Combinatorial Programming: Methods & Applications.

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D. Reidel, Dordrecht-Holland/Boston U.S.A. 1975 xiii + 386 *pp. Cloth.* Dfl. 90/*US*$36.00. Vol. 19, Series C—Mathematical & Physical Sciences.

This book reports the formal proceedings of the NATO Advanced Study Institute held at Versailles, France, 1974 in order to give an ostensive form of definition of combinatorial programming by means of invited survey papers together with some research contributions. Part I is devoted to General Methodology and begins with an excellent paper by Müller-Merbach on the morphology of combinatorial problems and an algorithmic approach to finding good methods and good heuristics for solving such problems. Hansen has a major survey on Branch and Bound Methods in terms of some unifying concepts, and Hammer gives a guided tour of Boolean methods, demonstrating their power. Part I is concluded by Dantzig and Eaves on Fourier-Motzkin elimination and the application of its dual to generate all the solutions to integer linear programs.

Part II is devoted to Paths and Circuits and has papers by Roy, Gondran, Christofides among others. Gondran presents a general algebraic structure for the synthesis of graph theory path and routine problems and Christofides reviews algorithms for the travelling salesman problem.

In Part III on set partitioning, covering and packing, Balas and Padberg give a survey of set partitioning; both theory and algorithms are discussed. Marsten gives a branch and bound algorithm for large set partitioning problems with computational experiences. Edmonds uses matching theory to investigate the conditions required for a "good" algorithm.

Miscellaneous topics are collected into Part IV, for example graph colouring and application to scheduling, "one-machine" scheduling, the quadratic assignment problem. The book concludes, as it began, with Müller-Merbach, now with some stimulating ideas on the use of puzzles in teaching combinatorial programming.

Some of the papers discuss applications of combinatorial programming and computational experience is sometimes quoted. Nevertheless the papers are largely theoretical and the greater part of the case studies presented at Versailles are not included. The languages used are English and French with the former being more common. "Non-specialist" means different things to different people. This school was directed to the non specialist but the latter needs to be either trained as a mathematician or as a mathematician by interest and experience. Moderate sized or large O.R. groups could usefully hold a copy of the book but most of it is not everyday reading for the majority of O.R. workers. It will, of course, be very useful to intending research workers in the field since all the papers touch the frontiers of knowledge and some unsolved problems are discussed.

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