

results, as in a rather detailed discussion of "Climate and Human Behavior" which, among other things, observes that "The hot drought phase is the typical season for despots, dictators, communism, totalitarianism, Gestapo, pogroms, fascism and decadence in general".

The writing is very uneven, but extremely rarely distinguished. With some exceptions the factual material is correctly and concisely reported. At the same time, it is in general highly selected, with an immensely strong bias towards the writing down or omission of anything that is not American.

The editor says that this encyclopædia is intended to serve the needs of three classes of people. First, there is the expert investigator who wants to find out the facts about topics of research which lie outside his own field. Well, such a person will no doubt have a background for critical evaluation and can look after himself. It seems likely, however, that most investigators will want to go where they can get both fuller and better information. Second, there are undergraduates and graduate students who have heard things mentioned in passing, by their lecturers, and want to discover more about them. The book is of far more doubtful value for these, because most of them will lack the critical equipment needed to appraise a large bulk of its contributions. Third, there are the people who want to know what are the trends in current psychology. Whether the book adequately or clearly represents these trends and whether in any event the trends can be properly understood without a much wider setting than can be attempted in a large series of short and shortish articles, many of them extremely restricted in scope, could obviously be a subject of long debate. One thing, however, seems plain. The last seven years have made a lot of difference to psychology, but this is far from obvious so far as the effort of the present volume is concerned.

For trends alone, a smaller book, with longer, better informed and much more international surveys of a few outstanding developments, would be preferable. For a genuine psychological encyclopædia—if this is required—a very much larger volume or succession of volumes could alone fill the bill.

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## UNIFICATION OF ALGEBRA

### College Algebra

By Prof. A. Adrian Albert. Pp. xii + 278. (New York and London: McGraw-Hill Book Co., Inc., 1946.) 14s.

IN one sense, it is somewhat surprising to find how little progress has been made, during the past fifty or sixty years prior to 1939, in the presentation and content of many subjects taught in schools and colleges. In some directions there has been a considerable advance, notably in experimental science, but in mathematics the forward movement has been much slower. Our methods and subject-matter seem to be securely tied up in the bonds of tradition. Yet, all the time, a great and evolutionary force has been quietly at work; this has eventually inspired the necessity for a new outlook and a corresponding change in the *modus operandi*. The Second World War has contributed considerably to this onward sweep, for it has revealed in no unmistakable manner how far behind we are. It must not be forgotten that it took a long time to replace Euclid by modern

geometry, as well as to break down the artificial barriers erected by tradition between the various compartments into which mathematics was originally divided. It is, for example, not so long ago that the student of arithmetic and pure geometry was denied any application of algebra to those subjects. Happily, those days have gradually passed away, yet much remains to be done. Only recently, the Mathematical Association devoted much time to a discussion of reforms in the school certificate examinations. As a result, it advocated considerable revision in the syllabuses prescribed by the examining authorities—less formal algebra and geometry, and a closer co-ordination between geometry and trigonometry.

But the evolutionary spirit has also penetrated the subject-matter itself. Newer conceptions are demanded which will not only develop a more coherent unity in mathematics generally, but also in the compartments themselves. In the case of algebra, for example, it asks: Is algebra, as taught to undergraduates, regarded as a complete entity, or is it made up of a collection of seemingly unrelated topics? Prof. Albert, who is well known for his outstanding research on algebra, declares that the time is ripe for the subject to be presented as a unified whole instead of a miscellaneous collection of isolated topics; hence this new and inspiring work on "College Algebra". As he pointed out in an earlier volume entitled "Introduction to Algebraic Theories" (1940): "During recent years there has been an ever increasing interest in modern algebra, not only of students in mathematics, but also of those in physics, chemistry, psychology, economics and statistics"

"College Algebra" formulates a standard minimum of requirements which emphasize that algebra has a basic unity. The first three chapters are devoted to number systems, and include permutations and combinations, since these "involve nothing but counting". The fourth chapter deals with the purely algebraic theory of polynomials and rational functions. In Chapter 5, on identities and applications, the binomial theorem, summation formulæ and the progressions are treated in logical sequence and with great clarity. The sixth and seventh chapters are concerned with equations, both in theory and practice, while in Chapter 8 the algebraic theory of vectors and linear equations is linked up with trigonometry and analytic geometry. Finally, in the last two chapters, matrices, determinants and linear systems are discussed. It should be mentioned here that the author regards Chapter 10, devoted to matrices and quadratic forms, as a pedagogical experiment, since his personal experience has shown that the "theorems and techniques can be taught to immature students if no attempt is made to derive the results". Thus the text is presented in this form and should be useful to mathematical economists and psychologists.

As in all Prof. Albert's books on algebra, the subject-matter is arranged with consummate skill and written with great clearness, with the laudable desire of providing a sound foundation upon which to build an intelligent course in the calculus. The order of treatment may seem a little unusual at first, but the book tends to open a new epoch in the presentation of algebra as a new and rigorous approach to the subject, and notably in the emphasis placed upon knitting together the various topics into a fundamental unity.

It would be both interesting and progressive to see a school algebra fashioned upon similar principles.

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