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Book Reviews

Annual Review in Automatic Programming, Volume 3. Edited by R. GOODMAN, 1963; 360 pages. (Oxford: *Pergamon Press*, 80s.)

The third volume in this series contains, like its predecessors, a collection of independent papers of which all but two can be placed into one or other of the two groups, scientific or commercial. The aims of the previous two volumes have been adhered to, and if it is thought that there are omissions from the present volume, one should remember that the interesting ideas are not always easy for the Editor to chaperone into print. Furthermore, the present volume does reflect the direction in which a great deal of thought was being led at the time of collecting these papers.

On the scientific side all the emphasis is on ALGOL, and the subject really seems to have received justice in this volume. The commercial papers are well introduced by being preceded by an excellent summary of four commercial languages, each of which lays claim to being on a par with COBOL.

The omission of a Preface, as was present in the previous volume, is thought to be a sad loss, but it may be a wise move since the hopes expressed in it on the occasion of its previous appearance cannot be said to have been satisfactorily fulfilled. One feels too, that as more people enter this field, the guiding hand of the Preface could set the scene against which the true achievements can be seen in all their glory.

As to the individual papers, the one describing "A Multi-Pass Translation Scheme for ALGOL 60" was in vogue at the time of writing and is still of commanding interest since it pertains in detail to one of the country's fastest computers. The scheme is reported to be adaptable to any machine but it transpires that a machine having logic similar to that described would be almost essential. The author's thumb-nail description of his own computer on one sheet is quite an achievement, but had it been twice the size the reader would have been pleased. For anyone who has the task of writing an ALGOL translator with optimization, these 44 pages will prove very absorbing, and it is clear that a great deal of thought has been given to the snares and pitfalls which can occur when compiling a language of the scope and complexity of ALGOL. The parallel scheme for a fast "load and go" compiler deserves a mention in the paper as a reviewer feels that many readers would like to pursue the two schemes side by side, as, for instance, they have been presented somewhat differently at a recent symposium.

The paper on "The Compiler Compiler" is presented as being a sequel to previous publications. This need not deter would-be explorers although the previous digestion of past presentations of the same subject will make the journey much easier. If one wishes to criticize the authors, and there are four of them, for the apparently heavy going, let him be reminded that the scheme really does work. This paper deals with the manner of definition of a language in phrase-structure terms, thereby the allowing of the construction of a compiler for that language. Although one of the longer papers in the volume, it is well laid out and makes for clear reading. Some remarks on the more mundane aspects, such as size of program and difficulties of application of the technique, would not have been out of place at the end of the paper.

By far the longest paper in the book deals with an American idea, "Jovial—A Programming Language for Real-time Command Systems". The author prevents the reader's interest from waning by giving trivial yet helpful examples of each concept and, whereas the main theme may be above the skyscrapers, these examples are real-life facts. This paper, whilst having a welcomed introduction, lacks an exposition of the manner in which the author is going to conduct us through the undergrowth of commands in the language. This is but a small defect, however, in a paper which blows a wind of fresh air through the sheets of ALGOL.

The commercial languages are ably and more or less fully reviewed by A. d'Agapeyeff and associates. He compares COBOL and FACT, both of which had a good airing in Vol. 2, and the I.B.M. Commercial Translator and the English counterpart NEBULA with each other. The present authors take each of these main languages in turn and discuss their relative merits, unlike the similar theme which was handled in Vol. 2 subject-wise. One must mention that RAPIDWRITE, CLEO and FILECODE are then described in this informative review. This paper has the advantage of being short and concise, and well deserves its place. In passing, one can note that it again bemoans the

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These coefficients are of widely different magnitudes. The largest value of $|\gamma_{ps}|$ for a fixed p occurs near $s = s_0$, where

$$s_0 = \tfrac{1}{2} + \left[\tfrac{1}{4} + \frac{2p^2(p+1)}{4p+1}\right]^{\frac{1}{2}} \simeq \frac{p}{\sqrt{2}}. \qquad \text{(A.17)}$$

We introduce coefficients $L_p^{(t)}$ useful for discussing the convergence of the iteration process. We may write

$$L_p^{(0)} = \sum_{s=1}^{p} \frac{|\gamma_{ps}^{(0)}|}{s^{2p}} = \frac{2^{2p}}{(2p)!} N_p \qquad \text{(A.18)}$$

where

$$N_p = 1 - \frac{(2p-1)!!}{(2p)!!} \simeq 1. \qquad \text{(A.19)}$$

The values of $\gamma_{ps}^{(t)}$ for this mesh ratio sequence may be easily obtained using (A.14), and the value of $L_p^{(t)}$ is given by

$$L_p^{(t)} = \sum_{s=1}^{'} \frac{|\gamma_{ps}^{(t)}|}{s^{2(p+t)}} = L_p^{(0)}\{F_p^{(t)}(1, 4, 9, \ldots p^2)\}^{-1}. \qquad \text{(A.20)}$$

We should like to acknowledge helpful discussions with Professor J. M. Blatt and Dr. L. M. Delves.

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state of progress in U.K. as compared with U.S.A., and it is perhaps sad that, since in the preface to Vol. 2 the editor wrote that Vol. 1 reflects the backward state of automatic programming methods in U.K., we do not seem to have progressed very much further forward.

The paper on RAPIDWRITE describes a worthwhile effort, although it does not present any new information, and most of those who are interested may wish to seek elsewhere for their description The language SEAL comes back for a follow-up from Vol. 2 but one still feels that it is somewhat out in the cold. The problem which yet remains to be solved is to what extent commercial users dare depart from COBOL, and also to what extent a language unique to one machine can be allowed to propagate a growth of programs which are not interchangeable.

This volume has maintained the standard of its predecessor, also with an increase in price, but the timing of the next volume and the selection of papers still merit all the editor's skill if the publication is to remain fresh. B. RICHARDS

Proceedings of a Harvard Symposium on Digital Computers and Their Applications. Edited by A. G. OETTINGER, 1962; 332 pages. (London: *Oxford University Press*, 120s. Cambridge, Mass. *Harvard University Press*)

The Proceedings of the first two Harvard Symposia on digital computers occupy respected places in the libraries of computing laboratories, and this volume, the Proceedings of a Symposium held in April, 1961, may be expected to gain similar acceptance. This Symposium was, however, quite different from the others. Previously the design and hardware aspects of computers had occupied substantial time and so, too, had reports of problems in Numerical Analysis and applications to the physical sciences. This time much greater emphasis has been placed upon the application of computers to the social sciences, and much less upon original contributions in the areas of interest of the first workers on automatic computers. The second difference was in the composition of the Symposium: the others were attended by hundreds of participants from all over the world; 47 people met informally on this occasion and all but a handful of these were Faculty members of Harvard itself. Accordingly, this must have been a much more domestic affair than the earlier ones, and inevitably has sacrificed something of the authority of the earlier Symposia. The variety of topics is so great that it is unlikely that many of such a small gathering fully understood all the papers, or even that many would do so for any particular paper; the reviewer is certainly in no better position than those attending and he, therefore, cannot comment on all the papers.

Several of the contributions were surveys of possible and actual computer applications in special fields. These papers will be full of interest to someone outside such fields, and yet give valuable guidance and will be a source of useful references for those workers thinking of applying computers to similar problems. The papers on computers in Educational Research, Public Health, X-Ray Crystallography, Medicine, Statistics, Economics, Psychological Research and Business Administration were of this type. Some of the problems mentioned required the application of known techniques—for example, statistical ones—but have awaited the simultaneous occurrence of the right equipment and the right investigator. Other problems posed are those of what E. B. Newman calls paracomputation—non-computational uses of computers. If a criticism is to be levelled here it is that much of what is written is too imprecise to tell a reader how he should proceed on his own machine. Simulation is featured in several papers; one on Queueing Theory and Reservoir Design gives numerical examples of the calculations performed.

There are several papers which show the sorts of differential equations which arise in physical problems, and the numerical methods available for their solution. Examples are given from hydrodynamics, plasma dynamics, kinetics and molecular-beam theory.

Two of the longest papers in the volume deal with document content, one in the context of information retrieval, and the other, by Mosteller and Wallace, about the problem of disputed authorship. The latter work received considerable publicity in the American press because of the great public interest in all matters pertaining to the Constitution. The problem was to determine which of Alexander Hamilton and James Madison wrote certain papers urging the ratification of the Constitution. Even to an Englishman this paper contains a fascinating account of the work by two eminent statisticians to clarify the obscurity of history. They describe the early work, how one of them thought it easy but long, how wives and others counted, how checks were necessary, how first ideas failed to give any indications to the answer, and how finally computer counts yielded data to which their statistical methods might be applied and so point to a conclusive answer.

The editor, who has himself contributed a paper with the intriguing title: "The Geometry of Symbols", is to be congratulated on disciplining his colleagues to such an extent that their accounts only rarely seem to become incomprehensible—a considerable achievement when dealing with material of such interesting diversity. E. S. PAGE