

The traditional courses of the senior and first graduate years are critical in the development of a mathematician. It is at this point that keen interest and ambition should be aroused in the student of ability. If uninspired teaching causes him to become bored, he will transfer his interest to another branch of learning. On the other hand, it is only just to a mediocre student to allow him to find out at this point that he will not make a satisfactory graduate student. A mere drill course will not satisfactorily test his abilities.

Elementary courses are best taught from texts, of which there are enough for every taste. Graduate courses are seldom taught from a single text, for the interests of the professor as well as the subject itself are in constant flux. But how are these transitional courses, the "senior" courses, to be handled? Frequently the instructor is not a specialist in the subject, and more frequently he has not the time to work up an adequate set of notes. A good text seems indicated.

But a satisfactory text for a senior course must be more than a rehash of a dozen earlier books. It must be an introduction to modern mathematics. The author must be acquainted with present-day research and he must be able to present his subject in a modern manner, for otherwise the course will not be an introduction to graduate mathematics. A text which is not modern in content and terminology just won't do.

The book under review successfully meets the neces-

sary conditions set forth above. It is specifically designed to serve as an introduction to the author's "Modern Higher Algebra" (which is distinctly a book for graduate students) but can be used effectively by seniors and graduate students who merely wish to know something about matrices.

The book is in two quite distinct parts. The first 108 pages constitute an introduction to the theory of matrices. The usual topics are considered, rectangular matrices and elementary transformations, equivalence of matrices and of forms, linear spaces and polynomials with matrix coefficients. The method of elementary transformations is used wherever possible, even in the proof that the determinant of a product of two square matrices is equal to the product of their determinants. The treatment of determinants is sketchy, for the student is assumed to know how to handle them, but it is lucid and in the modern manner, and should help in dispersing some of the fog emanating from the traditional treatment of determinants. Bilinear and quadratic forms are briefly treated without reference to projective geometry. Linear spaces rationalize the subject of similarity of matrices. Invariant factors and elementary divisors, without which matrix theory is not matrix theory, are treated in Chapter V.

Even though the author states that the book is written for juniors and seniors, it seems to be on the graduate-student side of the fence. It is a fairly solid and comprehensive treatise on the algebra of matrices with no by-lanes or diversions. There is very little motivation for the material, very little to enlighten a student regarding the significance of quadratic forms or similarity of matrices, for instance. There are many new problems in the book, and these will be welcomed by all who teach the subject, but they are mostly drill problems which help not at all in rationalizing the subject to an undergraduate. This means that the text must be administered by an understanding teacher. At various places in the text are to be found summaries of further results not treated in detail. Teachers hold

differing opinions regarding this as an effective method of teaching, but it should arouse the curiosity of the better students.

This policy of omitting proofs is carried to an extreme in the last twenty-four pages of the book. This last chapter is entitled "Fundamental Concepts," and one is tempted to believe that the author has designed it to serve as a preliminary chapter to his "Modern Higher Algebra." An abstract group is defined, and then one comes up against the statement but not the proof of the simple theorem that the order of a subgroup of a finite group is a divisor of the order of the group. This policy is continued throughout the chapter. After the definition of ring comes the statement, "We leave to the reader the explicit formulation of the definitions of subring and equivalence of rings. They may be found in the first chapter of the 'Modern Higher Algebra.'"

This last chapter, then, is an encyclopedic treatment of groups, rings, abstract fields, integral domains, ideals and residue classes, quadratic fields and their integers and the Gaussian field. It is interesting to a mature reader, and under the administration of an expert algebraist should be a quick road to knowledge. A non-specialist who attempts this chapter with a keen class may be in for a few bad moments.

This book is a distinct contribution to the mounting list of books devoted to modern algebra. It is modern in its viewpoint and correct in execution, and the student who has mastered it is on the graduate-student side of the hurdle, ready to pursue further work in abstract algebra.

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### PHARMACY

*History of Pharmacy. A Guide and a Survey.* By EDWARD KREMERS and GEORGE URDANG. x + 466 p., 30 figures. Philadelphia: J. B. Lippincott Co., 1940. \$5.00.

THIS history falls into 4 parts. The first deals with primitive pharmacy in Babylon and Assyria, Egypt, Greece and Rome, among the Arabs, and in Europe in the Middle Ages. The second describes the rise of professional pharmacy in Italy, France, Germany and England, and outlines the interrelations of medical theory and materia medica, giving a detailed account of its development. The international relations based

on professional and industrial foundations arising between these countries are also discussed.

The third part gives a comprehensive account of the growth of pharmacy in the U. S. A. in the colonial, Revolutionary and national periods tracing the dependency of American pharmacy upon that of the several European parent countries. The progress of pharmacy in the U. S. A. was marked by the growth of local, state and national societies, and the enactment of local, state and federal laws. Education began in private schools followed by state-supported schools usually attached to universities. The establishment of legal qualifications administered by state examining boards led to supplemental correspondence and coaching schools.

Pharmaceutical literature in America took shape, after various state organizations had planned an American pharmacopoeia to replace those of London, Edinburgh, Dublin and Paris, widely used in the U. S. A., in the Massachusetts Pharmacopoeia (1808), followed by that of the New York Hospital (1818) and that of the U. S. A. (1820). The seventh edition (1862) was the first to be issued under the direct auspices of the American Pharmaceutical Association. Legal status was granted it by the Pure Food and Drug Act (1906). The eleventh revision (twelfth edition) appeared in 1936. This series of editions is in itself a historical record of the scientific advances not only in pharmacy but also in some aspects of biochemistry, immunology, endocrinology, and especially in the history of the growth of knowledge and standardizations of the vitamins. The chapter on the establishment of a literature also contains a record of textbooks, works of reference and journals.

Part IV records the discoveries, inventions and contributions to science by pharmacists in the fields of chemistry and biochemistry and to the wider field of literature. Annotated bibliographies are provided for each chapter. The glossary is unusually extensive, including much historical material which is supplemented by an elaborate chronology of dates of pharmaceutical and general scientific interest.

This book is a mine of biological and biochemical information related to pharmacy, as well as a detailed and inclusive history of pharmacy.

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## REPORTS

### THIRTIETH ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN

IN the Annual Report of the Brooklyn Botanic Garden for the year 1940, which the director, Dr. C. Stuart Gager, has submitted for the thirtieth time since his

appointment, he records not only the activities of the year, but also briefly calls attention to the progress which the Botanic Garden has made since it was established thirty years ago. It is noted that this progress has continued, with minor fluctuations, notwithstanding