BOOK REVIEWS

Dimensions and Entropies in Chaotic Systems—A Quantification of Complex Behaviour, *Proceedings of an International Workshop at the Pecos River Ranch, New Mexico, September 11–16, 1985*. 1986, pp. 257. (Published by Springer-Verlag, Heidelberger, Plat 23. D-1000, Berlin 33, Germany.) Price: Not known.

A book of this kind, which synthesizes two of the current fashions in physics—the study of chaos and the study of fractals—is commendable for its timeliness. This collection of papers from a recent workshop has, however, much more going for it.

It is necessary to distinguish between *chaos* and *noise*. Qualitatively, it is difficult to do so since chaotic motion—like noise—is apparently random, but it is possible to make a quantitative distinction: (self-generated) chaos can have the dimension of *at most* the number of degrees of freedom, while noise arises, in principle, from an *infinite dimensional* process. One of the earliest works to suggest that dynamical chaos, such as that in strange attractors, gives rise to fractal objects, was that of M. Henon in 1976. The Henon attractor, specified by the map $(X, Y) \rightarrow (Y + 1 - 1.2X^2, 0.3X)$, under successive magnification shows structural self-similarity. Mandelbrot's book, *Fractals: Form, Chance and Dimension*, was published around the same time and it was not long before the fractal dimension of a strange attractor was used as one way of characterizing it. There is, however, a multitude of fractal dimensions—some of which, such as the information dimension or the correlation dimension, are more appropriate in describing the dynamics. The unified framework was provided by Procaccia and Hentschel in 1983 and the logical conclusion seems to have been reached in "multifractal" measures of Kadanoff, Procaccia and others.

In properly characterizing dynamical chaos, the most pertinent measure is provided by the Lyapunov exponents which measure the rate at which nearby trajectories separate or, equivalently (through the Pesin formula) to how fast information is lost. The Lyapunov exponents may be related to the fractal dimension (the Kaplan-Yorke conjecture).

The first part of the book deals with the mathematical aspect of the problem. Articles by Procaccia and Mandelbrot provide an historical review. Specific algorithms for computing the fractal dimension (articles by Hunt and Sullivan) or the Lyapunov exponent (articles by Wolf, Vatsano) are given, along with several discussions of problems associated with the methods. In particular, the task of accurate (numerical) analysis of finite data-sets is a delicate one and prospective practitioners will find the work of Mayer-Kress, as that of Yorke, useful in providing warnings.

The latter part of the book deals with the study of chaos and associated fractal behaviour in particular experimental situations, primarily in fluid flows (Swinney, Caputo, Libchaber, Sreenivasan), and also in medical areas: three articles deal with low-dimensional chaos in the brain.

That fractal measures are not always the most relevant has been pointed out repeatedly, most recently by Kadanoff in *Physics Today* and J. A. Krumhansl in *Physical Review Letters* and it is perhaps worthwhile to keep these warnings in mind. At the same time, it is undeniable that there is a tendency to see fractals and/or chaos in virtually any discipline at present. This book will be immensely useful to those who wish to properly and completely characterize strange sets and should, therefore find a place in any library.

R. RAMASWAMY

School of Physical Sciences,
Jawaharlal Nehru University,
New Dehli 110 067.

Breeding for Disease Resistance in Rice by S. Gangopadhyaya and S. Y. Padmanabhan, (Published by Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi), 1987, pp 340, Price Rs. 96/–.

Rice, a major staple food crop, grown under widely varying agro-climatic conditions is prone to several diseases caused by fungi, bacteria, viruses, several diseases caused by fungi, bacteria, viruses and thousands of cultivars of the crop in different countries of the world. Our knowledge on the scientific basis of host-pathogen relationships has been ever-expanding and there has been an explotion of scientific literature in the subject during the

past two decades. Plant pathologists and breeders have been finding it difficult to keep pace with the latest information and techniques on rice pathogens and the cultivars and their interactions ranging from immunity to complete susceptibility to different races of the pathogens under the influence of environmental factors. The authors have attempted to bring together the available information on the diseases of the rice, including the etiology and symptomotology, the morphology, physiology and genetics of the pathogen, the host-plant resistance and the methods of breeding for resistance to different diseases and overall approach to control the major diseases of rice. The vast information on the subject has been summarized and presented in a systematic manner.

Of the 274 pages of the general text nearly 50% is devoted to blast disease, the most important and well-covered in the literature. Nine other fungal diseases are covered under Chapter 3, the most important of which are brown spot and sheath blight. The bacterial diseases are covered under Chapter 4. The major bacterial pathogen. *Xanthomonas campestris* pv. *oryzae* has been given good coverage. Of the ten virus diseases covered under Chapter 5, tungro disease is the most serious and the information on it has been well presented.

Chapter 6, 'Methods of breeding for disease resistance', gives the three areas of approach, viz (1) sources of resistance, (2) genetic behaviour of the resistant genes, and (3) methodology of transfer of resistance. This Chapter should normally precede the earlier ones, so as to expose the readers to the 'Principles' prior to the 'Application and results'. Chapter 7 on 'Control of rice diseases through resistant varieties', though very brief, appears to be superfluous. The references listed are exhaustive and extensive.

The rice research workers for whom this is addressed will find in it a very useful reference book. The authors (one of whom SYP passed away recently) deserve to be congratulated on their laborious and time-consuming efforts in shaping this valuable volume.

G. RANGASWAMI

21, Indira Gandhi Road,
Fairlands,
Salem 636 016.

Versatile Eucalyptus by B. K. C. Rajan (Published by Diana Publications, 76 Nandidurg Road, Bangalore 560 046) 1987, pp. 243, Price: Rs. 160/- or $ 25.00

The book is spread over 37 chapters covering 207 pages besides 17 appendices. There are 36 black and white plates. Two colour plates occupy the front and back pages. The first few chapters deal with the history of Eucalyptus and the spread of their plantations. The silvicultural characteristics of the genus and five species *E. camaldulensis*, *E. citriodora*, *E. globulus*, *E. grandis* and *E. tereticornis* in particular have been described in two chapters. Utilization aspects of wood and leaves have been covered besides giving details of the wood properties for use as timber, firewood, pulpwood etc. The environmental aspects, uptake of water, nutrients and recycling have been covered. Methods of planting practised in various states of India are described. Tables of volume, weight and yields have been reproduced with respect to several species. The last chapter mentions the points of criticism of Eucalyptus planting and provided answers to these.

Seventeen apendices give opinions of people favouring Eucalyptus. This appears as a propaganda for Eucalyptus and should have been avoided. The book has made no mention of the famous work of clonal propagation of *E. grandis*, *E. saligna* and *E. alba* carried out in Aracruz on the eastern coast in Brazil and reported in 1984 even though there is a seperate chapter for vagetative propagation. This is one of the most important research on Eucalyptus for increasing productivity of the plantations.

The book fails to provide guidance to any tree planter on the correct choice of *E. species* for specific edapho-climatic conditions, spacings, rotations etc. Suggestion of trying *E. camaldulensis* for fodder is erroneous. The notes on the five tree species are disappointing as much of the information given is about their performance in Australia. Vast amount of research work carried out on these species in India has not been considered in these notes. However, the book is a welcome addition to forestry literature in India and is also well produced.

A. N. CHATURVEDI

Senior Fellow,
Tata Energy Research Institute,
New Delhi 110 003.

Weed flora of Kashmir Valley by Maharaj Krishen Kaul. (Published by Scientific Publishers, Maan Bhavan, Ratanada Road, Jodhpur 342 001) 1986, pp. 422. Price: Rs. 275/-.

Weeds are unwanted plants in a given region and they are therefore out of place. In the cultivated fields they are regarded as pests and are responsible for low yields of crops. The extent of damage caused by them to the crops and their impact on the quantum of produce is enormous. Therefore their control is of paramount importance in getting higher yields of grains, vegetables and fruits, anywhere in the world. A detailed study on them is essential if we have to check them and get higher returns. It involves their collection, identification, their biology including their seed output, seed germination, vegetative multiplication, a knowledge of their ability to compete with crop plants and among themselves, the extent of damage caused not only to the crops but also to the habitat and finally the modes of their eradication.

Kashmir, being located in the temperate region of our country and consisting of mainly hills and valleys adjoining those of the neighbouring countries, is expected to have a special type of weed-flora, usually not found in other parts of the Indian subcontinent.

In the eight pages of introduction the author has provided useful information on weeds such as their definition, origin and modes of dissemination and also the geography of the area including the climate, the soil types and crops cultivated. He has also mentioned the previous work on weeds in India.

This information is useful for all those who are interested in weed research. The volume contains taxonomic descriptions for 401 species belonging to 251 genera distributed over 56 families which are arranged according to the taxonomic classification of Bentham and Hooker. The key provided for identification of genera and species is simple and easy to follow and therefore very valuable for the identification of the concerned taxa. One hundred plants have been illustrated and the figures drawn from live specimens by the author himself. This has added greater value to the work especially in recognizing the taxon easily. The author has included in the appendix, aspects of seed output of 177 weeds in a tabular form, new records of weeds, aspects of germination of Senecio vulgaris, temperature responses in germination of a taxon and also has given in percentage the frequency of weeds in the wheat fields. Indices to botanical names and local names have been very appropriate and useful.

Nevertheless, it should be pointed out that the volume coming out in 1986 contains literature only up to 1975. It could have been updated. A considerable amount of work on weed research has been published from South India and the author seems to be unaware of it.

The author has included moong and gram in the oil-bearing crops along with linseed (p. 4) and does not enumerate pulses, millets and oilseed crops raised in Kashmir, although cereals, fruit crops etc. are given.

In the descriptions of the taxa 'Habitat' is given as a sub-heading but is not appropriately described. Root description is not given to all species, seed characteristics are not provided and the chromosome numbers given are mostly from other sources and of plants of other localities and countries (those of Kashmir valley may have different chromosome numbers!)

There are a number of printing errors for example (p. 64) the pedicel of the flower is printed as petiole which is a part of leaf and infested crop is printed as infected crop (p. 375). There are several misspelt words. The addition of an errata could have taken care of this defect.

Although as many as 100 plants are illustrated most of the drawings are not uniform and meaningful. Those pertaining to the flowers could have been larger in size. The gynoecium has been invariably described as "Ovary with style" which is not appropriate.

In figure 54 the flower contains only 4 stamens but according to the description it is 5.

In figure 60 drawing 'b' is explained as flower from above although it is a side view. There are two drawings of 'd' and one of them does not belong to the plant concerned.

In figure 81 lables 'c' and 'd' are missing.

The appendix included in the book could have been published as independent papers and appears inappropriate to a volume of this type.

There are 103 references and the latest among them is of 1975 without bringing the material up-to-date.

Despite all the inherent lapses the volume is a valuable reference book for students and researchers in the pertinent field although the cost of the book is high.

G. BORAIAH

Department of Sericulture,
Bangalore University, P. K. Block,
Bangalore 560 009.

Annual Review of Computer Science 1986, vol. 1, pp. 459, (ed.) Joseph F. Traub (published by Annual Reviews Inc., 4139 El Camino way, Palo Alto, California 94303, USA) Price: USA $ 39.00, Elsewhere $ 42.00.

This is a new volume in the series of *Annual Reviews* published by Annual Reviews Inc. Currently this series publishes yearly reviews in 26 subjects ranging from anthropology to physical chemistry. They have been adding subject areas when the editors consider the subject mature and active. Computer science has been selected from 1986 and the annual reviews are expected in this subject each year.

The review has an editorial board with distinguished computer scientists with the responsibility of selecting subject areas and appropriate authors who can authoritatively write a review in a specified subject. These reviews are written by authors, selected by the editorial committees who are asked to contribute a critical assessment of current work in their field along with a briefly annotated bibliography. The same topic may be reviewed again in a later issue if significant progress is reported in the area. This first volume has reviews in 14 important areas written by authorities in each subject area.

The titles of the topics covered in this first volume are noted below, along with the number of pages indicated in brackets against each: 1. Dado: A tree structured architecture for artificial intelligence computation, Salvatore J. Stolfo and Daniel P. Mirarker (19); 2. Frame-buffer display architectures, Robert F. Sproull (28); 3. Natural-language interface, C. Raymond Ferrault and Barbara J. Gross (36); 4. Advances in compiler technology, John Hennessy and Mahadevan Ganapathi (16); 5. Computer system performance evaluation using queing network models, Ediward D. Lazaowska, John Zahorjan, and Kenneth C. Sevcik (24); 6. Architecture and applications of a heterogeneous, massively parallel machine, David Elliot Shaw (32); 7. Computerized reconstruction and 3-D imaging in medicine, Gabor T. Hermann (14); 8. Programming environments today, Steven P. Reiss (28); 9. Structural and parallel algorithms for finding maximum matchings in graphs, Zvi Galil (16); 10. Data flow architectures, Arvind and David E. Culler (28); 11. Knowledge representation and reasoning, Hector J. Levesque (34); 12. Type architectures, shared memory, and the corollary of modest potential, Lawrence Snyder (30); 13. Information based complexity, H. Wozniakowski (62); 14. Qualitative student models, William J. Clancey (70); Subject index (8).

As may be seen from the contents, a variety of topics is covered. Each article has a brief "state-of-the-art" presentation with a critical evaluation of the research and possible future research direction. A bibliography of important articles is included with each article.

This volume will be invaluable typically for Ph.D. students starting research in the area. It is stated in the preface that some reviews which appeared in this series were frequently referred to and cited by subsequent authors.

This review is a welcome addition to the computer science literature and future generations of research students will find this an invaluable source of reference. It is a must for university and other research libraries.

V. RAJARAMAN

Computer Centre,
Indian Institute of Science,
Bangalore 560 012.