part. The succeeding four chapters are taken up with three-dimensional phenomena and related mathematical problems under the headings of Stokes' stream function, spheres and ellipsoids, solid moving through a liquid, vortex motion. The last chapter is devoted to the introduction of the equations of motion for viscous fluids and concludes with a brief description of boundary layer theory.

While this book can be recommended as a text in classical hydrodynamics for advanced graduate student engineers, it will take a more important place as a reference work and as a source of many original approaches in the manner of presentation for those teaching the subject. The over five hundred exercises ranging from easy to very difficult should prove very interesting since many were taken from the official examinations for Constructor Lieutenants at the Naval College and for the degree of M. Sc. at the University of London.

A. T. IPPEN

Convergence and Uniformity in Topology. By J. W. Tukey. Annals of Mathematics Studies, no. 2. Princeton, University Press, 1940. 9+90 pp. $1.50.

The extension of metric methods to non-metrizable topological spaces has been a principal development in topology of the past few years. This has occurred in two directions: one through a rebirth of interest in Moore-Smith convergence due to results of Garrett Birkhoff, and the other through the concept of uniform structure due to André Weil. In this pamphlet these ideas and their interrelations are given a full and detailed treatment. Many of the results are new. This is likewise true of the point of view and much of the mechanism.

Chapters I and II are concerned with set theory, partially ordered sets, Zorn's lemma, and directed sets. In particular a *stack* (=the set of finite subsets of a given set, ordered by inclusion) is a directed set. Directed sets are classified into cofinally equivalent types, and these are found to be partially ordered. Chapter III introduces the *phalanx* (a function from a stack to a topological space T). It is proved that the topology of T is describable by the convergence of its phalanxes. Chapter IV considers compactness and equivalent properties in terms of phalanxes. The *biggest* compactification of a space is defined and constructed from ultraphalanxes. Chapter V is concerned with coverings of a space (by open sets), and the equivalence of the existence of families of coverings to the existence of metrics and pseudo-metrics. This leads naturally to the notion of *uniform structure* (Chapter VI). A uniform structure is a family $\{U\}$

of coverings of T such that, for any two, U_1, U_2, there is a third, U_3, such that, for each $u_0 \in U_3$, the sum of the u's in U_3 meeting u_0 lie in a set of U_1 and in a set of U_2. Such a structure exists if and only if T is completely regular. This notion generalizes the notion of metric. A given space may have various inequivalent uniformities; a compact space has only one. The concept of completeness is extended, and it is proved that any space with a uniform structure may be completed. Chapter VII carries over these notions from a collection of spaces to their product. An extension of Tychonoff's embedding theorem is proved. Chapter VIII presents a number of examples.

An extensive symbolism makes the reading difficult—especially so when meeting one of the numerous misprints or omissions.

N. E. STEENROD

Formal Logic. By Albert A. Bennett and Charles A. Baylis. New York, Prentice-Hall, 1939. 17+407 pp.

It is well known that logic, which for a long time remained in practically the same form in which Aristotle left it, has lately been undergoing a revolution. The cause of this phenomenon is, essentially, the impact of mathematics upon logic. It has been realized for some time that, by using mathematical methods, the statement of logical principles can be greatly simplified; likewise their scope can be extended so as to take in types of reasoning—such as those dealing with relations—which were only awkwardly handled by the traditional methods. The result has been the creation of an entirely new formal framework of great power and elegance.

As in many such revolutions a long time has had to elapse between the discovery of the new ideas and their appearance in elementary textbooks. Although the revolution in logic has been going on for nearly a century, yet it is only within about the last decade that textbooks of general logic have shown appreciably the effects of the new ideas. But since 1930 there have appeared a number of books of that character in which this effect has been marked. These include books by Stebbing, Cohen and Nagel, Eaton, Chapman and Henle, and a recent book by Churchman. None of these books contains a complete revamping of the subject, but every one is something of a compromise between the old and the new; nevertheless the amount of information concerning the new doctrine is considerable.

The present book belongs to the category just described. It aims "to provide a simple and clear survey of the field of formal logic synthesizing classical and modern developments into a unified treat-