J. Indian Inst. Sci., 64 (A), Apr. 1983, Pp. 127–136

BOOK REVIEWS

John von Neuman and Norbert Weiner—from mathematics to the technologies of life and death by Steve J. Heims. The MIT Press, Cambridge, USA, 1982, pp. 568, $ 10.95.

The modern transformation of society in the current century took an accelerated pace by the production and military use of the atom bombs in 1945. To men and women this event marked a sudden and shocking discontinuity in the even flow of life-stream which seemed to change the world radically. The aftermath saw the emergence of a new breed of military-political strategists who saw in the development of atomic arsenals a dubious deterrent to the easing of world tensions. Two outstanding mathematicians of the present century, namely John von Neumann and Norbert Weiner who were Jewish immigrants to US from Hungary and poland, played significant roles directly and indirectly in the armament race. By their creative and magnificient accomplishments they captured the imagination of the scientific community and confirmed the faith in the irrepressibility of the human potential. For many scientists the successful explosion of the atom bomb constituted the water-shed in a radical cultural transformation. The professional lives of Neumann and Weiner encompassed both sides of the shed. Before the war each had become accustomed to being a 'mathematical genius'; after the war they played active and prominent roles outside mathematics proper. Their shifts of primary activity from pure science to work in the service of explicit social and political values signalled and symbolized the cardinal cultural transformation of the second half of the present century. This transformation made scientific and technological progress obsolete as a primary goal but instead made consideration of which aspects of science and technology to adopt in the lives of men, paramount. By mental and psychological make-up, the two men responded differently in such a transformation. Neumann believed in nuclear weapons being a means to the salvation of humanity having played a central role in the Manhattan project and later in the development of the H-bomb. He saw the 'silver lining' in the mushroom clouds. On the other hand when Weiner heard about the massacre at Hiroshima and Nagasaki he was conscience stricken. He sent a letter of resignation to the President of MIT saying that he has decided 'to leave scientific work completely since I see no course which accords with my conscience'. Neumann relished the political and bureaucratie patronage that accrued consequent on the successful explosion of the atom bomb where his mathematical idea of 'implosion' worked. Weiner, on the other hand, had

imbibed, since childhood, the ideals of non-violence and human compassion and respect for the oppressed and the under privileged, a trait which characterized the impoverished immigrant jew Leo, his father, who was, in addition, an anti-vivisectionist and a vegetarian ! A true Gandhian who took inspiration in the work of Tolstoy and his works into English for the benefit of the Americans! Weiner was a complete vegetarian and the author of this review had the privilege of knowing him when he came to attend the First National Congress of Theoretical and Applied Mechanics held at Kharagpur. JBS Haldane who was then in India was his very close friend. Through this mental make-up Weiner gave more attention to the problem of 'Life and Life-Giving' by working in the areas of Biology and Medicine. Weiner also had a breath of interests, namely languages and philosophy. His father rose to the position of a Professor of Slavic Languages at Harvard and this must have inspired young Weiner. In fact he got his Ph.D. at Harvard at the age of eighteen in the area of Mathematical Logic ! Neumann came from a wealthy family of bankers in Budapest and was an aristocrat, who enjoyed the good things of life including fast cars! He had several women friends and was often insensitive to the feelings in spite of his genius being a 'biological anomaly' ! During their professional years both had contributed handsomely to areas of basic mathematics and in their applications. While Weiner made use of conceptual models based on incomplete information, Neumann often made use of rigorous deterministic models. One can identify at least three major areas in which both these perspectives have been made to bear: weather prediction, theory of games and technology-nervous system (cybernatics and automata theory). Individually, they are known for their work in Brownian motion and Weiner measure; comprehensive theory of quantum mechanics, amongst many other significant work. Even after decades of their discoveries, they continue to influence researchers in communication theory, artificial intelligence, quantum field theories and the rest.

The book examines the various ingredients like origin, ideas and style that are the part make-up of the two men and certain trends in their lives. The latter part of the book deals with the impetus the nuclear weapons race received in early fifties. The author's penetrating analysis of the working of the minds of these two great men provides a rational basis for the appreciation of the 'man and the mathematician'. The book is complete with many references and explanatory notes. For the specialist and the generalist alike the book would represent a valuable source material of the biographies of two outstanding mathematicians of the century.

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Probability and random processes (Second Edition) by S. K. Srinivasan and K. M. Mehata. Tata McGraw-Hill, New Delhi 110 002, 1981, pp. 360, Rs. 27.

Books written for scientists and engineers particularly in the mathematical and related fields have generally been collections of watered down recipes from the original area with a smattering of examples of physical phenomena. Let it be granted that the broad motive of such books is to educate the scientist or engineer in an established fundamental field, that has great potential for applications. If the field has well-established applications, the standards of suitability could be less stringent in that the credibility of the field's applicability is not at issue. Unfortunately, relatively recent developments in stochastic processes whose applications remain to be established are not easily available especially to the engineer because treatments have not struck a balance between mathematical rigor and motivation by suitable blend of theory with meaty applications. Viewed in this light, inspite of the several books on the applications of probability theory and stochastic processes that are around, there certainly is scope for more innovative ones.

This book by Srinivasan and Mehata cannot be said to be specially innovative. It does fulfil well the essential chore of laying out the standard features of probability theory, random variables and stochastic processes and on that the authors deserve commendation. But one is hard put to lay hands on any distinctive quality. Interestingly, the authors have themselves sensed this in conceding to a feeling of let-down by what appears to have been lost in rendering the contents of an exciting course into this book. This is certainly not uncommom experience.

The book, endowed with a healthy crop of problems at the end of each chapter, would do as well as others in meeting the requirements of a senior undergraduate course, for students in engineering, for example. As a postgraduate textbook, however, the scope should have been widened to include, for example, some filtering theory, aspects of Itô calculus and Itô differential equations, etc.

In summary, the book appears to be a competent compilation of introductory topics in probability theory evolving from the basic concepts of probability to the treatment of standard stochastic processes. It is well suited as an undergraduate textbook for engineering students.

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Getting started in GPSS by K. S. Dunning. Engineering Press, Inc., San Jose, California, 1981, pp. viii + 117, $ 5.95.

This is a small but good introductory undergraduate book. Its stated objective is to provide a short survey course for students who wish to quickly become familiar

imbibed, since childhood, the ideals of non-violence and human compassion and respect for the oppressed and the under privileged, a trait which characterized the impoverished immigrant jew Leo, his father, who was, in addition, an anti-vivisectionist and a vegetarian ! A true Gandhian who took inspiration in the work of Tolstoy and his works into English for the benefit of the Americans! Weiner was a complete vegetarian and the author of this review had the privilege of knowing him when he came to attend the First National Congress of Theoretical and Applied Mechanics held at Kharagpur. JBS Haldane who was then in India was his very close friend. Through this mental make-up Weiner gave more attention to the problem of 'Life and Life-Giving' by working in the areas of Biology and Medicine. Weiner also had a breath of interests, namely languages and philosophy. His father rose to the position of a Professor of Slavic Languages at Harvard and this must have inspired young Weiner. In fact he got his Ph.D. at Harvard at the age of eighteen in the area of Mathematical Logic ! Neumann came from a wealthy family of bankers in Budapest and was an aristocrat, who enjoyed the good things of life including fast cars! He had several women friends and was often insensitive to the feelings in spite of his genius being a 'biological anomaly' ! During their professional years both had contributed handsomely to areas of basic mathematics and in their applications. While Weiner made use of conceptual models based on incomplete information, Neumann often made use of rigorous deterministic models. One can identify at least three major areas in which both these perspectives have been made to bear: weather prediction, theory of games and technology-nervous system (cybernatics and automata theory). Individually, they are known for their work in Brownian motion and Weiner measure; comprehensive theory of quantum mechanics, amongst many other significant work. Even after decades of their discoveries, they continue to influence researchers in communication theory, artificial intelligence, quantum field theories and the rest.

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as basis of processing elements and finally memory elements and processing elements as basis of digital systems are discussed. The rules of binary arithmetic and coding are discussed for completeness of the chapter. The next chapter is on combinatorial logic. The author rightly points out—but only partially exemplifies—that for an optimsed design of the operational hardware a knowledge of limitations and imperfections of technology is a must. A comparative study of the different logic families perhaps with the aid of table/chart would have been of help to the beginner. The topics on the methods of deriving Boolean expression of a function from the truth table, Karnaugh maps are presented well. Towards the end, the discussion is more mathematical—various strataegies of analysis of combinatorial logic networks are detailed. A 'digital design language' (DDL) is described together with its syntax rule. More of this follows in later chapters. In general, this chapter covers a wide range of concepts, notations and techniques—from the details of an electronic amplifer to symbolic models and systems that involve tens and thousands of amplifiers.

Chapter three deals with synthesis of combinatorial logic networks. PLAs and elementary coding concepts also form a part of this chapter. The importance of 'specifications' in a design process is emphasized. The usefulness of verbal specification of logic problems—the connectives of an English statement which often reveal required logic is discussed. The author has worked in detail the realization of a decoder starting from verbal description translating it into Binary notation and the final realization. Adder/Subtracter circuits and the corresponding DDL connection statements are dealt with the full mathematical rigour. Using a basic logic cell iteratively through time or space for data processing, signed number representation, design of arithmetic units and design of decimal-oriented digital system are described in considerable depth.

The fourth chapter explores sequential concepts and components. The author has clearly brought out time as a variable in a logic network. Models of sequential networks latches & flipflops with practical examples and timing diagrams are detailed. Sources and application of delay in electronic circuits is dealt with mathematical analysis.

The state model of synchronous sequential networks forms the subject of chapter 5. The state model that consist of input, output and state alphabets, and next state and output functions with the use of state transition table, diagrams or equations is elaborated. Drawing state diagrams from the combination logic decomposition of a given network is discussed. The other topics covered in this chapter include minimizing the number of states in a logic model, choosing cost-effective codes and further descriptions of DDL language. An appendix at the end of the chapter deals with the syntax of the DDL. A summary of the sematics of DDL is presented in a separate appendix.

Chapter 6 deals with sequential subsystems and familiar functional circuits like conting, shifting, transferring, etc., and their applications. While synchronous realisation of the functions is emphasized, the asynchronous realisation which is the most economical to use is explained in detail. Processing systems and control units, ROM and PLA

with computer simulation using the GPSS language. To this end, the book has small chapters, each with about six pages on an average. The language, GPSS, has developed to handle Monte Carlo type of simulations, especially for queueing systems. With the help of simple examples, the GPSS language rules, generating probability distributions, reading program output and typical error messages are discussed.

Chapters 5, 6 and 7 introduce the language details needed for writing simple GPSS programs. Chapter 5 considers the language rules. The basic blocks of GENERATE, ADVANCE, TERMINATE, ENTER and LEAVE, SEIZE, and RELEASE, QUEUE and DEPART, START, SIMULATE and END only are introduced for this purpose. These are quite adequate for the level of programs introduced in the examples presented in the subsequent chapters. Chapter 6 considers the important probability distribution generation and Chapter 7 gives the details of the queue statistics available in program output.

Each chapter is easy to read and brings out the essentials in a straightforward way. The book is basically suited for introducing GPSS in a course on ' Modeling and Computer Simulation ' with about 3–6 lectures and some exercises on writing simple application programs. The book is suitable for B.E. (Computer Engineering) and students of related disciplines taking an elective course on operations research or computer simulation. For simulations of moderate complexity, one has to, of course, go to one of the standard texts on GPSS (Such as Schriber's simulation using GPSS or Gordon's The application of GPSS V to discrete systems simulation).

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Logic design of digital system by Donald L. Dietmeyer, Allyn and Bacon, 1981. 516 p.

Logical design of digital system by Donald L. Dietmeyer is slightly slanted towards mathematical approach and is more suitable for an advanced course in Logic and Switching theory. But the concise introductory concepts (first eight chapters) make a useful reading for students with minimal or no background in logic design. Some of the more interesting topics include computer organization described around the author's conceptual ' EDC ' — Elementary Digital Computer ; minimization of switching functions and analysis of Asynchronous sequential logic. Topics in digital communication and some practical aspects of logic circuits could have made the book more complete. The problems at the end of each chapter cover a wide range—from some simple substitution type to thought-provoking practical ones. Answers are given for the routine problems, solutions are discussed for the more complicated ones. Though the book is not very suitable for a traditional logic design course, the in-depth mathematical analysis makes it useful for algorithmic logic-design.

The first eight chapters are introductory in nature. The first chapter introduces some basic components of digital system. Flipflops as basis of memory elements are

Information systems—an introduction to computers in organizations by William M. Taggart Jr. Allyn and Bacon, Inc., 1980, pp. 602, £ 9.95.

This book is a general broad-based introduction to computers and management information system fundamentals. The intended readers of the book are users of information systems, who do not have a prior knowledge of computers. The book is divided into five modules: introduction, an overview of computer hardware and software technology, the structure of a management information system, an elementary discussion of the steps in developing a computer based information system and lastly a discussion of various applications of computers in organizations. Each chapter starts with a brief statement of objectives and ends with a chapter summary. This structure is useful as the material is descriptive and such summaries give an overview. There are a number of questions at the end of each chapter. Besides this there is also an extended case statement to encourage group discussion. Each chapter also has some 'funny' cartoon possibly to hold the attention of the reader. The overall printing and production of the book is excellent.

The material presented is somewhat repetitive and verbose. The book has 600 pages. The same information could have been presented in half the number of pages. Further it is neither a 'popular introduction' nor is it one which can be used to design information systems. There is plenty of material in the book on a broad range of topics. It, however, lacks in depth of presentation and the reader will be smothered by a bewildering array of topics and jargon as he laboriously wades through this entirely descriptive book.

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Space—New opportunities for international ventures edited by William C. Hayes (Jr.) Vol.49 in Science and Technology Series. American Astronautical Society, 1980, pp. 300, $ 25 (PB). Orders to : Univelt, Inc., P.O. Box 28130, San Diego, CA 92128, U.S.A.

This volume consists of seventeen papers presented at the 17th Goddard Memorial Symposium held in March 1979. The three year gap between the presentation of the papers and this review makes a considerable difference to the view point of any reviewer/reader, for many of those termed as 'activities in progress' have since been realised.

In a broader perspective, the space technology has political and economical implications besides the scientific challenge. All these facets find place in this volume under five broad sections preceded by introduction to the theme. The introductory part is very impressive with its lucid presentation. The reader would be pleased to find that at least in one scientific activity the concept of 'humanity as one' seems meaningful and feasible. Specialist readers will find the articles on space shuttle—there are three of

control are given descriptive and elegant mathematical treatment. Memory systems are briefly discussed in the concluding section of the chapter.

After covering in detail sequential logic, processing and control units, the author logically introduces the large assemblages of the sub-systems in the definition, design and programming of an elementary digital computer (EDC). The fundamentals like architecture, organization, control, processing, programming, etc. are clearly drawn. Since the design approach is algorithmic, rather than logical, the chapter is suitable for a second course in logical design or computer organization course. The programming aspects of a typical digital computer like algorithms, flowcharts, high level languages are discussed in some detail though with a background of the EDC.

Chapter 8 is a continuation of the previous chapter. Advanced computer concepts are discussed. The author starts with the distinction between micros and minis. Advanced register applications, various addressing modes and their use is highlighted. Aspects like relocation, stack, autonomous memory make an interesting reading. A Bus-oriented CPU is described. Microprogram control is described in considerable detail. The chapter also covers an analysis of configuration and characteristics of peripheral equipment.

From chapter 9 onwards, the treatment is fully mathematical. The emphasis is on the analysis of larger combinatorial switching circuit problems, in algorithmic procedures. The tuple and array notation, array operators, computer assisted synthesis of synchronous and sequential networks is detailed. An appendix carries a combinatorial logic subroutine set with some sample programs in Fortran.

Minimization of switching function is the subject of chapter 10. The chapter starts with a discussion on the mathematical and economical aspects of minimization. Manual minimization is covered in detail. A further description of the Karnaugh map minimization follows. The rest of the chapter is devoted to detailed analysis of algorithmic minimization of single output switching functions. This chapter also carries sample program of minimization (in Fortran).

More mathematical theorems and algorithms on multiple level synthesis is covered in chapter 11, 12 and 13. Asynchronous sequential logic and their synthesis, state assignment techniques and implementation of asynchronous networks is discussed. Hazards in combinatorial and seprential networks—both static and dynamic—is perhaps the best discussed topic in the text.

A list of reference texts journals is given at the end of each chapter. Sample programs are given at several places. The text carries an index.

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It is simply this : If Americans were to exploit mineral and other resources of space should they share it with the less developed countries? If the answer is Yes, then the motivation to go ahead is minimal as can be expected of any commercial venture.

The arguments are now going to be made at the level of government and the dicisions are yet to be arrived at.

One of the other papers concerning ARIANE seems to have been made more optimistically than the situation seems to warrant. At the time of writing this review, the fourth launch has had problems in third stage and ARIANE is still not operational. On the other hand space shuttle project is healthy and growing.

One has to watch the developments keenly to see how these programm s become successful commercial ventures.

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Precast concrete connection details—Floor connections prepared by Stupre (Society for studies on the use of precast concrete, Netherlands). Beton-Verlag, Dusseldorf, 1981, pp. 133, DM 120.

This bilingual volume (English and Germany) is the second part of a systematic compilation of structural connection details for precast concrete elements. Whereas the first part published in 1978 dealt with connections between columns and beam, the present volume deals with connection details between floor units and of floor units with panels or beams.

Thirty-four connections with their possible variants are shown in more than 130 schematic drawings. The detailed text covers recommendations on the applications, the design and the erection of each connection. In addition, criteria for the rating of the various connections and their variants regarding their suitability, advantages and disadvantages are also given.

The detailed information given in this volume is very valuable for design and construction engineers engaged in precast concrete construction for their structures.

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them—fascinating both in terms of its technology and capabilities and in that some parts read as historical writings, for as on today the space shuttle has already completed three successful flights. However, this information can be found at many places.

The papers dealing with STS, earth observation, private operation of space shuttle, etc., under new steps and opportunities address the planners and those at the helm of affairs in space organisations. Although a bulk of it runs dry, there is some information content worth drawing one's attention to.

Economics is an important aspect of any large scale scientific venture where in the early stages the apparent returns are not attractive. The papers on this are likely to evoke interest ih the user community and also in those where space technology is at its beginning. The questions like ' Why ESA works in ARIANE in the space shuttle era ' or ' Why space technology in USA has attracted private sector' may find answers in this volume

Finally the experiences and programmes of Indonesia, Japan and Europe stress the need for well defined goals, plan of growth of space technology and emphasise the necessity of self-reliance (does it contradict cooperation ?).

The volume, though cannot be termed as outstanding, contains a good collection of thoughts and plans, and those at the policy making levels would find a study of the book worthwile. For others it is a nicely brought out book of facinating ideas; could even be a light reading.

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Commercial operations in space 1980–2000 (18*th Goddard Memorial Symposium*) edited by John L. McLucas and Charles Sheffield, Vol. 51 in Science and Technology Series. American Astronautical Society. Orders to Univelt, Inc., P.O. Box 28130, San Diego, CA 92128, USA, 1981, pp. 214, HC $ 30, SC $ 20.

This volume has an interesting assortment of papers ranging from material processing in space through new technologies for space shuttle to future of space utilisation as affected by space laws.

A rather well documented paper on material processing techniques and problems in space environment brings out the future research requirements in the areas of fluid dynamics, metallurgy, molecular dynamics, etc. A few other papers discuss the problems of space power systems, electric propulsion system of high specific impulse and low thrust (of the order of 1 kg) in the typical style which brings out succinctly the essential features.

One of the relatively interesting problems of future developments in space is brought out by several key persons as well as men of repute in a public debate.