58[W].—L. R. Ford, Jr. & D. R. Fulkerson, *Flows in Networks*, Princeton University Press, Princeton, N. J., 1962, xii + 194 p., 23 cm. Price $6.00.

This small volume presents a unified treatment of network flow methods for solving a class of linear programming problems subsumed under the phrase "transportation-type models." The problems treated by the authors are limited to the case for which the assumption of integral constants in the constraints implies the existence of an integral solution. Numerous examples are provided to elucidate the various techniques. Extensive bibliographies at the end of each chapter greatly enhance the value of this book.

An elegant proof of the max-flow min-cut theorem is developed that yields an efficient computational method for determining a maximal steady-state flow in a network subject to capacity limitations on arcs. This theorem is also utilized to (a) develop necessary and sufficient conditions for the existence of network flows that satisfy linear inequalities of various kinds, (b) solve combinatorial problems involving linear graphs, partially ordered sets, set representatives, and zero-one matrices, and (c) study multi-terminal maximal flows in undirected networks.

Adaptations of the maximal flow algorithm are presented for obtaining network flows that minimize cost, subject to various kinds of constraints on arcs. Included in this category are:

(a) A specialized algorithm for the standard Hitchcock transportation problem,

(b) A general algorithm for the trans-shipment problem with capacity constraints on arcs,

(c) A shortest chain algorithm for an arbitrary network,

(d) A method for constructing minimal-cost feasible circulations in a network having lower bounds as well as capacities on arcs.

Two interesting and useful applications of the theory developed for minimal cost flows are discussed; namely, (a) constructing a maximal dynamic flow in a given time interval for an arbitrary network in which each arc has a traversal time as well as a capacity, and (b) constructing a cost curve which depicts the minimal project cost as a function of the completion date of the project.

The authors have made a commendable contribution to the development of computationally efficient methods for the application of network flow theory to operations research and combinatorial mathematics. Their lucid discussions of the basic principles should make this book a valuable reference for those who are interested in the solution of management control problems which can be depicted by arrow diagrams of a network-analogue variety.

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59[W].—Western Data Processing Center, University of California, Los Angeles, *Contributions to Scientific Research in Management*, [Proceedings of the Scientific Program following the Dedication of the Center January 29–30, 1959], Division of Research, Graduate School of Business Administration, University of California, Los Angeles, 1961, ix + 172 p., 26 cm. Price $2.50.

This volume is comprised of three chapters, which contain the proceedings of the symposium listed in the title. Of the four papers in the first chapter, two (Arrow,