formed in an open-loop fashion capable of handling trajectory-shaping techniques using simple guidance and flight-control-program schemes. It may be noted that quite similar computer programs are being used in the simulation of preliminary performance trajectories.

A more rigorous mathematical simulation of aerospace vehicle flight dynamics must include the vehicle as a material body, whether it be rigid or flexible, a representative closed-loop autopilot and an adequate closed-loop guidance scheme. All of these elements can not be handled by the Rocket computer program as may be noted in the closing portion of the book. However, the advent of Fortran as a scientific programing language that can be used on practically all large-scale digital computers makes it possible to adapt the Rocket trajectory computation program to many different computers without any modifications, provided that the specific trajectory needs are satisfied. It may be recommended that anyone interested or actively engaged in the use of the Rocket computer program should acquire this book as the operational manual or guide to accompany the computer program, thus furnishing adequate operational instructions.

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COMMUNICATING TO A COMPUTER

Title Introduction to Algol
Authors R. Baumann, M. Feliciano, F. L. Bauer, K. Samelson
Publisher Prentice-Hall, Inc., 1964
Pages x + 142
Price $9.00

Reviewer John E. Denes

This book is by far the best available text on a rather difficult subject, the fledgling universal computer programing language, Algol (ALG Orithmic Language). Algol is not yet accepted by the bulk of computer users in the United States and probably never will become the dominant programing language. However, there exists a constantly growing library of programs written in Algol, and even the casual computer user who does not want to be completely dependent upon professional programers will have to acknowledge Algol's existence. This primer, as it calls itself, seems to have been written for the casual user.

There is one serious objection to the book, namely that its price ($9.00) seems outrageous. Effectively, the book has 96 pages, many of which are more than half blank. Not included in this number is the 40-page appendix, a rigorous description of the language, which is of no value to the average user of the book and which, in addition, is only a reprint of freely available material already in the open literature. There is no other unfavorable comment to make.

In 1958 Fortran was a relatively new programing language implemented on only one computer, the IBM 704, and users of computers were searching for a universal machine-independent, problem-oriented language. Representatives of ACM (Association for Computing Machinery) and GAMM (Gesellschaft für Angewandte Mathematik und Mechanik) met in Zurich to try to reach an agreement on such a language. Their aim was to specify a universal language, based on mathematical notation and principles, acceptable to the computing profession. In those days, most computer usage was of a scientific nature and, thus, the language searched for omitted the needs of other users. The outcome of that and subsequent meetings was a rigorously defined language, Algol.

In most of Europe, where IBM's, and consequently Fortran's, influence was not as strong as in the United States, Algol enjoyed an immense success and became the dominant scientific programing language. In the United States, after the more-or-less forced implementation of Fortran by all computer manufacturers, Algol fared less well. The recent IBM announcement of its New Programing Language (NPL) might well mean the end of future development of Algol. However, Algol's past acceptance makes it impossible just to ignore its existence.

Increased use of large-scale computers and a continued shortage of professional computer programers has forced most scientists and engineers to acquire at least a superficial knowledge of programing. These computer users are not interested in computers per se; their interest lies mainly in using the computer as a tool, in getting solutions to their problems. For this, they demand that the professional programer supply them with some formal language in which to describe a problem solution, a language easily learned and not dependent upon a particular type of computer. Algol is such a language and, while not the most popular one, it is becoming more and more important to scientists and engineers.

Unfortunately, most descriptions of Algol are very formal and rigorous, written more for the implementer than for the user. This book is definitely written for the user. Its clear presentation, logical progression, and numerous examples make it useful for self-study. Some of the examples should have been chosen with more care to illustrate solely the programing aspect rather than add the distraction of numerical analysis. It is obvious that the author's intent was the book's use as a classroom text, in which case the selection of examples is understandable. The mature scientist should be able to take these ad-

ditional difficulties in his stride and not let them distract him from his learning.

More and more, undergraduates in engineering and the sciences are taught courses in Algol. In the not-too-distant future, it is quite reasonable to assume that Algol will be used as the accepted description language of all computing processes, the way mathematics is the accepted description medium for natural processes. As a publication language, as a formal, unambiguous description of an algorithm, Algol is definitely far superior to any other medium. It is the only language accepted in the Algorithms Section of ACM Communications, the preferred language in many other publications.

After a thorough study of this book, one will not necessarily be able to write a good Algol program; this was not the intent anyway, at least for American readers, particularly since there aren't any Algol processors available for most American computers. However, one will be able to read and understand a published algorithm written in Algol and encode it in one of the available languages such as Fortran.

John E. Denes is Group Leader for Systems Programming in the Applied Mathematics Department at Brookhaven National Laboratory. Before joining BNL in 1961, he was in charge of the IBM 704 group of the Programing Research Section at Argonne. Mr. Denes received his BS (magna cum laude) degree in Physics in 1957 from CCNY. He is the author of several reactor codes for computers and of a (IBM 704) machine-language to machine-language translator (George). Since 1959 he has been a member of the Share Fortran committee and since 1963 chairman of the Share Direct-Coupled 7090/7040 project. A past president of the Long Island chapter of the Association for Computing Machinery (ACM), he is also a member of SIAM, MAA, AAAS, and of Phi Beta Kappa.

BRAINSTORMING AND OTHER TECHNIQUES

Title Creative Synthesis in Design
Authors John R. M. Alger and Carl V. Hays
Publisher Prentice-Hall, Inc., 1964
Pages 112
Price $2.95 paper; $4.95 cloth

Reviewer J. B. Godel

Creative Synthesis in Design is one of a series of eight design books published, or about-to-be published, covering such subjects as decision theory, engineering communication, reliability and studies of specific design problems. In *Creative Synthesis in Design,* the authors examine the subjective elements of problem solving in engineering.

They divide the design process into six sequential categories: recognizing the problem, establishing functional specifications, proposing solutions, evaluating alternatives, deciding upon a solution and, finally, implementing the decision. A "design decision table" is used to evaluate alternatives by rating each concept on how well it meets the requirements of the specification. An interesting weighted scoring arrangement helps to point the way towards the best solution.

The authors believe that there are methods to stimulate creativity in problem solving. The first step (and perhaps the most difficult in the reviewer's opinion) is understanding the problem. Secondly, the problem solver must have cultivated a creative attitude, which is defined as one possessing self-confidence, constructive discontent, positive outlook, an open mind and the courage of his convictions. As to the methods of achieving the best solutions to design problems, it is suggested that existing knowledge and experience relating to the problem be studied as a prerequisite to individual and group creative effort.

The mechanics of individual and group creative effort is covered in sufficient depth to be useful to the reader. A morphological analysis of the problem outlining a systematic examination of possible solutions is presented with clarity. 'Brainstorming' as a tool for group inventiveness, in which many solutions are offered with no immediate consideration of their worth, is explained. The text provides a useful guide for conducting such a session. Final chapters are devoted to project planning and scheduling. Elementary descriptions of Program Evaluation Review Technique (PERT) and Critical Path Method (CPM) might be helpful to the novice.

Creative Synthesis in Design is not a lengthy volume. As such, it can do little more than survey the field and guide the interested reader toward further study. Abundant reference material is found in the bibliography. The book is well written in an unsophisticated style and, while its use to the practicing engineer is limited, it should be of special value to the engineering student.

J. B. Godel has been practicing design engineering for over 15 years. For the past 13 years he has been with Brookhaven National Laboratory designing remotely operated devices, reactor components, and experimental equipment for studies in high-energy physics, medicine and chemistry. Prior to BNL he designed packaging machinery for Union Bag and Paper Corp. He attended Polytechnic Institute of Brooklyn and Hofstra College (Long Island) and is a licensed professional engineer in the state of New York.

THERMAL STRESS AND STRENGTH

Title Strength and Deformation in Nonuniform Temperature Fields
Author Ya. B. Fridman, ed.
Publisher Consultants Bureau Enterprises, Inc., 1964
Pages iv + 169
Price $25.00
Translated from the Russian, 8 1/2 x 11 in.

Reviewer Robert B. McCalley, Jr.

This book contains five chapters by different authors on problems of thermal stress and strength. Each chapter generally follows the form of a survey of the state of the