# Book Reviews

**The Enjoyment of Mathematics.** Selections from mathematics for the amateur. Hans Rademacher and Otto Toeplitz. Princeton University Press, Princeton, N.J., 1957. 204 pp. Illus. $4.50.

This is an excellent and welcome translation of the well-known *Von Zahlen und Figuren,* the second edition of which was published in 1933. The English title is very appropriate, for the book is indeed a thoroughly enjoyable sampler of fascinating mathematical problems and their solutions. Moreover, the translator, Herbert Zuckerman, has added two new chapters which, as Hans Rademacher notes, "faithfully reflect the spirit in which this book was written."

The authors planned their volume with the hope of extending delight in mathematics beyond the limited circle of those who possess a marked talent for it. They aimed at acquainting their readers with typical methods of proposing and solving problems that are of inherent mathematical interest. They have therefore deliberately avoided mention of the uses of mathematics in science and technology, as well as discussion of the logical and philosophical foundations of the subject. The examples are taken from several branches of mathematics, including elementary number theory, geometry, topology, analysis, and set theory. Although some of the topics that are discussed will doubtless be familiar to many readers, a number of them (such as Waring's problem, periodic decimals, or the spanning circle for sets of points) are not easily available elsewhere in a form suitable for laymen. Each of the 28 chapters, with the exception of the last, is self-contained, assumes no previous knowledge of the subject, and develops solutions for the question discussed in a way that makes clear the essential simplicity of the reasoning and the strategy of the argument. The book certainly achieves what the authors sought to accomplish.

In one of the two chapters that were added by Zuckerman, Cauchy's proof that the geometric mean is never greater than the arithmetic mean is presented. The second of these chapters extends a proof given by Bonse (which was expounded in the original version of the book) for the Chebyshëv inequality that when $n \geq 4$, the $(n+1)$th prime is less than the square root of the product of the first $n$ primes. The stronger result is established that when $n$ is sufficiently large, the $(n+1)$th prime is less than the seventh root of the product of the first $n$ primes. As Zuckerman remarks, the proof uses only the simplest arithmetical ideas but nevertheless "shows clearly how ingenious and how difficult mathematics can be. . . . If this last chapter seems to require a difficult chain of thought, if it shows how mathematics can build a real and meaningful structure on such a small foundation, then it probably exhibits most clearly the real motive of this book." In my judgment, the qualification "probably" is unnecessary.

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**Malaria.** Eradication, insecticide resistance, entomological investigations, epidemiology, control, and prophylaxis. *Bulletin of the World Health Organization,* vol. 15 (No. 3–5), pp. 361–862. World Health Organization, Geneva, 1956. $6.

The successful eradication of malaria from large areas of the world in which it was previously the cause of great morbidity and mortality has led to a change in strategy in the control of this disease in recent years. The introduction of residual insecticides has been very largely responsible for success in the instances in which eradication has been effected. The rather widespread development of resistance to these sprays on the part of insects, particularly house flies, has, however, alerted malariologists to the possibility that *Anopheles* mosquitoes might also develop such resistance. There are now reports that two species of *Anopheles* in widely separated areas have developed resistance to DDT, that two other species have become resistant to dieldrin and related insecticides, and that still another species has been found to be resistant to both of these groups of insecticides. It is now apparent that if eradication of malaria is to be accomplished through reduction in the numbers of malaria-carrying mosquitoes, the race must be won before sufficient insecticide resistance has developed among these mosquitoes to nullify these efforts. The new policy that was adopted by the eighth World Health Assembly has shifted from that of control to one of eradication of the disease.

This bulletin is devoted in large part to this goal. It consists of 25 articles and 16 shorter notes, contributed by more than 40 authors. G. MacDonald discusses the theory of eradication of malaria in which natural disappearance of the disease is related to deliberate elimination, and an analysis is made of the factors that affect basic reproduction rates in epidemics arising from small origins, duration of infectivity of primary malarial cases, density of mosquitoes as related to man, and longevity of the vectors and their degree of anthropophilism. He gives a simplified method for expressing such an analysis mathematically.

Three articles are devoted to insecticide resistance among malarial vectors; these include descriptions of the actual measurement of resistance in the field and a discussion of the rationale of its prevention. In the first of these, Busvine discusses the manner in which resistance may be detected and measured and speculates on the way in which it arises, the possibility of preventing or overcoming it, and its importance in the past, the present, and the future. In his discussion of the possible advantage of using two insecticides simultaneously, he dismisses the possibility that this practice may be advantageous in cases where susceptibility to the two insecticides is positively correlated or quite independent but admits its advantage in cases where the susceptibility to one compound is the reverse of susceptibility to another. It appears unfortunate to me that no references are given to the work on which his conclusions are based.

In the second article that deals with insecticide resistance, Livadas and Thymakis report their investigations on the susceptibility to DDT of anophelines in different localities. Although they found considerable difference in susceptibility in the mosquitoes of the areas tested, they found, in general, that anophelines in Greece were increasing in their resistance to DDT.

Belios and Femeliaris, in the third paper on resistance, report the results of tests to determine the susceptibility of *Anopheles sacharovi* larvae to DDT, chlordane, and dieldrin on the coastal plain of Astros, Peloponnesos, where these insecticides had been used as residual sprays and for larviciding by air for