

Groups In Galway 88

It has been decided to celebrate the tenth anniversary of this meeting by adding an extra day to the usual (two-day) format. The 1988 meeting will commence after lunch on Thursday May 26 and conclude after lunch on Saturday May 28.

Among the speakers will be Laci Kovacs and Mike Newman, both from ANU, Canberra. Any enquiries should be addressed to:

Dr. J. McDermott
Groups in Galway 88
Department of Mathematics
University College Galway
Galway, Ireland.

Real Analysis Symposium, Coleraine

A Symposium on Real Analysis will take place in Coleraine From August 9th to 12th, 1988.

The main speakers will include P. Bullen (British Columbia), G. Cross (Waterloo, Ontario), R. Henstock (Ulster), J. Kurzweil (Prague), P.Y. Lee (Singapore), J. Mawhin (Louvain), W. Pfeffer (California Davis) and C.A. Rogers (U.C. London).

Further details can be obtained from:

P. Muldowney
Magee College
Derry, Northern Ireland

BOOK REVIEWS

MATHEMATICS AND OPTIMAL FORM by Stefan Hildebrandt and Anthony Tromba

Scientific American Books, 1985, xvi+215pp. ISBN 0-7167-5009-0

"Namely, because the shape of the whole universe is most perfect and, in fact, designed by the wisest creator, nothing in all the world will occur in which no maximum or minimum rule is somehow shining forth."

Leonhard Euler

This quotation from Euler illustrates the depth of the current connecting mathematics with the search for an understanding of the origin, purpose and structure of the world. One of the oldest examples of the search for a unifying principle is that of Xenophanes (about 565-470 BC) who established the existence of a unique God, who is necessarily spherical, by an argument from homogeneity. More recently, we have the string theories of particle physics which seek to derive all four fundamental forces of nature by considering Riemann surfaces embedded as minimal surfaces in a ten-dimensional space-time.

The authors of this book are well-known for their work on variational problems in partial differential equations, and particularly on minimal surfaces. Thus they have a professional interest in soap films, where fascinating photographs of complex bubbles go hand in hand with hard analysis, *a priori* estimates, and novel geometric constructs.

The book appears in the excellent Scientific American Library series, and therefore raises hopes that are not entirely filled in this case. There are lots of entertaining anecdotes and quotations, and many interesting pictures. There is an impressive variety of examples of extreme behaviour and extremal principles. What is missing is the unfolding of a logical argument, or a series of deepening insights such as is offered by some other books in the collection such as Weinberg: "The Discovery of Subatomic Particles", and Atkins: "The Second Law". Also, there is an inclination to include material which, while of considerable interest, is not closely relevant to the main theme. For example, a

page is given to the story Aeneas and Dido, as an offshoot of the isoperimetric property of the circle.

All in all, this is a fascinating collection, drawn from legends, philosophy, natural science, literature and art, illustrating mankind's search for perfection.

D.J. Simms
School of Mathematics
Trinity College, Dublin.

CALCULUS FOR PHYSICS by Richard Dalven
McGraw-Hill, 1984, x+149pp. St £8.25

Cries of frustration emanating from both teachers and pupils have been heard with increasing frequency in introductory physics courses in recent years - inadequate mastery of elementary mathematics being the source of the anguish on both sides. Indeed, the pages of this Bulletin have not been immune from the consequences of this problem [1,2]. While considerable study of the situation on both sides of the Atlantic has isolated some of the causes of this worldwide problem, finding sensible remedies has proved more difficult.

The widespread nature of this very real problem, however, has spawned a growth industry of books, self-teaching aids, computer-aided-learning packages and similar patent medicines, all designed to help the student to overcome his/her difficulties prior to, or in parallel with, an introductory course in physics. The principal difficulty with these approaches is that they tend to assume that the student has infinite time at his/her disposal to undertake remedial study of the required mathematical techniques. Some "Mathematics for Introductory Physics" or "Calculus for the Scientist and Engineer" books exceed 1000 pages! Many of the self-pacing aids require long intensive sessions and lack suitable instructional material. The physics teacher who attempts to incorporate some revision of mathematical methods into the course, soon finds

himself teaching a course in mathematics only, and usually an inadequate one at that.

Here at last is a little book which manages to get the balance right for those students whose problems are principally due to an inadequate background in elementary calculus. The book is designed for students taking their first course in physics and who have already taken, or are taking concurrently, a course in differentiation and integration. In the Irish situation this book would be useful for students taking Leaving Certificate higher level courses in both physics and mathematics or for those taking a first year course in introductory physics at a third-level institution. Richard Dalven is an experienced lecturer in freshman physics at the University of California at Berkeley and he shows a great sympathy for the problems encountered by students at this level. No pretence is made that this book represents a course in mathematics; rather, this is a review of introductory calculus, particularly where it is applied in elementary physics courses. Throughout the book the student is referred to his/her course in calculus in a refreshingly direct and informal tone. ('I would suggest that you work through this material fairly slowly, using your calculus book to refresh your memory on the mathematical points').

In a mere 118 pages of text all the essential topics needed for an introductory physics course are reviewed. No attempt is made to teach physics *per se* and the applications taken from physics are confined to the very simple. An emphasis is placed, however, on the interpretation of the key concepts in differentiation and integration as they arise in physics at this level.

Physics teachers are often amazed at the resistance of some mathematics teachers to invoke examples from everyday experience as an aid to understanding. This waste of good pedagogical opportunity seems extraordinary to this reviewer who had the particular privilege to be introduced to calculus by the late Mr. Fred Holland. Thirty years on, I still vividly recall him racing up and down the classroom with the floor covered with chalk lines as he kept reducing the distance over which he timed himself. His use of his pupils' understanding of the idea of speed to communicate insight of the nature of a derivative was, like all his teaching, masterful.

Dr. Dalven's book comprises two main sections, *viz*, derivatives and differentials (Chapter 2) and sums and integrals (Chapter 3). These are preceded by a short chapter in which the ideas of variables, functions and graphs are reviewed. It seems to be precisely in the area of the essential concepts of variables and functional relationships that the point of view of the mathematician has diverged most strongly from the physicist in recent years. Surely teachers