period—final synthesis. These steps are represented by Hamilton's quaternions, by Grassmann's theory of extension (Ausdehnungslehre), and—after a turn towards physical application in the transitional period of Tait, B. Peirce, Maxwell and Clifford—by the work of Gibbs and Heaviside. The contributions of all those men, and a number of less important figures, too, are discussed in detail. They are placed into the line of conceptual development of the idea, but at the same time the story is connected with the life and scientific work of each contributor.

Such a mode of presentation easily can lead to an undigestable book. Yet not in the present case: the author's main intentions and conclusions are summarized at the beginning and end of each chapter. A chronological table and some graphs on the number of relevant publications serve to illustrate the development. Well chosen quotations brighten the broad, in general nonmathematical exposition which is amply documented by notes (collected at the end of each chapter). A reader interested mainly in the results of this study should turn immediately to Chapter Eight. As the book, which is equipped with a very detailed index, concentrates on the development of the basic ideas and conceptions connected with a vectorial system, there is still room for another one tracing the history of the analytical side of vector analysis, i.e. in particular the interrelations between the development of mathematical physics and the formalistic side of the vector (and tensor) system.

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The Evolution of Mathematical Concepts. An Elementary Study. BY RAYMOND L. WILDER. John Wiley and Sons, New York, London, Sydney, Toronto (1968). xx+224 pp.

Being disappointed by a book that at first raised one's expectations is a saddening experience. As a reviewer, in such a case one finds oneself guilty of somehow having missed the author's intentions. But what about the case when the author gives to his book the sub-title "An Elementary Study", and the reviewer's main objection to the treatment is just that it is too elementary?

Professor Wilder's is an unusual book, a stimulating book. His intention is to investigate the evolution of mathematics from the viewpoint of an anthropologist. Mathematics is considered, and rightly so, as an element of culture. Since mathematics is so highly technical, an investigation into the mathematical subculture from the standpoint of an anthropologist can only be made by someone profoundly familiar with mathematics and its history, by a mathematician so well qualified as Professor Wilder. I have nothing to quarrel concerning his presentation of the history of number from the inception of counting up to and including transfinite numbers, and of the development of geometry, as presented in Chapters 1–3. But I am not at all satisfied with the special approach and the results achieved thereby.

According to the author the principal forces discernible in the development of mathematics are (1) environmental stress (physical and cultural) (2) hereditary stress (3) symbolization (4) diffusion (5) abstraction (6) generalization (7) consolidation (8) diversification (9) cultural lag (10) cultural resistance (11) selection. The effects of these forces are illustrated in the historical Chapters 1–3 (and also in Chapter 5: evolutionary aspects of modern mathematics); they are summarized in Chapter 4 (the processes of evolution) in sentences such as these: "In brief, during the pre-Greek era, *cultural stress* forced the invention of counting processes that, with increasing complexity, necessitated suitable *symbolization*—hence the introduction of numerals. The latter was aided by the fact that the Akkadians took over Sumerian symbols of an ideographic nature, a *diffusion* process, and this in turn led to further abstraction. Demands of engineering, architecture, and the like led to applications of numbers to geometric measurements and to the gradual assimilation by the number scientist of geometric rules, which were later to become theorems. The number scientist was being subjected to greater and greater stress, from *without* (cultural stress) by the demands of his nonmathematical brethren and from *within* (hereditary stress) by the need for systematizing and simplifying the processes by which he obtained his results of a numerical nature". Now I fail to see what kind of new insight into the historical process is gained by the application of this vocabulary, unknown at least to the ears of mathematicians and historians of mathematics.

Maybe, the author's principal intention is only to sharpen the eyes of his readers to recognize that there are other forces at work in the historical development of mathematical thought than those called hereditary stress by him, i.e. internal stresses and trends of mathematics itself. Such other forces as physical and cultural stress, demands made by the society, be they of physical, technical, or other cultural origin. Then, of course, the book will serve its purpose. It is, I believe, even better suited to introduce the student of anthropology and sociology into the formation of mathematical concepts and theories, and to the external influences that play their part in this process.

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Boolean Algebras. By Roman Sikorski. Ergebnisse der Math. 25 Springer Verlag, New York, 1969 (third edition). x+237 pp.

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