ORNSTEIN, D. S., *Ergodic Theory, Randomness, and Dynamical Systems* (Yale University Press, 1975), £2·50.

This book is an account of recent major advances in ergodic theory, due mainly to the author. In ergodic theory one considers invertible measure-preserving transformations of a probability measure space; a natural problem is to classify these up to isomorphism. In general this is hopelessly difficult, but recently much progress has been made for some important classes of transformations.

The major breakthrough was Ornstein's proof in 1970 that the Bernoulli shifts were classified completely by an isomorphic invariant introduced by Kolmogorov in 1958, namely the entropy. (A Bernoulli shift is the shift transformation on the set of all 2-sided sequences of elements of a probability space (X, μ) with the product measure. If μ is purely atomic and the measures of the atoms are $p_1, p_2, \ldots$ then the entropy of the shift is $-\Sigma p_i \log p_i$. Otherwise it is infinite.) The techniques he developed enabled Ornstein and others to show that various classes of transformation are isomorphic to Bernoulli shifts and hence subject to the above classification. These include ergodic group automorphisms of the n-torus and various transformations arising from dynamical systems. Analogous results were found for flows (one-parameter groups of transformations). The results have some relevance to the theory of stationary stochastic processes—such a process induces a transformation on the underlying probability space, which is isomorphic to a Bernoulli shift provided the future is nearly independent of the past, in a sense which can be made precise.

The author gives an exposition of the isomorphism theorems for Bernoulli shifts and flows, and a general criterion for a transformation to be isomorphic to a Bernoulli shift, and applies this to some particular cases (ergodic automorphisms of the 2-torus and certain geodesic flows). He also describes his example which shows that the isomorphism theorem does not extend to a larger class of transformations, the *K*-automorphisms.

All the proofs are extremely complicated. This is a very useful book for the dedicated specialist, but others will find it hard to proceed beyond the introduction.

A. M. DAVIE

BLYTH, T. S., *Set Theory and Abstract Algebra* (Longmans Mathematical Texts, 1975).

This book divides into two approximately equal parts. The first part is a course in naïve set theory, proceeding from the basic concepts of sets and mappings, through equivalence relations and order structures, to cardinal arithmetic and the construction of *N*. The section ends with a chapter on infinite cardinals. The second part is devoted to the study of the basic algebraic systems: semigroups, groups, rings and fields. The whole section is built around a careful construction of ***R*** as the unique universally archimedean field. The presentation throughout is quite sophisticated, universal definitions being introduced at an early stage (definition of set product). Substantial collections of exercises are scattered liberally through the text.

I would have reservations about using this book as a teaching text. This is probably because, as the author seems to acknowledge in his preface, the book falls badly between two stools. It seems rather too *careful* a book to be used as an introductory text in these topics, but is also a bit limited to be used at a higher level, there being no serious discussion of Sylow and Galois theory, for example. The general Nonsense of the first half seems to require a level of mathematical maturity that one would only expect to find in a student who already has experience of abstract algebra. This is a pity, because the book does contain some nice solid material at a fairly elementary level.

JOHN PULHAM