REVIEW

Kitchen creations

The Problems of Mathematics
by Ian Stewart, *Oxford UP, pp 257, £17·50 hbk, £5·95 pbk*

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THIS latest work from one of mathematics' most gifted expositors is intended to show what mathematicians do, what notions populate their world, and how these relate to nonmathematical "reality". If one's mathematical ability is now less than it was at school, or even if one is not a professional user of mathematics, Ian Stewart's book is no easy read; but it is a challenging and interesting one. Those with no knowledge of the subject will be able to glimpse its beauty and appeal.

In *The Problems of Mathematics*, Stewart guides us through centuries of thought to show how problems or whole areas of mathematics reappear or are looked at anew because of other, apparently independent, developments in the science. Again and again, the author stresses that mathematics is about ideas and problems, rather than techniques of calculation. If an idea is good, it will give rise to new ones which will take on a life of their own. As Piet Hein puts it:

> A problem worthy of attack
> proves its worth by hitting back

Only with hindsight can bad ideas be reliably distinguished from good ones.

Nonstandard analysis, fractals, Fermat's last theorem, Riemann's hypothesis, Godel's theorem, many-body dynamics, the four-colour problem, catastrophe theory, are a few of the subjects Stewart discusses in the book's 20 chapters. They are presented as independent, but interconnected and interacting, parts of an intensely active field of thought. Stewart also indicates some of the philosophical difficulties created by developments in mathematics (for example, by irrational numbers, infinities, computer-assisted proofs).

Scattered through the book are glimpses into the mathematicians' kitchen where exotic creations are cooked up. Stewart shows the importance of imagination and taste, the tentative gropings, the false approaches, the common (or uncommon) sense guesses—the everyday aspects of the art eliminated from the rigorous proofs.

The Problems of Mathematics has few pictures (only nine), which is at first surprising when one considers that the author is best known professionally as a geometer. However, most of the concepts he describes live naturally in spaces with many dimensions and are not easy to illustrate. We believe that it benefits the nonspecialist to understand that it is the inner logic of the mathematical process, rather than the need to project it onto a page, which dictates the dimensions. But it would have been helpful to have more illustrations of the rich patterns of chaos, and it is a pity that the fractal sets illustrated are not the most spectacular—a picture of a coastline perhaps, together with its fractal model, might have helped to understand the need for a non-integer dimension.

You *do* need to be a mathematician to understand mathematics in all its depth and beauty, but in this unusually wide-ranging and helpful book, Stewart gives nonspecialists more than a few glimpses of the inner workings of the subject and its practitioners. □