larger organisms, and this could conceivably be the cause of various functional and structural size-related properties. But the question of which properties are affected by selection and which are the inevitable consequences of the internal engineering of an organism remains a difficult one.

Two points stem from the above. One is Calder's important caution that allometric interrelations are statistical correlations and they therefore cannot tell us anything about causes. The other is a point made by both authors: it may not always be the examples that come close to the allometric mean that are interesting, but the exceptions. For instance, Scholander and his colleagues showed that an arctic weasel has an exceptionally high metabolic rate, well above the norm for its size; and they suggested that because it is small, and has short legs, its fur could not be thick enough to keep it warm in winter. The weasel's solution to the problem is to stoke its internal fires to a higher rate. Another interesting case is the hearts of small shrews and hummingbirds which are larger than the expected mean. The suggestion is that were this not so their hearts would have to beat at a physically impossible rate in order to supply sufficient blood flow; they compensate by increasing their heart to a size that has a lower, but mechanically possible natural frequency. Both these examples show that selection can, no doubt within limits, alter one feature to the exclusion of the others.

The use of allometry in ecology is a new and exciting subject, but still in its infancy. It has also been reviewed by R.H. Peters in his recent book (*The Ecological Implications of Size*, published by Cambridge University Press in 1983) in a somewhat different way from Calder, although the two books overlap to some degree. What Calder does, which is especially useful, is to consider reproduction and development, as well as population properties such as animal density and home range size, for they are all interrelated. Often information about one of these subjects provides important insights into others. This is shown particularly well in the very recent work of P.H. Harvey, R.D. Martin and others on brain size and its ecological implications, work that is in progress and therefore not reported in any of these books. But the new studies do prove that the subject is important and advancing in significant ways.

Again, the interesting questions all relate to the matter of causation. Calder is quite right to stress that what have been shown are correlations, which cannot, in the long run, be satisfying. It is like the problem of smoking and cancer; what the correlation *means* is the paramount issue. We must find ways of understanding what are the causes of allometric relations, and what are the causes of specific examples of deviation from those relations. This is the real strategy for the future and these two books are admirable stepping stones along the way. □

J. T. Bonner is a Professor of Biology at Princeton University.

Science digested

Bryan Silcock

Sci-Tech Report.
Edited by Jon Turney.
Pluto Press/Pantheon: 1984. Pp.386. Pbk £8.95, $11.95.

IF THE social responsibility in science movement needs a handbook, here it is: a collection of 170 shortish articles intended to "assess the state of science and technology and locate sci-tech inventions within a wider social and political context". The general approach might be described as left-radical-ecological. Thus nearly all of the contacts and organizations listed at the end of the book are pressure groups, most of them against something or other.

Sci-Tech Report is not a book you can sit down and read. It is far too fragmented for that. But it contains an unusual selection of information that as far as I know cannot be found elsewhere between one set of covers.

The first third, dealing with new technologies of political (in the widest sense of the word) significance — nuclear power, cable television, computers, genetic engineering, bacteriological warfare — is fairly predictable. But we then move on to such things as accounts of science policy in the main industrialized countries and a few in the Third World as well; articles on aspects of the sociology of science such as the publishing of scientific papers, the ownership of intellectual property and fraud in science; theories of what drives the innovative process in different industries; and discussions of controversial issues, sociobiology and creationism for example, which help to form the public image of science.

The contributions range from the mainly factual to the definitely political. Their style is mostly straightforward and simple, their quality uneven. But anyone with a critical interest in science as an activity and who sees it as more than a dispassionate search for knowledge should find them well worth dipping into.

Sci-Tech Report originally appeared in France. For the English edition some material has been dropped and about 40 new articles added. This was deliberate. I assume that the dropping, in my copy at any rate, of pp. 291–306, and the duplication of pp. 307–322, was not. □

Bryan Silcock is science correspondent of the Sunday Times.

Russian tidings

K.F. Bowden

Ocean Tides: Mathematical Models and Numerical Experiments.
By G.I. Marchuk and B.A. Kagan.
Pergamon: 1984. Pp.292. £36, $65.

IN THE past 25 years there has been a remarkable revival of interest in ocean tides. This has been due largely to the greatly improved methods of calculation, using modern computers, but also to advances in measurement by deep-sea tide gauges and the developing use of satellite altimetry. Marchuk and Kagan are leading workers in the USSR on the theory and numerical modelling of tides. Their book is in part a monograph describing their own work and that of their colleagues, and in part a general account of the present state of knowledge. While this combination leads to some unevenness in the treatment, both aspects have something of value to offer.

The first chapter gives a clear account of the astronomical and other forces affecting the tides, the equations of tidal dynamics and general features of the methods used to solve them. The next two chapters are more mathematical and are based on the work of the authors and their colleagues on analytical and numerical procedures. While these accounts are likely to appeal mainly to practitioners in this specific field, the fourth chapter is of wider interest and comprises a survey of our present knowledge of the distribution of tides in the world ocean. Following a review of empirical charts, it summarizes the computed co-tidal and co-range charts produced in various countries and discusses a Russian version in some detail. It is interesting to note that, in their preface to the book, the authors express the view that the appearance of more advanced computers will not result in better agreement between computational and observational data. They point to the need to pay further attention to certain physical aspects of the problem.

The last two chapters deal with topics related to ocean tides but which are more specialized and again reflect Marchuk and Kagan's own research interests. In that on the benthic boundary layer, they give a comprehensive review of the subject and describe in particular a theoretical model of their own. The other is on the vertical structure of internal tidal waves which are generated mainly, in the authors' view, by the flow of a stratified ocean over an irregular sea bottom. It is estimated that, in the deep oceans, the rate of transfer of energy to internal tides is of the order of 100 times greater than the rate of dissipation by bottom friction and turbulence. □

K.F. Bowden is Emeritus Professor of Oceanography at the University of Liverpool.