

most other environmental changes, the Gaian way was not an automatic homeostatic reaction but a creative co-evolutionary response.

It seems worth considering that the Gaian control results in global homeostasis only over a period of time which is short on the evolutionary scale. One figure will suffice to illustrate the magnitude of the terrestrial changes that are continuously caused by life. In their aggregate, all the green plants now fix approximately 840×10^{12} kilowatt hours of solar energy per year in the form of biomass. This is more than 10 times the amount of energy that all of humankind uses annually, even with its most extravagant technologies. Who can doubt that this continuous process of accumulation of organic matter and energy will eventually affect both the surface of the Earth and various forms of life. Furthermore, Lovelock himself points out that the process of change may pick up speed and complexity as a result of human interventions, and he appropriately quotes me in stating that, on a local level, profound co-evolutionary changes have occurred in certain terrestrial

environments and in their biological systems during historical times.

In the last chapter of his book, Lovelock has the courage to explore the relevance of the Gaian hypothesis to the effects of human interventions into nature. I wish I had space to explain why I agree with him when he states that environmentalists often shoot at wrong targets because the resiliency of the Earth, considered as an organism, probably makes ecosystems more resistant to pollution than commonly believed. As I cannot discuss these problems here, I shall conclude by expressing my wish that in the next edition of his book, Lovelock emphasises not only the homeostatic aspects of the Gaia hypothesis but also its creative aspects. This would be in the spirit of his statement that the Gaia concept is an alternative to the "depressing picture of our planet as a demented spaceship, forever travelling, driverless and purposeless, around an inner circle of the sun". □

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Pollution in perspective

Kenneth Mellanby

A Perspective of Environmental Pollution. By M. W. Holdgate. Pp. 278. (Cambridge University Press; London, New York and Melbourne, 1979.) £15.

SOME ten years ago I was invited by a British publisher to write a book with the title *Pollution in Perspective*. This was to have been a 'popular' book in which I would try to distinguish between real, damaging pollution and trivial environmental contamination which, though harmless, nevertheless caused so much public concern. Being an idle fellow I procrastinated, and my text is still mainly in my imagination. Therefore, when I saw Dr Martin Holdgate's new book, with so similar a title, my emotions were mixed. On the one hand I felt guilt for not having completed my own book on such an obviously important subject, and on the other hand I experienced relief that someone else had done the job so competently.

For there can be no doubt that Dr Holdgate has produced an excellent book. Although he modestly denies having given his subject complete coverage, I cannot find any significant gaps. All major topics in the field of pollution are dealt with

clearly, scientifically and with a full understanding of the facts, where these are easily available, and also the lacunae in our knowledge are always mentioned.

The book starts by placing pollution in its ecological context, and then goes on to define pollution and classify pollutants. A very important chapter is "The significance of pathways" which deals with the way substances are dispersed in the air, in fresh water and in the sea. The significance, sometimes overestimated, of the transmission of toxic substances through food chains is assessed. The great value of the book is that it constantly relates the concentrations of specific pollutants in the environment to the real effects on man or other targets. It thus shows how standards for pollution control may be scientifically determined, and how monitoring may be used to determine dangers and enforce controls. The costs of pollution control, and the way these may — or may not — be balanced against benefits are discussed. The international problems caused when pollutants cross frontiers are described.

The general theme is admirably stated in the book's last paragraph:

"Finally, there are grounds for optimism. There appears to be no reason why pollution should be the doom of mankind or the destroyer of the ecological balance of the world. But pollution control is an essential element in sound environmental management. The higher the standards of environmental quality and safety we demand, the more effort we shall have to make, and the more it will cost. It is a matter of wisdom and judgement how much risk is acceptable and how high environmental quality should

stand amid the other goals that compete for the resources of society".

No doubt there are those who will accuse Holdgate of "complacency" for not preaching doom and gloom, but thoughtful readers will welcome his clear assessment of the national and global situation. He shows that if mankind is destroyed by pollution, it will be our own fault.

Within its limits, which I shall discuss later, this book deserves nothing but praise. It is well written, and reasonably free from jargon. It will be a godsend to lecturers in universities, polytechnics and colleges of higher education who have to give courses on pollution or pollution control. Most of them could improve their current lectures simply by reading aloud from Holdgate's text.

My only criticism of the information given is that it is not always up to date. Dr Holdgate is a senior civil servant, with the characteristic respect for his sources, particularly where these are such things as the prestigious reports of the Royal Commission on Environmental Pollution. He reproduces (as others have done) a number of their admirable diagrams. For instance, from their first (1971) report we have graphs showing the amounts of smoke and sulphur dioxide in Britain's air at different dates. These figures show the remarkable improvement in air quality between 1950 and 1968 or 1969. For smoke, we are even given the "projection" for the year 1975, four years before this book appeared. As Dr Holdgate is Director General of Research in the Department of the Environment, where there are many junior scientists who have up-to-date figures for the period since the Royal Commission reported readily available, it is a pity that the diagrams were not redrawn and updated. This is not a trivial point, for the result would have reinforced many of the book's arguments, for the figures would have shown that there has been a further, substantial, improvement in air and water quality right up to the present day.

Notwithstanding this minor fault, this is a book which deserves a wide circulation. However, I fear that its sales will be reduced by the way it has been presented by the publishers, who have not served their author well. The text is set in reasonably clear type, but it is much too small to make reading a pleasure. The sections all bear unnecessary numbers (for example, 2.5.1 Pollution in the air) which may make prospective buyers who run through the pages in a book shop think that they are being offered a government report, and so they will be put off. Finally, the price of £15 for 278 pages (with no expensive plates) will not deter the lecturer who has to deliver a course on the subject, but his students will not be able to afford their own copies. This may, of course, be welcomed by some teachers, who will be able to keep up the pretence

that their oratory arises from their own original deliberations. The book is also too costly to circulate widely among concerned members of the public who need the information to allow them to make correct decisions on environmental problems. Also, though well written, the style is of the good scientific paper, which may present difficulties to those used to lighter literature.

So, although Dr Martin Holdgate's *A Perspective of Environmental Pollution* is a fine book, valuable to the élite, it may

not reach the mass audience envisaged by the publisher who wanted me to write *Pollution in Perspective*. So I fear that Dr Holdgate may not have let me off the hook, and that I may still have to write my own book. If I do, I, like all future writers on this topic, will have to thank him for marshalling so much information so admirably, and for reducing our work so considerably. □

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Pragmatic humanism

Stephen H. Schneider

The Climate Mandate. By W. Roberts and H. Lansford, Pp. 197. (Freeman: San Francisco and Reading, 1979.) Hardback £6.70; paperback £3.30.

In the past five years at least twice this number of popular books on climate has crossed my desk. Some promise ice (for example, *The Cooling*), others fire (for example, *Hothouse Earth*) and one even has the title *Ice or Fire?* Among these offerings one of the most recent, *The Climate Mandate*, is one of the best. Its authors are Walter Orr Roberts, former Director of the National Center for Atmospheric Research (NCAR) and Henry Lansford, a science writer and former Information Officer at NCAR. Dr Roberts is presently Director of the Program in Food, Climate and the World's Future of the Aspen Institute for Humanistic Studies. His concerns with humanity are well reflected in *The Climate Mandate*.

The team of a scientist/humanist and a science-writer has resulted in a very readable (and mercifully short — only 197 pages) selection of topics related to climate and climatic change. We are spared the unexcavated railings and pet theories of some climatic prognosticators that climatic doom is nigh as well as the bland assurance of some ostrich-like professional meteorologists that there is no climate problem worthy of public note, let alone a dozen books.

Of course, in 197 pages one cannot fully lay out the range and depth of all phases of the climate problem. *The Climate Mandate* will thus likely be only a partial help to those looking for a non-specialist textbook on climatic change to supplement, say, a beginning level college course in geography. On the other hand, it is much better than most of its competitors in

confronting directly the place of climate and climatic variability in the world food picture. In fact, the book is organised to build up to the last chapter ("Defining the Problem — Malthusian Pessimists, Social Idealists, and Technological Optimists") in which the authors offer scenarios for world development within the demanding constraints of population growth, environmental stress, ideological differences, economic inequities and, of course, fluctuating climate. The scenarios comprise "the climate mandate".

To back up their solutions to the world predicament, there are chapters which review briefly climate history; the physical factors influencing climate; the climate theories of various scientists; the difficulties of climate forecasting; the respective roles of climate; technologies and infrastructure in crop productivity; and a cautious description of some weather modification operations in the US. If one extrapolates slightly from their carefully hedged remarks on weather modification, they seem to suggest that more dollars have flowed from granting agencies to weather modifiers than from seeded clouds to water users. They caution that such technological fixes are not panaceas, an apt thought in which to transition to the final chapter, where the food/population/energy/environment/climate problem (that is, the human predicament) is addressed.

The human predicament had been addressed often in the two hundred years since Malthus, and Roberts and Lansford bring it up to date with an overview of three modern contrasting views. First, there are the "Malthusian pessimists", personified by ecologist Garrett Hardin, who counsel "lifeboat ethics", whereby rich countries like the US are advised to abandon hope of feeding chronically poor countries with high population growth rates. The "technological optimists", on the other hand, believe that modern energy and capital-intensive farming can easily accommodate the foreseeable growth of world population — if only Third World governments would provide markets for farmers to sell their produce and incentives for corporations to transfer their

technologies. Finally there are the "social idealists", who fear that transfer to the poor of modern large-scale technologies is another form of imperialism, as it makes the developing countries dependent on products developed and produced abroad. They counsel the overthrow of the "elites" who dominate Third World governments and the establishment of locally self-reliant, labour-intensive production systems.

Roberts and Lansford believe, as do I, that it is simplistic to view the human predicament simply as a problem of monolithic cause ("the danger lies in the conviction that a single aspect of the problem is so overriding that attempts to deal with any others are simply a waste of time and money"). They propose, instead, an approach they call "pragmatic humanism", in which we are to accept the "premise that many human lives can be saved and much misery avoided by a diversity of efforts". Technology or the Green Revolution are legitimate tools in this "whole-system approach", but their applications must meet local needs. The authors then offer "scenarios" which comprise "the climate mandate". The first element is to establish a "world food emergency reserve" and distribution system to mitigate the effects of local climatic variability. (This reviewer could hardly disagree without revoking his own writings.) Next is the need to develop agricultural self-reliance in developing nations — with US and USSR joint-help. The key to success is flexibility and cooperation on all sides. Specific examples of how to bring this about, however, are few. According to their scenarios the Earth could "have the ability to produce adequate food for a doubled or tripled world population", but they admit (and unfortunately this is the only reference to this crucial issue) that "the ecological implications have not been examined in any comprehensive way".

The authors conclude optimistically, despite the litany of obstacles they properly point out, that "if we heed the climate mandate, and if we accept the fact that the Earth's people are bound together by mutual needs and expectations that must transcend our rivalries and contests, humanity should be able not only to survive but to prevail over the hunger and starvation that have threatened so many people for so many centuries."

The Climate Mandate is a compassionate book; it reflects the authors' own humanity. Its hopes and sentiments are appealing. But if past experiences with global cooperation remain our only reference, I would continue to rate the prospects as "technologically optimistic, but politically bleak". □

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