DU VAL, PATRICK, *Homographies Quaternions and Rotations* (Clarendon Press: Oxford University Press, 1964), ix + 116 pp., 35s.

This delightful book is one of the series of Oxford Mathematical Monographs.

Homographies and anti-homographies, at first defined in the complex plane, are transferred by stereographic projection to the sphere, on which they become projective self-transformations. Rotations and reflections appear as special cases. Consideration of finite groups of rotations follows, and naturally introduces the regular polyhedra. Quaternions enter the story because of their application to the representation of rotations of three- and four-dimensional Euclidean space. The elements of certain finite groups of unit quaternions correspond to the vertices of regular polytopes, which are discussed in Chapter 4. The final chapter deals with invariant forms of finite groups of homographic transformations. A connection with the theory of singularities of algebraic surfaces is only briefly mentioned. However the author explains in his Preface, which forms a succinct historical introduction to the book, that it was this connection which prompted him to undertake the work.

The monograph will appeal strongly to those readers for whom the fascination of mathematics lies in the exploration of elegant relationships between its different branches. The printing is first-class and the excellent illustrations include a colour plate.

D. MONK

WIELANDT, HELMUT, *Finite Permutation Groups* (translated from the German by R. Bercov) (Academic Press, New York and London, 1964), x + 114 pp., $2.45.

Although there are plenty of textbooks on abstract group theory and representation theory, none on permutation groups alone has appeared for over forty years, although the subject is very much alive. A monograph on this topic is therefore to be welcomed, especially when written by an authority like Professor Wielandt.

In the author's words, the aim is " to bring together some rather elementary theorems on permutation groups which either no longer appear in current textbooks or have not yet appeared in textbooks at all ".

In Chapter I we meet the fundamental concepts of a constituent of G (where G is a finite permutation group on a set Ω), an orbit of G, the subgroup G_Δ of G consisting of those permutations in G leaving each element of Δ fixed ($\Delta \subseteq \Omega$), transitivity, regularity, primitivity, a Frobenius group. Chapter II consists of 24 pages on k-fold transitivity, k-fold primitivity and $(k+\frac{1}{2})$-fold transitivity. (Some of this is hard going.) Chapter III deals with the transitive constituents of $G_\alpha(\alpha \in \Omega)$. Chapter IV deals with the situation where G, H are permutation groups on Ω and H is regular; usually H is a subgroup of G. In a natural way G can be regarded as a permutation group on H, and by working in the group ring of H over the integers or complex numbers one can obtain information about G. An interesting and valuable part of the book is the 13 pages of applications and discussion which follow the basic theory. A permutation group on a set of n elements can be regarded as a group of $n \times n$ matrices, so the methods of representation theory may be applied; this is discussed in the last chapter. The last section of this chapter is devoted to proving the author's theorem that a primitive group of degree $2p$ is doubly transitive if $2p$ is not of the form a^2+1.

J. L. BRITTON

S. G. MIKHLIN, *Variational Methods in Mathematical Physics*. Translated by T. Boddington (Pergamon Press, Oxford, 1964), xxxii + 584 pp., £5.

The variational method which forms the subject of this book consists in substituting for the problem of solving a given differential equation with boundary conditions an equivalent problem of finding a function which minimises a certain integral or functional associated with the equation. A familiar example occurs when