A mathematician's Miscellany. By J. E. Littlewood. London, Methuen, 1953. 8+136 pp. 15s.

From the introduction: "A Miscellany is a collection without a natural ordering relation; I shall not attempt a spurious unity by imposing artificial ones. . . . The other quality is lightness, notwithstanding the highbrow pieces; my aim is entertainment and there will be no uplift. I must leave this to the judgment of my readers, but I shall have failed where they find anything cheap or trivial." There is nothing cheap or trivial in the book, because there is so much of Littlewood's mathematical personality in it. For the same reason, and despite the author's disclaimer, there *is* uplift in the book. It is indeed more than entertainment to learn Littlewood's views, to see his tastes, to feel "what makes him click." Even his entertaining game of debunking ("every mathematical proof is a debunking of some sort") becomes an experience when Littlewood discusses the discovery of Neptune.

The book is intended for the mathematical amateur. But the amateur whom the author envisages is of the rare type who frowns on a repetition of what can be found in Courant-Robbins. Littlewood's masterful style and lack of ostentation should have a wide appeal, but presumably the book will be enjoyed mostly by professional mathematicians who are used to concentration and who have the basic experience of mathematics as art.

The opening chapter is entitled "Mathematics with minimum 'raw material'." In rapid succession (sometimes in telegram style) the author reviews a series of puzzles, paradoxes, unexpected arguments, and proofs. They all illustrate the nature of mathematical reasoning, its power, or its appeal. "Official" mathematics is represented by a few items ranging from an isoperimetric inequality (whose claim to interest lies in the simplicity of the proof) to the highbrow convexity theorem of M. Riesz. Thorin's proof is given, and the reader is led to share Littlewood's excitement when an upper bound is taken "with respect to a variable that is not there!"

Next we come to a short digression on the Tripos, and then to "Cross-purposes, unconscious assumptions, howlers, etc." This chapter is, in part, hilarious, although it contains serious and noteworthy views on style and rigor. A satirical gem is a proof of Weierstrass' approximation theorem presented with all the horrors of bad mathematical manners.

There follow "The Zoo" (conformal mapping), "Ballistics," and "The Dilemma of Probability Theory." This theory, it is said, is genuine mathematics, but when the student of probability interprets its relation to experience then he is merely philosophizing. That is true, but it is not clear why this perfectly general dilemma should be connected with probability more than, say, ballistics. In fact, "in actual experience" (in particular before breakfast) multiplication tends to be noncommutative and should Littlewood defend number theory against this attack, he would be merely philosophizing. However, that he can do this in a provocative and worthwhile fashion is shown in the chapter "From Fermat's Last Theorem to the Abolition of Capital Punishment." In a few crisp lines the author takes us from ideals in algebra to functions and thence to a function whose domain is the historical time and whose range lies in the sample space of the Universe. Such a function is a sort of historical record (past or future) and we are confronted with the notion (or lack thereof) of determinism.

We come now to an extensive description of Littlewood's mathematical education and of conditions before 1907, and then to reprints of articles from the Mathematical Gazette. The latter include a few book reviews, a discourse on "Newton and the Attraction of a Sphere" and a causerie on "Large Numbers."

Of an altogether different nature are the final chapters "The Discovery of Neptune" and "The Adams-Airy Affair." In an elaborate and exceedingly interesting study the author shows how Neptune *could* have been discovered by most elementary means; he discusses the importance and bearing of accidental factors on the actual historical development and makes a few cogent remarks on the role of the principal actors. The reviewer feels that he has greatly profited from this study, but in view of his difficulties with details it is only fair to confess that he, for one, falls short of Littlewood's ideal of an amateur. A more exhaustive and detailed version of this noteworthy investigation would seem to be a worthwhile contribution to science.

The book concludes with purest mathematics: "A lion and a man in a closed arena have equal maximum speeds. What tactics should the lion employ to be sure of his meal?" The problem is old, the optimal strategy well-known and, what's more, "obvious". The joke is that the good old solution is false. A simple, but ingenious, construction shows that the man can save his life (provided, of course, the lion is a mathematical point). The proof is due to A. S. Besicovitch, who never published it. In fact, when congratulated on the idea, Besicovitch snorted indignantly: "It is only a joke." Yet, according to Littlewood, "A good mathematical joke is better, and better mathematics, than a dozen mediocre papers."

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