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BOOK REVIEWS

Designing micro computer systems by Udo W. Pooch. Hayden Book Company, Inc., 50 Essex Street, Rochelle Park, New Jersey 07662, U.S.A., 1979, pp. 224, $ 9.95.

This book aims at providing the background information necessary to build a microcomputer system. In the preface the authors point out that this is not a hand-book that can replace the detailed instruction sheet attached to the microprocessor kits. They also point out that the book does not aim at teaching the technical skills required for assembling the kits. It is with this background that one should read this book. Even though the earlier chapters provide some background on the basic concepts of the computers one should have some knowledge of the computers and computing to undertake the reading of this book. For example, the software concepts are just enumerated. Nowadays, it is appreciated by one and all that in the microcomputer field the hardware and software are inseparable.

The chapter on basic hardware components has been well presented and put across to the reader in a progressive and a logical manner. The bit-sliced microprocessors could have been dealt with in more detail indicating some of the contemporary chips of AMD 2900 series. In addition to the microprocessors taken for examples in the later chapters (Intel 8080, Zilog Z–80 and Motorola MC 6800) a chapter on AMD 2903 and 2910 could have enhanced the reading value of this book.

Chapters 3, 4 and 5 deal with Intel 8080, Zilog Z–80 and Motorola MC 6800. The authors have succeeded in presenting these systems in a way that is easily readable and understood by all. However, a chapter on a 16 bit microprocessor should have been included in this book instead of taking three examples of 8-bit micro processors. The chapter on microprocessor interfacing is very appropriate as the development of a microprocessor system does not stop with assembling the system. Development is complete only when such a system is interfaced with peripherals meant for providing the required data for the microcomputer. This chapter, though short, highlights the importance of interfacing the peripherals like key board, D/A, A/D convertors, the printers, floppy disc and also an audio cassette system.

This is a useful book for a computer hobbyist before he can undertake the hardware design for which the data sheets and the application notes of the manufacturers will be required in addition.

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Components for microcomputer system design edited by Dave Bursky. Hayden Book Company Inc., 50 Essex Street, Rochelle Park, New Jersey 07662, U.S.A., 1980, pp. 272, $ 11·95.

The microprocessor has revolutionized electronic system design during the past decade. Being a universal component, microprocessors with a wide variety of specifications and characteristics are now being produced and their performance as well as reliability have greatly improved in recent years. Also, the microprocessor prices are coming down year by year making them more attractive in practical applications. Recognizing the importance of microprocessors, the *Electronic Design* magazine regularly publishes articles dealing with technology, current trends, capabilities, practical design information and future projections of microprocessors contributed by scientists and engineers from industries and R and D laboratories as well as its own editorial staff. These articles have been found to be immensely useful by electronic engineers and designers around the world for gaining most up-to-date knowledge and information on this important subject. The editor has done an excellent job in selecting the most useful articles in this area which have appeared in *Electronic Design* in about two years preceding 1980 and organizing the same in this book form.

The articles in the book have been organized into five sections. In the first section, an overview of microprocessor and microcomputer technology is covered. The articles in this section summarize the different microprocessors and bit slices now available indicating how the available technology is shaping the future products. This section also includes a data manual of the latest microprocessors and microcomputers, which is of great use to system designers. The second section covers the latest in single-chip microcomputers. Such microcomputers have now become the mainstay of electronic games, appliance controllers, computer perepheral controllers, etc. Section three of the book deals with the high-power 8-bit microprocessors. In this section, bipolar high-speed microprocessors useful for control applications, the 8088 microprocessor system which facilitates 16-bit performance on an 8-bit CPU, and R6500 microprocessor family are covered in detail. This is followed by a discussion on 16-bit microprocessors in the following section. A wide variety of 16-bit microprocessors, *viz.*, Z 8000, MC 68000, Intel 8086 and TMS 9900 are covered here together with some of their applications. The last section gives bit-slice processors of high performance. Semiconductor technologies such as ECL, Schottky TTL are emphasized here and a few applications are also covered.

The Editor should be complimented for organizing these 33 papers in book form for the use of electronic system designers. In the reviewer's opinion, it serves as an excellent reference source on microprocessors and related components, which field is advancing rapidly.

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Computer design development: Principal papers edited by E. E. Swartzlander. Hayden Book Company, Inc., 50 Essex Street, Rochelle Park, New Jersey 07662, pp. 310, $ 14·95.

This book is a compilation of what are considered by the editor to be the key papers in the development of computer hardware over the last forty years. The material is grouped into three areas: Logic Design, Arithmetic Algorithms and Computer Architecture. The emphasis is on new concepts and ideas—not technologies; thus the book does not cover the developments in the area of integrated circuits which have revolutionized the computer industry over the last decade.

The first section begins with Claude Shannon's classic paper on the symbolic analysis of relay and switching circuits. This important paper develops the frame work which enabled the use of Boolean logic concepts in switching circuit design. Readers who are familiar with the Karnaugh Map and Prime Implicant Method for combinatorial function minimization would be interested in the next two papers by the original contributors of the ideas: M. Karnaugh and E. J. McCluskey, respectively. The papers on sequential circuits begin with G. H. Mealy's paper which first proposed what is now known as the Mealy model of a sequential machine. The penultimate paper of this section by S. H. Unger deals with the detection and elimination of hazards in asynchronous networks. The final paper by J. H. Tracey is on the state assignment problem to avoid critical races in asynchronous sequential machines. The paper provides a good introduction to the design methods used for sequential networks

The series of papers on Computer Arithmetic begins with the paper by O. L. MacSorley, where the now well-known carry lookahead technique for addition was first proposed. Some speed-up techniques for multiplication and division are also reported Following this is A. D. Booth's paper which is the origin of the "Booth's Algorithm" for multiplication. Parallel multipliers are described in the following paper by L. Dadda. A number system which is useful for certain types of specialized processing is next described in the paper by H. L. Garner on the residue number system. The section concludes with a paper describing the floating point execution unit of the IBM System 360 model 91 by S. F. Anderson *et al.*

The third section begins with what may be in the words of the editor the single most significant paper in the field of computer design. The paper is entitled "Preliminary discussion of the logical design of an electronic computing instrument" authored by A. W. Burks, H. H. Goldstine and J. Von Neumann. Since this was one of the first attempts to describe a stored program computer, the paper is basic and remarkably thorough. Many features of modern computers, automatically taken for granted by designers, are first proposed here: the concept of a stored program, the use of 2's complement arithmetic, etc. This paper should be read by all computer designers for a good insight into the genesis of 'Von Neumann' machines. The paper by I.S. Reed which follows is on the symbolic synthesis of digital computers. It describes a systematic approach to the design of the control unit of a computer, and later gave

rise to register transfer languages, so commonly used in computer design and documentation. A different approach to the design of the control unit is proposed by M. V. Wilkes in the following paper. The idea of a microprogrammed store was first introduced here, though it was implemented only a decade later. The IBM 360/65 Cache Memory System is next described in a paper by J. S. Liptay. The cache memory organization greatly reduces the speed mismatch between a relatively slow main memory and a fast processing unit. The CDC 6600, the first large computer to employ a parallel architecture, is described in the succeeding paper by J. E. Thornton. The section concludes with the description of the SOLOMON computer—the first array processor, by D. L. Slotnick *et al.* This was the predecessor of the giant ILLIAC IV. The need for parallel algorithms to suit this radically different organization was first emphasized here.

An appendix containing the original paper by W. H. Eccles and F. W. Jordan on the bistable flip-flop, and a paper on the CORDIC trigonometric computing technique concludes the volume.

Though most of the material in this volume is available in standard texts on Switching Theory and Computer Organization and Architecture, not many designers may be familiar with the origins of the techniques and concepts used by them. In this respect, the book is a useful reference. It would have been helpful to the reader interested in the history of computers, to have in the editorial comments, a mention of the criteria used in the selection of papers. Anyone familiar with the area would note the omission of papers on stack computers and pipelined architectures—important developments in their own right. Anyhow, the book has made many classic papers accessible, as many of the older papers are difficult to obtain, and serves 'to record the excellent work which has occurred in this vital field.'

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Programming programmable calculators by Harold S. Engelsohn. Hayden Book Company, Inc., 50 Essex Street, Rochelle Park, New Jersey 07662, U.S.A., pp. 224, $ 10.75.

Tens of millions of people use calculators for numerous specific and worthwhile purposes. Majority of them find it very difficult to understand the manuals accompanying programmable calculators and this book is meant to translate the jargon found in the manuals into clear instructions that someone with little or no programming experience can understand. The author tries to achieve his objective by giving numerous examples.

This text has been written so as to be applicable to the vast majority of the programmable calculators that use an algebraic operating system. Among the machines discussed specifically are: Texas Instruments SR52, SR56, TI57, TI58, TI59, PC-100 and PC-100A, Commodore PR100.

Chapter 1 discusses the organization of calculators and how the different functional units work internally. It also discusses entry and running of programs, program editing and basic instruction set. Chapter 2 introduces the basic steps involved in translating a problem into a procedure or algorithm in terms of the given programmable calculator's instruction set. Loops, conditional branches, and advantages and disadvantages of using labels are discussed in Chapter 3. Chapter 4 covers the use of testing registers, preprogrammed functions and flags. Chapter 5 discusses certain unique features (flags and IF decision) found in SR52 calculator. The use of subroutines is explained in detail by developing two important programs in Chapter 6. Chapter 7 presents the concept of indirect addressing which is built into the SR52 and the T158/59.

The main strength of the book lies in the numerous examples and sample programs given throughout the book. The examples which occupy more than a half of the book are presented fully. Comments explaining what each instruction does and program listing that trace the actual execution of the program help the reader understand the solutions effectively.

The book suffers from some minor omissions. First, it does not cover all the features (*e.g.*, Reverse Polish Notation) found in modern-day calculators. Second, a glossary of some selected calculator operations and concepts would have been of immense help to the reader. Third, a section on programmable calculator applications in business, industry, education, engineering and science would have brought out the versatality of the programmable calculators.

In spite of the above drawbacks, this is an excellent introductory book on programming programmable calculators to the beginners.

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Fortran on time-sharing by G. E. Zinsmeister, F. D. Stockton and L. A. Webster. Engineering Press, Inc., San Jose, California 95103, U.S.A., 1979, pp. 103, $4.95.

This book assumes no previous knowledge in time-sharing, but presupposes that the reader has a very easy access to a computer terminal. The instructions to use the users terminal are applicable to the CDC CYBER time-sharing system. For DEC–1090 and other time-sharing systems, the instructions for using the terminal naturally need modifications.

The book begins with detailed instructions to get started with the use of terminals, creation and updation of files and the job termination on terminals. After covering these aspects, the book starts with the introduction to the Extended Fortran, similar to BASIC. The Fortran discussed is especially applicable in the time-sharing environ-

ment. Most of the Fortran–IV instructions are covered. As the book itself is compact, it is not very detailed. In the format statements, only the F and E formats are covered. Many of the extended statements like GET, RUN, etc, being BASIC-like, are not available in many Fortran–IV versions.

The last part of the book discusses efficient ways of writing programmes, program development and debugging, and a list of common programming errors. Sixteen groups of problems given at the end of the book serve as an aid in covering problems pertaining to all aspects of Fortran. A useful index is appended at the end of the book.

It is on the lines of Teach Yourself series and serves as a good and compact introductory text to a beginner who has an easy access to a users terminal, and the compuuer accepts the Extended Fortran version.

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Thermodynamics of nuclear materials—1979 Vol. I,—pp. 588, Australian Sch. 840; Vol. II, pp. 427, Australian Sch. 840, 1980, Division of Publications, International Atomic Energy Agency, Wagramerstrasse 5, P.O. Box 100, A–1400 Vienna, Austria.

The two volumes under review are the proceedings of an international symposium held in Jurich, FRG, from 29th January to 2nd February 1979. The design of nuclear fuels and their containment requires thermodynamic data to base estimates of fuel life, of cladding and coating performance and integrity, and of the behaviour of fuels under accident conditions involving high fuel temperature and pressures. Thermodynamics research is costly in terms of materials, equipment, time and manpower, and international cooperation is therefore very much needed to ensure that there is a minimum of unnecessary duplication of effort on a world-wide scale.

The IAEA meetings of 1962, 1965, 1967 and 1974 covered the full range of basic thermodynamic studies and methodologies and brought about an interaction between thermodynamicists and engineers. The 1979 symposium covers more of applied thermodynamics.

Volume I presents seven sections on the following : Vapourization thermodynamics, Equation-of-state studies, Spectroscopy, EMF studies, Diffusion studies, Oxide fuels and Fission products. Volume II covers five sections on Fusion thermodynamics, Basic thermodynamic studies, Phase diagrams, Studies related to clad performance, and Melt/Concrete interaction, followed by a Summary and indices.

A significant portion of the symposium programme was devoted to oxide fuels, particular reference being made to fast breeder reactor applications. There are discussions on oxygen diffusion and its effect on fuel/cladding interactions, phase diagrams for fuel-fission product systems, vapourization of core components and melt-down accidents of cores. One feature of importance in international fusion experiments is the thermodynamics of materials required in fusion reactors—liquid helium, solid lithium alloys, and lithium-containing ceramics. The stability of vitreous storage media and the resistance of glasses to leaching can be improved by considering the thermodynamic data of the major components; and studies have been reported on diffusion of elements in glass matrices intended for fixing high-level radioactive waste.

While this is an authentic scientific symposium, useful for the academics as well as the practising nucler engineers, there is not even a single paper to highlight the dangers of nuclear energy programmes in a critical manner, even though there are some papers where passing mention is made of possible accidents. It would have been useful if the translations of the papers in Russian, French, etc., were given so that the international readers need not search for translators again.

While the two volumes are of prime importance to nuclear scientists, there is no doubt about its academic value and materials scientists would certainly benefit by possessing a copy in their libraries.

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Uranium evaluation and mining techniques: Proceedings of a symposium held at Buenos Aires, 1–4 Oct. 1979, Published by International Atomic Energy Agency, A–1400 Vienna, 1980, pp. 550, Aust. Sch. 800.

Many countries have started national programmes to determine their uranium potential and to explore the uranium deposits. The International Atomic Energy Agency is concerned with the exploration and processing of uranium ores and the volume under review is the proceedings of an international symposium on uranium evaluation and mining techniques, organised jointly by IAEA, the OECD Nuclear Energy Agency and the OAS Inter-American Nuclear Energy Commission. The following were the major sessions; (1) Introductory papers; (2) Physical exploration and estimation of ore reserves; (3) Mining and other uranium recovery methods; and (4) Estimation of undiscovered uranium resources. Immediately after each paper discussion is also presented. The papers have been presented in English, French and Russian. There are five subject areas covered by the symposium, *viz.*, the problems to meet world demands of uranium; the methods of estimation of ore reserves; the techniques of

winning uranium; appraisal of undiscovered uranium resources; and finally the production capability. Some of the notable papers deal with (*a*) geostatistics, a versatile technique for estimating ore reserves, (*b*) *in situ* leaching of low grade ores in special environments and of ores left in mines, (*c*) uranium in marine phosphates, copper leach liquors and gold ores and (*d*) interactive genetic models.

An observation which we can make out of the various papers presented is that radioactive materials are found in a variety of common commodities such as, for example: (*a*) uranium in copper leaching and (*b*) uranium in phosphates—rare earth phosphates or rock phosphates used in fertilizer manufacture.

Precautions against radioactivity are rarely implemented in the handling of these processes. One would expect the United Nations to take greater interest in standardizing mineral resources classification and processing. The International Atomic Energy Agency would do well to take steps to ensure the safety and future of mankind in all matters connected with the mining and processing of radioactive minerals.

The book is a timely publication and will be extremely useful to Atomic Energy Departments and others dealing with the teaching and research in atomic minerals.

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Underground disposal of radioactive wastes, Proceedings of a symposium jointly organized by IAEA and NEA (OECD), Otaniemi, 2–6 July, 1979. International Atomic Energy Agency, A–1400 Vienna. 1980, Vol. I—pp. 516, Austrian Sch. 750, and Vol. II—pp. 612, Austrian Sch. 880.

Of the various dangers adversely affecting the nuclear energy programmes, the one on waste disposal is quoted as the most serious. International attention has therefore been given to this problem, and the two volumes under review present the proceedings of a symposium jointly organized by the International Atomic Energy Agency and the OECD Nuclear Energy Agency and held at Otaniemi, Finland, 2–6 July, 1979.

With today's technology, the most feasible option for the safe disposal of the radioactive wastes from nuclear power programs is to deposit them underground in an appropriately conditioned form at suitable sites—shallow land burial, emplacement in suitable abandoned mines, deep-well injection and hydraulic fracturing, geological formations, etc.

A total of 68 papers were presented in ten sessions covering the following topics: national programs and general studies; disposal of solid waste at shallow depth and in rock caverns; disposal of liquid wastes by deep-well injection and hydraulic frac-

turing; disposal in salt formations, crystalline rocks and argillaceous sediments; thermal aspects of disposal in deep geological formations; radionuclide migration studies; and safety assessment and regulatory aspects. An impressive variety of viable disposal options is presented, which indicated also the trend to develop a broad scientific base behind the concept of geological waste disposal. After each paper, the discussion that followed was also presented in the text. The last chapter is the round-table discussion on reliability of radioactive waste isolation in geological formations; and this is followed by list of participants and author index.

The contents of these two volumes would certainly assist and guide further national and international efforts in this important field. While some may claim that many geological environments exist with the capability of providing safe isolation for all types of radioactive waste, there are others who consistently point out the dangers ahead. In a symposium of this type, the opponents of nuclear energy programs ought to have been given a chance to present their views in the round-table discussion. It is the duty of the scientists to convince the people of their safety under any nuclear energy program.

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The ignis fatuus of biogas by J. Van Brakel. Delft University Press, Mijnbouwplein 11, 2628 RT Delft, The Netherlands, 1980, pp. viii + 141, Dfls. 28.80.

The full title of the book is "The Ignis Fatuus of Biogas. Small scale Anaerobic Digesters (Biogas Plants): A Critical Review of the pre-1970 Literature". For such people who do not know Latin, a quotation is given on the cover. "*The Impression seene on the Land is called in Latine, Ignis Fatuus, foolish fire, that, nurteth not but only fearest fooles*" by W. Fulke, Meteors (1640). With such a title and quotation one may expect a review that is completely historic and pedantic in nature, but what is actually presented in the book is a technical review.

After a brief coverage in the introduction of how marsh gas produced by the anaerobic fermentation was first discovered and then analysed, the origins of the present day anaerobic digestors are traced. The obvious relation to the treatment of municipal sewage in large sewerage works or human waste in small septic tanks has been brought out at the outset and the large body of work on these has been reviewed.

As the author himself puts it "...the fact that only the literature until 1970 is covered does not follow that only a historical record is presented". But he claims that although there has been an enormous increase in the interest in anaerobic digestion, there has been hardly any addition to the knowledge of small scale anaerobic digestors

since 1970. The claim, of course, is to be seriously disputed. The author goes on to say that "...in fact, most people concerned with the subject now know less about it than, say, the people concerned with it in 1955 in Germany". In addition, the author states that over the past five years many decisions have been made by governments and international agencies concerning projects and programmes involving anaerobic digestion, which involve large sums of money but have been based on little knowledge of technical aspects of anaerobic digestion, economics and socio-cultural aspects. These decisions have been made mostly "...in an atmosphere of romanticism and almost mythical ideas about a process alleged to produce fuel and fertilizer from waste, free of charge."

It is in this light that the author has aimed the review of biogas literature to be of use to both decision-makers and those involved in R and D by providing a more thorough and balanced picture of the status of technology of small scale anaerobic digestors. A number of non-English publications have also been reviewed.

After a short section on the variety of applications where anaerobic digestion can be, and has been used, a detailed historic study of the small scale digestors (mostly located on farms) is given. Here, a substantial attention has been given to the work carried out in India, since outside Europe and USA it has been in India that many significant contributions have come from. The vast proliferation of small scale digestors in China has been a very recent development. In fact, one of the very first anaerobic digestors to be installed was in India—at the Matunga Leper Asylum (near Bombay) for treating their wastes in a septic tank type digestors. The methane gas was collected and used for lighting, cooking and running a gas engine over the period 1895–1920 (the engine being used after 1907). The pioneering work on anaerobic fermentation carried out in the Indian Institute of Science finds a mention.

The sections on gas yields and the fertilizer value of spent sludge are quite useful and are fairly complete. The book on the whole contains very useful information and is certainly an essential reading for every research worker in this field. There are several serious drawbacks such as: the sketches given are too small and of poor quality, having very long figure captions, the arrangement of publications in the bibliography is rather confusing since it is done countrywise rather than subjectwise. But, by and large, the matter is well presented and the book is an absolute must for any collection of biogas literature. The author has succeeded in his task of making the reader aware of the richness of the past literature and this would go a long way towards the re-invention of much of what was already done as seems to be the current practice.

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Appropriate building materials by Roland Stulz, Swiss Centre for Appropriate Technology (SKAT), Varnbuelstr. 14, CH-9000, St., Gall, Switzerland, 1981, pp. 324, S.Fr. 39.

This book provides useful information on a variety of building materials/techniques, the emphasis being on the use of local materials in developing countries. The listed technologies typically include topics like stabilised soil blocks, alternative cements, fibre and cement-based roofing units. The book can be of considerable value to engineers planning to carry out innovative constructions in developing countries. It has been well produced with a number of illustrative diagrams and photographs. It also includes useful cross-references to current literature.

It must, however, be pointed out that in spite of the deceptive simplicity of the information, it would be misleading to think that one can implement these ideas right away. In the final analysis, many of the technologies discussed in the book lack in crucial details. There has to be a process of adaptation/innovation at the local level if alternative building methods are to be successfully implemented. The monograph is, however, of immense value as a window to the world of possibilities in construction alternatives.

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