the work of Bose, Shrikhande and Parker in their recent refutation of Euler's conjecture (which was that no such pairs exist for any order $4k+2$ and is now known to be wrong for all orders $4k+2>6$). Other fine results are on the existence and non-existence of balanced incomplete block designs and perfect difference sets.

The author has himself made many distinguished contributions to the subject, and his authority is evident throughout the book. Extensive references after each chapter, excellent book production and accurate printing combine to make this a worthy addition to this distinguished series of monographs.

JOHN LEECH

CHORLTON, F., *Textbook of Dynamics* (D. van Nostrand Co. Ltd., London, 1963), 263 pp. Paper 25s., Cloth 45s.

This book is a straightforward treatment of some topics of classical dynamics based on vector methods and on the analytical methods deriving from Lagrange's equations of motion. It is obviously designed as a textbook to be used by undergraduates attending " conventional " courses in dynamics as part of an honours degree in applied mathematics. Some parts of it would be useful to students reading for a general degree or for a degree in physics or engineering.

Within this framework it is a carefully written book. The basic physical principles are clearly stated, the necessary mathematical techniques are developed and the theory is fully illustrated by worked examples. At the end of each of the eleven chapters there are problems for the student to work for himself. These are carefully selected from examination papers set in the Universities of Cambridge, London and Reading; answers are given to these problems.

The only sense in which we should quarrel with the author is with his claim that his treatment is " modern ". It is in fact no more modern than the classic treatise of Lamb, published many years ago, and much less modern than well-known treatises by Whittaker and Birkhoff. There are many students of the present generation requiring a modern course of dynamical theory because of its own intrinsic merits or because they wish to go on to do research in quantum theory, astronomy or the mechanics of continua. Unfortunately the course outlined in this book will not give them what they want; if it is of use to some British students it is only because they have to sit examinations on syllabuses which bear no relation to their subsequent careers.

I. N. SNEDDON

MAXWELL, E. A., *Fallacies in Mathematics* (Cambridge University Press, 1963), 95 pp., 6s. 6d.

Dr Maxwell's little book on fallacies in mathematics is already well known—indeed it is so widely recognised as a minor classic that it comes as a surprise to realise that the first edition was published only in 1959. The present edition is described as the " First Paperback Edition ". It is a reprint of the first edition but is now available at a much reduced price. It is to be hoped that this will lead to its being acquired by many sixth-formers and students as well as by those who are entrusted with the task of teaching them, for it is difficult to think of any other book which so fully achieves the author's aim " to instruct through entertainment ".

I. N. SNEDDON

AUSLANDER, L. AND OTHERS, *Flows on Homogeneous Spaces*, Annals of Mathematics Studies 53 (Princeton University Press, 1963), vii + 107 pp., 22s.

This is a series of papers presenting recent results of the authors concerning the action of a one-parameter group of transformations on a homogeneous space G/H of a connected Lie group. Here H is a closed subgroup, and the transformation group

https://doi.org/10.1017/S0013091500011329 Published online by Cambridge University Press

is a subgroup of G acting naturally on G/H. If G is nilpotent, or solvable, the homogeneous space is called a nilmanifold or a solvmanifold respectively. A basic knowledge of Lie groups and Lie algebras is assumed, but there is a useful summary of known results on nilmanifolds (including the work of Malcev), solvmanifolds, ergodic flows and group representations.

Flows on some compact three-dimensional homogeneous spaces are considered in detail. Familiar properties of flows on tori are generalised to flows on compact nilmanifolds, and using group representation theory the ergodic flows are identified and shown to be minimal (all orbits dense). These results are applied to diophantine approximations, giving a generalisation of Kronecker's theorem. Flows on solvmanifolds are studied in some detail. The final section is on discrete groups with dense orbits, and a conjecture of Mahler on diophantine approximations is proved.

D. J. SIMMS

MILNOR, J., *Morse Theory*, Annals of Mathematics Studies 51 (Princeton University Press, 1963), vi + 153 pp., 24s.

This very welcome publication of a lecture course given in Princeton makes generally available for the first time a connected account in modern terms of Marston Morse's theory relating the nature of critical points of a differentiable function on a manifold to the topology of the manifold. Morse's work was done over thirty years ago, but has recently been in the limelight as a result of Bott's use of it in determining the stable homotopy groups of the unitary and orthogonal groups, and Smale's proof in dimensions greater than four of the generalised Poincaré conjecture that a compact n-manifold with the same homotopy type as an n-sphere is homeomorphic to an n-sphere.

The general theory obtains information about the topological cell structure of manifolds by studying critical points of C^∞ functions, and about the space of paths joining two points by studying Jacobi fields along the geodesics joining the two points. Some previous elementary knowledge of homotopy theory, Riemannian geometry, and the calculus of variations would therefore be helpful. The applications are mainly to Lie groups.

The elegance and conciseness of the account and the skill with which the proofs are presented make this a very rewarding book to read. The way in which the calculus of variations is used to yield results on the homotopy properties of the unitary and orthogonal groups is a striking example of cross-fertilisation in mathematics.

D. J. SIMMS

https://doi.org/10.1017/S0013091500011329 Published online by Cambridge University Press