Renewed interaction

Peter D. Moore

Allelopathy, 2nd Edn.
By Elroy L. Rice.
Academic:1984. Pp.422. $55, £42.50.

PERHAPS the best possible excuse for writing a second edition of a book is when the author changes his mind about the definition of the title; this becomes even more imperative when the title is a single word, such as allelopathy. When Rice wrote the first edition of this book in 1974, he adopted a conservative definition and confined his attentions to those chemical interactions between plants (including microbes) which result from the release of compounds into the environment and which cause harm to the recipient. He now feels that the definition was too narrow and that the term should include stimulatory interactions, and in this respect he comes into line not only with the coiner of the word (Molisch) but also with many others who use it.

Predictably, wider use of the term has resulted in the second edition including information which was excluded from the first. Hence it is a fatter book. But there is also a marked change in emphasis, for almost a third of this edition is devoted to what may be regarded as applied aspects of the subject, such as the importance of allelopathic studies in agriculture, horticulture and forestry. Further semantic problems occur even in these fields, as in the case of such well-known weeds as *Camelina sativa* in flax fields. It has long been known that flax plants in the immediate vicinity of the weed suffer reduction in growth rate, but is this due to allelopathy or to "competition" for some environmental resource such as nutrient ions? Both views have been held by various workers and chemical tests on plant exudates have not clarified matters, for leaf washings of *Camelina* have often been found to stimulate the growth of young flax plants. The latest work quoted by Rice suggests that benzylamine, secreted by *Camelina*, stimulates flax at concentrations below 100 ppm, while above 200 ppm it serves to inhibit it. So here we encounter problems both in the definition of allelopathy and of competition which are currently dogging the study of this subject.

In the analysis of allelopathic interactions in natural vegetation, emphasis has often been placed upon the occurrence of bare patches around plants or of patterns exhibited by plant populations. This work is thoroughly reviewed here, both for herbaceous and for woody species. The involvement of microbial elements in the plant interactions also receives due attention, as for example in the discussion of nitrification and the extent to which late successional species produce chemicals which inhibit the process and thereby gain advantage over those species with the potential to replace them. This is a subject which generates strong feelings among ecologists and it is well reviewed by Rice, who, predictably, comes down in favour of the idea of succession suppression by dominant plants.

From the ecological, we are taken into the realms of physiological and biochemical studies of allelopathy, including the chemical nature and the mode of transfer and action of the active agents.

The subject of allelopathy is one which transgresses a number of disciplinary boundaries and which can be expected to interest a wide readership. The first edition of this book certainly spent more time off my shelves than on them and is now very well worn. Such intensity of use, which I am sure is widespread, coupled with the amount of research into allelopathy over the past ten years, amply justifies the publication of a second edition even if the author had not revised his opinion on the definition of the term. □

Peter D. Moore is Reader in Ecology in the Department of Plant Sciences, King's College, University of London.

Ice age development

G. de Q. Robin

Ice Sheets and Climate.
By J. Oerlemans and C.J. van der Veen.
Reidel: 1984. Pp.217. Dfl.90, $34.50.

Ice Sheet and Climate Modelling would have been a better title for this work, which aims to help graduate students bridge a gap between glaciology and climatology. The authors' views and research contributions are presented concisely in relation to brief outlines of our knowledge of the climate system and of the work of other modellers.

In 12 short chapters descriptions and relevant equations are presented, starting with the global climate system. Here the energy balance, transport by atmosphere and oceans, and related effects of albedo feedback on these systems are covered. A largely mathematical outline is given of ice dynamics, including flow of ice shelves and grounding lines problems. Economical methods of numerical modelling are then introduced, and are later applied to problems of growth, decay and stability of ice sheets in the Northern Hemisphere and the climatic stability of ice sheets of Greenland and Antarctica.

Adequate modelling of vast ice sheets must involve their heat budget and bedrock adjustment to ice loading. Oerlemans and van der Veen avoid lengthy analysis of frictional heat production from stress–strain rate distribution by equating the loss of potential energy to total frictional heat production in steady-state ice sheets. Their analysis of bedrock adjustment is similar to that found earlier works, but leads to more sweeping conclusions.

In the book, the approximate 100,000-year cycle of growth and decay of Pleistocene ice sheets is attributed to flow dynamics of the asthenosphere and ice sheet once growth is initiated. The authors place less emphasis than others on latitudinal variations of radiation with time as a controlling factor. Even so they consider such variations are one likely cause of initiation of ice ages, with the next suitable minimum at 65°N at 50,000 years being much more likely to start an ice age than the earlier but less severe minimum around 20,000 years. In the near future, they calculate, warming of the atmosphere by doubling of the carbon dioxide content will deposit more ice on Antarctica (where melting is negligible) while on Greenland total melting would increase more than accumulation. The assumption that ice flow changes are negligible over a short period leads to estimated mass changes of the two ice sheets that together would lower sea level by 0.1m in 250 years.

When linking heat flow to large-scale ice dynamics, Oerlemans and van der Veen reach similar conclusions to other studies but with two exceptions. They reject internal strain heating of cold ice and frictional enhancement of sliding by ice melting as likely causes of major ice surges, pointing out that some conditions that lead to surging of valley glaciers do not apply to ice sheets. They do however conclude that basal trapping of water beneath ice sheets could result in large-scale cyclic surging. At this point, in moving on to develop models that could work rather than first discussing if these are plausible, it seems that the cart is put before the horse. Surely beneath fast-moving ice streams, sometimes termed "continuously surging glaciers", water trapping must be stable and continuous rather than intermittent. Since such ice streams discharge a large fraction of Antarctic ice, the authors could query whether really large-scale surges are possible. Neither modelling studies nor field data seem to provide strong evidence in their favour.

Although it is apparent that English is not the authors' mother tongue, the book is clearly written and presented. Its broad conclusion is that ice-asthenosphere dynamics drive an ice age — once it is triggered off — rather than climatic factors driving ice sheet dynamics. Oerlemans and van der Veen do not claim to provide final answers, but they have produced a stimulating book that should, as they intend, result in further and more detailed research in this field. □

G. de Q. Robin is at the Scott Polar Research Institute, University of Cambridge.

● Cambridge University Press has issued paperback editions of *Theory and Experiment in Gravitational Physics* (by Clifford M. Will) and *The Very Early Universe* (edited by G.W. Gibbons, S.W. Hawking and S.T.C. Siklos). Price of each book is £15, $24.95. For reviews see *Nature* **299**, 284 (1982) and **309**, 473 (1984).