and ϕ), the point $z=\sum_{i=1}^{g}\phi(M_i)$ is generic on J with respect to K. The Jacobian varieties furnish concrete examples of abelian varieties of a given dimension and give a link between abelian varieties and curves.

But the more important link is furnished by the application of abelian varieties to the theory of correspondence of curves. In fact, there exists an isomorphism between the module of classes of correspondences between Γ and Γ' and the module of homomorphisms of J into J'. In the case $\Gamma=\Gamma'$ this isomorphism is one between the ring of classes of correspondences on Γ and the ring of endomorphisms of J. Thus the study of endomorphisms of an abelian variety is a generalization of the theory of correspondences of a curve.

The above gives perhaps a broad outline of some results of this book in relation to the classical theory. The author has not only generalized the classical theory into a more profound new theory, with new results, but has presented the results in such a way that the development seems most natural. Among other things the book gives ample justification of the struggle one has to go through in reading the *Foundations* of the author.

SHIING-SHEN CHERN

Lattice theory. By G. Birkhoff. (American Mathematical Society Colloquium Publications, vol. 25.) Rev. ed. New York, American Mathematical Society, 1949. 14+280 pp. $6.00.

In the preface to the first edition of *Lattice theory*, Professor Birkhoff remarked that one of the attractive features in writing such a book was "fitting into a single pattern ideas developed independently by mathematicians with diverse interests." Thus the first edition contained a quite exhaustive account of those topics in mathematics which make extensive use of lattice operations. The same philosophy prevails in the new edition though it is a complete revision of the original. Due to the large number of contributions to the subject in the intervening years, the new volume is nearly twice the size of the old, and yet many important topics are barely mentioned.

The general plan of the book is unchanged. Beginning with partially ordered sets (Birkhoff now uses the term "partly ordered set," though he was not completely successful in changing every "partially" into "partly"), the author treats successively more special systems concluding with chapters on lattice-ordered groups and vector lattices. This method of presentation has the advantage that results for particular lattices often follow as natural specializations of results already proved for more general lattices. On the other hand, this order is sometimes awkward in that the structure of the more general lattices is often characterized in terms of the structure of special lattices which are treated later in detail. For example, the most useful tool for the study of semi-modular lattices is the fact that independent covering elements generate a Boolean algebra.

There are several additions that should be particularly noted. A new chapter on chains and chain conditions contains a detailed account of the various forms of the Axiom of Choice with their interrelations and the applications to transfinite induction. A separate chapter has been devoted to the rapidly developing subject of semi-modular lattices. The inclusion of a proof of Ore's theorem on direct decompositions rectifies a serious omission in the first edition. Finally, there are new chapters on lattice ordered groups and semigroups, the study of which had just been initiated when the original edition was published.

Another feature which considerably improves the new edition is the addition of an extensive collection of exercises. These serve both to give the reader a chance to try the various lattice techniques for himself and to acquaint himself with further results which, for reasons of space, could not be given a more formal treatment.

The new *Lattice theory* will be invaluable as a reference book for workers in the field. The fact that it contains an account of nearly all of the work to date in the subject makes it ideal for this purpose. The theorems have been carefully formulated, the proofs are concise and, for the most part, well presented. Since the author has emphasized the applications of lattice methods to other fields of mathematics, the book should prove particularly helpful to researchers in other fields who are interested in the connection between lattice theory and their specialties. On the other hand the book will not provide a satisfactory introduction to the subject for the beginner. The comprehensive character of the treatment which makes it useful to the expert is likely to confuse the beginner. It will also be difficult for him to recognize the methods and techniques which are best suited to each of the various branches of lattice theory. For example, it may not be clear that formal algebraic methods using the basic lattice operations are appropriate for the study of distributive and modular lattices while more local and structural methods are appropriate for semi-modular and general relatively complemented lattices.

The emphasis upon the many points in which lattice theory touches on other mathematical fields tends to obscure the fact that there is a considerable body of pure lattice theory which is motivated in a natural manner from the postulates, and which has produced many results and problems which are fascinating and quite difficult. This is in contrast with many of the applications where the lattice theory is often quite trivial and the difficulties are those associated with the field in which the application is being made. Thus the lattice theory involved in the study of vector lattices is of a very elementary nature, while many of the results are not at all easy.

As a minor criticism, it appears that several of the "unsolved" problems should have been considered more carefully. For example, problem 82 asks for a characterization of Boolean algebras which are isomorphic with the lattice of all regular open sets of a suitable T_1-space. But such a Boolean algebra must be complete and any complete Boolean algebra is isomorphic with the lattice of regular open sets of its associated Boolean space. Also the answer to problem 93 is trivially in the negative. It should be pointed out in general that the problems vary widely both in difficulty and importance.

Clearly, the new edition is a great improvement over the original, and it should be the definitive work in the subject for some time to come, particularly, since the rapid growth of the field makes it unlikely that another such comprehensive account will be written.

R. P. Dilworth

Calcolo tensoriale e applicazioni. By B. Finzi and M. Pastori. Bologna, Zanichelli, 1949. 8+427 pp. 2000 Lire.

Despite the wealth of the literature which concerns itself with vector and tensor analysis and allied subjects, the present volume is a unique and worthwhile addition to the field. It is a broad survey of tensor algebra and tensor calculus, skillfully interwoven with geometric considerations, followed by applications to the mechanics of deformable continua, electromagnetic fields, and the theory of relativity.

The exposition is lucid throughout, proceeding from particular intuitive ideas to general abstract concepts. The account is replete with illustrative examples. The many applications make it of equal interest to the mathematician and theoretical physicist.

As is natural in such a broad, undetailed treatment, little attention is given to questions of rigor (as, for example, Duschek-Mayer, *Lehrbuch der Differentialgeometrie*, vol. 2, 1930) and the discussion of many topics appears to be compressed excessively. Even the survey