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Book Reviews

Earth surface systems - complexity, order & scale

Jonathon D. Phillips
Blackwell, Oxford. (1999)
224 pages. Price £60. ISBN 1557869340

The mission is an ambitious one; to promote systems theory, with its philosophy, perspectives and mathematical methods in the area of the earth sciences, and with an emphasis on geomorphic, hydrologic, and pedologic systems. Phillips paints the broad picture of Earth Surface Systems stating in the first sentence that "everything is connected to everything else". Still he is cautious not to overstate his case. It is not a book about general principles or a treatise in methodology and it does not provide a comprehensive coverage of the whole range of earth systems phenomena. With this reservation in mind it is nevertheless a rather frivolous excursion into a number of fascinating areas of research. Complexity, chaos and self-organisation are key concepts around which he organises his discussions and applications in various case studies, ranging from hydraulic geometry and channel network evolution to desertification and landscape evolution. Phillips introduces a number of mathematical tools from the theory of systems dynamics such as Lyapunov exponents, for the study of stability and deterministic chaos, and he also discusses entropy and information in its modern form (as measures of chaos). No doubt these are important concepts but it is doubtful if these rather short mathematical sections of the book will be understood or appreciated by students of earth systems, unless they are already quite familiar with mathematical modelling. It is also clear that Phillips' analysis is actually dependent to only a limited degree upon the mathematical machinery. He uses the ideas and concepts more in a qualitative or even metaphorical sense and I have the impression that his main goal is to open up new and interesting perspectives in a traditional area of research rather than presenting new scientific results.

A couple of more detailed comments: It is a bit unfortunate that the acronym for Earth Surface Systems, ESS, has a different meaning in evolutionary biology (an area which is relevant to Phillips' analysis) namely Evolutionary Stable Systems, (a game theory idea originating from John Maynard Smith). I would also have liked to see Phillips discussing Per Bak's work on criticality, which provides an interesting demonstration of how tools from complexity theory can be applied. It is worth noting that Phillips is not alone in his ambition to contribute to the awareness of geoscientists about the existence and usefulness of the theory of nonlinear dynamical systems. See for example: Irreversible Phenomena and Dynamical Systems Analysis in Geosciences (C. Nicolis & G. Nicolis eds), Reidel 1987. The articles in that book deal with case studies where advanced mathematical methods have been used for quantitative analysis, but is however only accessible to those who are experts in mathematics. I find Phillips book entertaining and informative and above all written with a spirit of enthusiasm that should inspire the reader to think in new ways about old problems and perhaps to go to the mathematical literature and look for further methodological knowledge.

ANDERS KARLQVIST

Interactions between the cryosphere, climate and greenhouse gases

edited by Martyn Tranter, Richard Armstrong, Eric Brun, Gerry Jones, Martin Sharp and Mark Williams
IAHS Publication No.256 (2000)
Price £42.50. ISBN 1502902

Every four years the International Union of Geodesy and Geophysics (IUGG) holds a General Assembly. This book, published by the International Association of Hydrological Sciences (IAHS), contains papers which were presented at the XXII General Assembly in a symposium organised by the International Commission on Snow and Ice (ICSI). Those who are familiar with the long and tortuous process of organising symposia within the IUGG system will realise that the "catch-all" title is the result of three years of negotiation to find a topic which would be supported by several IAHS Commissions and by other Associations. The inevitable result is a very mixed bag of papers with no single focus.

The editors have divided the contributions into four sections covering: interactions between climate, snow and permafrost, monitoring and modelling snow cover, ice mass variability and chemical processes in the cryosphere. In each section there are good contributions from established scientists who have taken the opportunity to present new ideas briefly but effectively. For example, there is a neat description of an experiment to measure the transmission of soil gases through seasonal snow cover by G. Jones, E. Bochove and N. Bertrand. Glaciologists familiar with the problem of modelling the transfer of gases from the atmosphere to the snow cover will be intrigued to learn that agricultural soils emit N_2O which diffuses into the snow from below. This small-scale study contributes to a global question: how does snow cover affect the exchange of gases between the soil and atmosphere?

S. Drobot and M. Anderson tackle another global question: what controls the onset of melt in the Arctic? This time the study itself is on the hemispheric scale, using remote sensing

data to map the onset of melt throughout the region and re-analysis models to determine the meteorological conditions. The authors identify a link between the 500hPa height anomaly field and the inter-annual variation of the melt onset date. Low pressures associated with warm air advection cause early onset of melt and produce a more complex pattern than the simple latitudinal variation which would be expected if the onset of melt were solely controlled by increased solar radiation in spring.

These two papers are by North American authors, but one of the special characteristics of IAHS volumes is the high proportion of contributions from scientists from China and the FSU. This often means that important new data are presented. For example ice core data from Tibet are discussed by Yao Tandong in this volume. When these authors are able to attend a symposium there are valuable opportunities for discussion and even planning future joint work. Unfortunately, the Birmingham symposium was plagued by last minute "no-shows". It is greatly to the credit of the editorial team that they have managed to publish well-edited versions of all papers including those of the absentees.

Overall the volume can be recommended to glaciologists for browsing. The editing is sometimes a little casual - this must surely be the first occasion when an *editor's* name is printed incorrectly! But there are many interesting tit-bits to be discovered and the wide variety of topics means that there really is something here for everyone.

LIZ MORRIS

Flowering plants of the Falkland Islands

Robin W. Woods.
Falklands Conservation, London. (2000)
108 pp. Price £12 (£7 to members of Falklands Conservation).
ISBN 0 953837106

The Falkland Islands possess a distinctive flora about which, like many other aspects of their terrestrial biota, little is known. The native vascular plant flora comprises about 170 species, of which *c.* 150 are flowering plants, including a number of endemic species. Most of these have a close affinity with the southern South American flora. The only comprehensive account of the entire vascular flora remains that of D.M. Moore (1968), but most species were not illustrated and the large-format volume was difficult for the amateur to use, especially in the field. Until now, the only other readily available illustrated "flora" was an excellent little booklet which included 61 of the islands' vascular plants (Davies & McAdam 1989).

Although better known for his works on the birds of the Falkland Islands, Robin Woods has produced a pocket-sized, user-friendly and practical guide to 46 of the native non-graminoid flowering plants of these fascinating islands. It is the outcome of a project to survey and record the distribution of important plants in the islands, begun by Falklands Conservation in 1998, with the primary aim of educating the local populace and ever-increasing numbers of visiting tourists. The book is beautifully illustrated with line drawings (by Christabel King) and colour photographs. Species are grouped by family, and some information provided about each family. Each species is allocated two pages, and includes a simple description with the main diagnostic features emboldened, and the habitat highlighted. Many of the plants included represent morphologically similar species which are often difficult to distinguish in the field. A map is provided dividing the islands into a net of 10 km grid squares. While this is invaluable for recording one's findings in the field, another map providing geographical features and place names would also have been useful.

This small book will be of considerable interest to anyone interested in the flowers of the Falkland Islands. Let us hope that other volumes will follow which will eventually provide a complete illustrated flora of the islands.

References

DAVIES, T.H. & MCADAM, J.H. 1989. *Wild flowers of the Falkland Islands*. Bluntisham: Bluntisham Books, 48 pp.
MOORE, D.M. 1969. The vascular flora of the Falkland Islands. *British Antarctic Survey Scientific Reports*, No. 60, 202 pp.

R.I. LEWIS SMITH

Proceedings of Third International Penguin Conference, Capetown 1996.

edited by John Cooper
Marine Ornithology vol. 27. (2000)
Price £40. ISBN 1018 3337

This whole volume of the journal is devoted to 29 papers given at the conference, out of a total 96 oral and poster contributions. It is a very mixed collection of material from the thought provoking review of ecological and behavioural heterogeneity, to more traditional data on population dynamics and reproduction of several species. There are also papers on the impacts of tourism, disease and oil, as well as foraging depth and range data for kings, yellow eye, magellanic, Humbolt and chinstrap penguins. Something for everyone with an interest in penguins. The first two conferences were produced as books, and you can buy this special issue separately and shelve it as the third volume in a continuing series.

(Available from J. Cooper, African Seabird Group, Avian Demography Unit, University of Capetown, Rondebosch 7700. South Africa. jcooper@botzoo.uct.ac.za)