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BOOK REVIEWS

Building IBM—Shaping an industry and its technology by Emerson W. Pugh, The MIT Press, 55, Hayward Street, Cambridge, Mass 02142–1399, USA, 1995, pp. 405, $ 29.95.

The author of this book was an IBM employee for 35 years and has an insider view of the development of IBM as a mega-multinational corporation. The history of IBM starts with a merger of a company founded by Herman Hellerith, the inventor of punched card system for census tabulation and accounting, and two other companies in 1911 by Charles R. Flint to form a company named Computing–Tabulating–Recording (CTR) Company. The name was changed to International Business Machines (IBM) Corporation in 1924. The transformation of CTR to IBM was due to the leadership and vision of Thomas J. Watson who joined the CTR in 1914. The book follows the course of events which slowly transformed IBM from a small punched card-based tabulator company to a dominant company in the computer industry during the 60s and 70s. It also discusses how some decisions taken in the early 70s led to the decline of IBM from its dominant position as we see today. The book is well researched; the author was given free access to IBM, internal archives as the book-writing project originally started as an IBM-sponsored project. The book is fairly detailed up to the development of IBM 360 and 370 but the later part starting in early 80 is not covered in detail.

Some of the interesting aspects brought out was due to the book is the faith Thomas Watson had in close cooperation with universities in developing new systems. IBM financed and developed Mark I (automatic sequence-controlled calculator) cooperating with Harvard University at a cost of $ 200,000 in 1944 and gave the latter $ 100,000 to operate it. Later a laboratory was instituted at Colombia for numerical computing and basic research which subsequently became the IBM Thomas J. Watson Laboratory.

An interesting aspect brought out by the book is the great importance attached to patenting inventions from the days of Herman Hollerith throughout the history of IBM. The story of IBM seems to be a story of accumulating patents in diverse areas through strong design and development support. This 'culture' has yet to be learnt by us in our country.

The book is well researched, profusely illustrated with plenty of footnotes to other sources. There are, however, many repetitions because of the way the book is organized. It has immense amount of information for anyone interested in the history of computing. It will also be of interest of management scientists interested in knowing how high-tech corporations flourish and then loose their pre-eminent positions.

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World and national space programs by G. L. May *et al.* Published for the American Astronautical Society by Univelt, Inc., P.O. Box 28130, San Diego, California 92198, USA, 1994, pp. 318, $60.

This volume combines the proceedings of the 30th and 31st Goddard Memorial Symposia whose themes were: World space program and fiscal reality, and Space: A vital stimulus to our national well-being. Both of them essentially address the American intelligentia, but should also interest others engaged in space activities.

The first half on 'Space: A vital stimulus to our national well-being' is an introspection by several key figures on NASA's achievements and future objectives. As the title demands, rhetorics are liberally used to stress the viewpoints. That the space program has indeed been a great stimulant to American psyche is evident in almost all the articles. Even the dissenting voice of Brenda Forman on the role of space program in US technological competitiveness contains the strains of pride and power which have been justly theirs.

NASA programs have been argued to be technological fronts to political gains during the cold war era. The impressions of Sputnik had to be erased by the glory of Apollo. Technological advancements served a political will. But with the end of the cold war, questions of economic and social benefits have been raised so often that the US space programs need reassessment, more so in view of the new technological competition from Europe and Japan.

In the section on 'Leadership, economy and stability', Logdon's article on US space policy needs a special mention. From Eisenhower to Reagan, the conviction that the space leadership symbolizes the super-power status has persisted. The conscious plan to attain "the ability to influence events and choices around the world so that they are congruent with American interest" has been a resounding success in shaping the present US. But economic compulsions still demand a careful reexamination of the space programs.

The section on 'Environment, education and health' lists the benefits, some of which are well known, that the human kind in general has derived from space programs. Most important among them is the impetus to communication and information technology which have revolutionized the world in the last two decades. The world has shrunk to a limit that a strange sense of fear overwhelms at the thought "... how alone humans are and what (little) humans share". Prevention and mitigation of disasters such as droughts, floods, crop failures, etc., can be effected at such speeds that the political squibbles are the only barriers. A whole set of new words like telemedicine, teleradiology, gravitational biology ... have been added to our vocabulary. Indeed satellite application has become both a medium of education and a branch of study in itself.

The search for a new rationale that can substitute the cold war resonances forms the common theme for the articles on 'Technology, international development and a projection for the future'. The elusive and emotional attributes like inspiration, prestige and hope need to be replaced by, or at least reinforced with, commercial and social benefits. This is well articulated in the article on Intelsat.

If one wishes to catch the spirit of the whole symposium without spending too much of time, the debate on the resolution "The space program has been and continues to be effective stimulus to US technological competitiveness" is recommended. It is well moderated, well contested and thought-provoking.

The theme of the second part of the volume 'World space programs and fiscal reality' is only a minor deviation from the first part. Tomorrow's dreams of space ventures are shared by all nations—US, Russia, Europe, Japan, China and Canada. Relatively lower investments in Europe, low manpower of Japan and the isolated struggle of China may not have deterred their space programs but may not take them too far. To move towards space cooperation is an economic compulsion and fortunately, a political reality for all the space-faring nations.

The pride and prejudice resulting from Apollo has to be suppressed if the US has to stop looking at cooperative ventures as 'bait' programs to enlist junior partners, investors and subcontractors. The dignity of every nation has to be respected. Equal partnership is the essence of success and the European Space Agency (ESA) has shown the way albeit in a limited way. Solutions to technological problems may have to be sought in any part of the world like in the complex set-up of Russia and CIS. A particularly interesting statement comes again from Brenda Forman—unless a Henry Ford of space program puts the space manufacture on assembly line, affordability of space ventures remains a big question.

The Soviet space program which was totally subordinated to political will has not found much relief after the breakup. With the cessation of subsidies, lack of private enterpreneurship and factionation of the facilities among several states of CIS, the Russian space program cries for cooperation. For the US, a clear technology policy may be the need to develop genuine partnership and the obsession with 'US leadership' must be overcome. Whether the time is ripe or not, for the formation of World Space Agency, Intelsat and ESA are the pointers to future course. Cooperation and globalisation, especially in the area of environmental monitoring, is in the interest of everyone.

The volume cannot be termed as highly technical but contains many thoughts that the technocrats must take note of. At the end of the volume, one wonders if the vision is so limited for the fantastic technological skill that humans have mastered. The debate, that the whole volume is, revolves around pride and pragmatism.

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Stochastic processes and their applications by V. Thangaraj, New Age International Pvt Limited, Publishers, 4835/24, Ansari Road, Darya Ganj, New Delhi 110 002, 1995, pp. 251, Rs. 395.

Statistics is a relatively young science and took roots in India while still nascent. Consequently, there was something of a tradition in statistics and its close ally, probability, in India at the turn of the half century. It took a nosedive when many leading lights found their way west. Nevertheless, an undercurrent of 'stochastic' activity always remained and has been slowly gathering momentum again, with an increasing number of publications in this area appearing on the scene in recent years. The volume under review is one such, being the proceedings of the Third Ramanujan Symposium held at the Ramanujan Institute for Advanced Studies in Mathematics, Madras, during January, 1994. Insofar as the theme of this volume is concerned, one must, however, tone down the above note of optimism with the observation that the current activity in stochastic processes, barring a few exceptions like the ISI and the IISc, is mostly confined to certain offshoots of statistics (time series analysis, inference on stochastic processes) and operations research ('classical' queueing theory, reliability). Though important in their own domains, these are by no means the 'mainstream' areas of stochastic processes. Many that qualify as such, stochastic analysis, large deviations for stochastic processes and random fields, interacting particle systems to name but a few, have a sparse presence if any. This is very much reflected in the present collection. Eighteen out of 22 contributions are of time series/op. research variety. A sampler reads Geometric infinite divisibility and autoregressive time series modelling, Analysis of split an

merge production systems, Cost-optimal parallel systems subject to common cause failures, A finite dam model with two components of release and so on. The four exceptions are in four different directions. The article by Prof. B. Ramachandran, presumably on account of his special invited lecture at the symposium, is a short account of some extensions of a result of Markinciewicz characterizing the normal law to stochastic integrals. An article by Om Prakash and Yudh Bir Singh gives variational characterizations of some entropy measures. The remaining two articles are the ones that stand out the most. One is a lengthy article by Prof. Pakshirajan on spaces of probability measures. This reads like concise course notes collecting several useful facts, an unusual format for a contribution to a proceedings volume like this. It does, however, contain a wealth of information and is a valuable reference on the opic. The article by Balaji and Ramasubramanian is likewise an excellent survey of reflecting Brownian motion in a quadrant, which has been an object of extensive study in recent years because of its occurrence as the 'heavy traffic approximation' of queueing processes.

To summarize, a motley collection of articles on stochastic processes and applications of varying quality and flavour, with a few excellent ones that make it worthwhile.

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Newton *versus* Einstein—How matter interacts with matter by Peter Graneau and Neal Graneau, Affiliated East West Press Pvt Ltd, 104, Nirmal Tower, 26, Barakhamba Road, New Delhi 100 001, 1994, pp. 117, Rs 95.

This book deals with all aspects of the matter interaction controversy in simple nonmathematical language. The authors try to make the point that by the 21st century physics will have to return to theories of far-action without any reference to fields in the understanding of matter interacting with matter. For this the whole material in the book is divided into six chapters. In the first, different principles of matter interaction are discussed with interesting historical notes. The second chapter considers the legacy of Newtonian attraction with special emphasis on differences in Einstein–Newton theories and their explanations. The third chapter discusses the force of inertia, Mach's principle and Sciama's theory which illustrates the involvement of inertia with cosmology. In the last three chapters the authors give description of some of the decisive tests which support action at a distance ruling out the field contact action. The arguments are based mainly on some experiments in classical electrodynamics which seem to have proved beyond reasonable doubt that some predictions of prevalent field physics are wrong while the Newtonian far-action electrodynamics of Coulomb, Ampere and Neumann agree with the observed facts. The crisis in quantum mechanics is another fact which authors discuss to make their point in support of far-action—this crisis being the nonlocal simultaneous interaction between particles which have been demonstrated by experiments showing that these nonlocal actions involve neither mechanical nor field contact.

The book makes an interesting reading as some very interesting historical notes regarding the interaction of matter have been made. It establishes with strong argumentative manner and predicts the return of physics to far-action principles. However, all the discussions and predictions are based on very few experiments which in turn are performed by a very small, close group and are published in highly specialised journals. This casts a doubt on the arguments put forth by the

authors especially in completely ruling out field action from the principles of matter interaction. Though the book is written in a laymen style, it can be recommended from this point of view only to physicists who are mature enough to read it critically. It cannot be recommended to young students who are beginning their scientific careers or to nonscientists who are curious about scientific developments as the discussions can lead confused views on the subject of matter interaction.

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