# Mathematics for the non-mathematician

P. T. Saunders

*Handbook of Applicable Mathematics.* Chief editor Walter Ledermann. Vol. I *Algebra.* Edited by Walter Ledermann and Steven Vajda. Pp. 532. (Wiley: 1980.) Subscription price for core volumes £27.50, $75 each, single volumes £32.50, $85.

UNLIKE their colleagues in physics, workers in the biological and social sciences have generally received very little training in mathematics. Few of them know more than a bit of calculus and some elementary statistics. As a result, they can find themselves totally unable to understand the increasing number of papers in their fields which employ more sophisticated mathematical techniques. Nor is it easy for even the most determined of them to do anything about this. It can be exceedingly difficult for a non-mathematician just to discover where to look up something, and even then he may be not very much further ahead. Mathematics is a cumulative subject; every new idea tends to depend on many that have come before. So he is likely to find that the explanation of the concept he is interested in is in terms of several other concepts which are equally unfamiliar. And as if that were not enough, at least some of these may originate in a different branch of the subject and not even be defined in the book he has consulted.

The *Handbook of Applicable Mathematics* represents an attempt to help "users of mathematics who are not professional mathematicians" when they find themselves in this awkward position. On completion it will consist of 16 volumes. The first six, called "core" volumes — *Algebra, Probability, Numerical Methods, Analysis, Geometry and Combinatorics, and Statistics* — are intended to cover all the mathematics the non-specialist is likely to encounter. There will also be ten "guide books", showing how mathematics is applied to different fields such as chemistry, economics, sociology, management, medicine and so on.

According to the editors, the aim of the *Handbook* is that "professional adults" needing to understand a particular mathematical idea will be able to find in it "just what they want to know". They have therefore tried to make the articles self-contained, to allow the reader to turn directly to the topic in question, rather than start at the beginning of the book. There is an elaborate cross-referencing system throughout the entire *Handbook,* so that any unfamiliar term or result can be located quickly and without searching through other works. They also claim to have "gone to great lengths to ensure that no branch of mathematics is omitted which is useful, and conversely that none is included which is not".

In some respects, the impression given by *Algebra,* the first of the core volumes and the only one so far available, is encouraging. The general standard of writing and exposition is good, and the authors have kept in mind the desirability of explaining to the reader in plain language what is going on and what some of the definitions "really" mean.

Viewed in the light of the claims made in the introduction, however, some important shortcomings appear. While the explanations are clear and often illustrated by examples, the pace often seems too fast for a newcomer to the topic, and there are no exercises. There are inconsistencies between the chapters with regard to the amount of detail included; this is always a problem in multi-author texts but more could have been done to combat it, especially in such an ambitious work. Further, the selection of topics does not appear to have been made with the care and ruthlessness promised in the introduction; perhaps an analyst might agree that the long account of decimal expansions (without, incidentally, any real mention of other bases) is necessary, but two pages on quaternions seems an avoidable luxury.

The real problem with this book, however, is that in trying to cater for all levels of mathematical competence in one work the editors have set themselves an impossible task. There is a limit to the speed with which mathematics can be assimilated. Most of us can learn a new mathematical idea if it is clearly explained to us in language we can understand. And we may even manage to learn a second new idea based on the first. But before we can grasp a third new idea, and a fourth, we generally need some time and practice to enable us to become familiar with what we have just been taught. Many of the less essential topics which are included in mathematics courses are there for just that purpose. If we try to go on before we have allowed the first ideas to to sink in, we are unlikely to understand the later ones, because they will be being explained in terms of ideas which are not yet a secure part of our mathematical vocabulary. So an explanation which is suitable for someone who has a good background in mathematics cannot be made suitable for someone who has not just by referring the novice back through a chain of earlier explanations.

So far as can be judged from the first volume and a proof copy of *Probability,* and without seeing any of the guide books, the *Handbook of Applicable Mathematics* will be of most value to those who already know rather more than the average amount of mathematics. They will find it a useful aid, but if it had been designed specifically for them it would have been a lot better. As it is, it tends to fall between two stools, with too much detail for reference and not enough for real learning, and despite its virtues many potential users may not feel it worth the considerable outlay. As for someone with only a minimal previous knowledge, he is unlikely to find that the series will open the rich storehouse of mathematics to him, even with the effort the editors warn him will sometimes be required. He would do better to try to acquire a solid foundation from some of the good — and much cheaper — elementary textbooks which are already available. There is, as has been said before, no royal road to geometry. □

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# Whither geography?

K. J. Gregory

*Geography: Yesterday and Tomorrow.* Edited by E. H. Brown. Pp.302. (Oxford University Press: 1980.) £10, $29.95.

THE 150th anniversary of the Royal Geographical Society provides the *raison d'être* for this volume. Founded in 1830, the RGS was third in the world following the establishment of geographical societies in Paris in 1821 and Berlin in 1828; like them its function included the encouragement of exploration and discovery, a tradition which has persisted to the present day.

Although the first professor of geography in Britain was appointed in 1833 at University College, London, the subject took firm root in Oxford and Cambridge, and between 1883 and 1924 the RGS gave grants to these two universities to foster its development. The Geographical Association, concerned with geographical education in schools, was founded in 1893, and in 1933 a group of geographers formed the Institute of British Geographers to provide an outlet for research publications because it was felt that the *Geographical Journal* had insufficient space for both research papers and accounts of exploration and travel.

Today, for the first time, both the President and the two Honorary Secretaries of the RGS are university geographers. Such strong links with university geography have not always featured during the course of the 150 years which are charted by T. W. Freeman in the first third of the book. Freeman concludes that the struggle for recognition of the subject has now been won; the way in which this was done and the subject recognized and established in education is explained in the following contribution by N. J. Graves.

To reveal the yesterday and tomorrow of geography as an academic discipline, the subject is divided into 12 subdisciplines,