

## International programme

**Indian Geosphere Biosphere.** T. N. Khoshoo and Manju Sharma. Vikas Publishing House, 576, Masjid Road, Jangpura, New Delhi 110 014. 1991. 286 pp. Rs 295.

This book contains the proceedings of a symposium on the Indian Geosphere Biosphere Programme organized by the National Academy of Sciences of India at Osmania University, Hyderabad, in January 1990. Taking cognizance of the very ambitious and timely international programme initiated by the International Council of Scientific Unions (ICSU), entitled 'International Geosphere Biosphere Programme—a study of global change', the National Academy of Sciences organized this symposium to create the necessary awareness among Indian scientists and encourage them to undertake research programmes in this challenging and highly interdisciplinary subject. The inaugural address was given by M. G. K. Menon, who is currently president of ICSU.

The Earth went through the last of its periodic glacial or ice ages from about 120,000 BP till about 10,000 BP. The present interglacial or warm period started around 10,000 BP and is still continuing; it also coincides with the beginning and flowering of present-day civilization. However, it is only after the Industrial Revolution of the eighteenth century that human activities started to have a noticeable detrimental impact on the environment—the land, the atmosphere, the water bodies and the biosphere. This pollution of the environment is associated with the release of large quantities of CO<sub>2</sub> and other greenhouse gases from fossil-fuel and biomass burning; release of methane from changing land-use practices; release of chlorofluorocarbons which destroy the ozone layer and of gaseous nitric and sulphur compounds which give rise to acid rain; reckless release of vast quantities of industrial wastes (toxic and otherwise) in land, water and air; deforestation; etc. The exploding population of the world, leading to wasteful style of living on the one hand and utter poverty on the other, has greatly accentuated this problem. Together they

have now assumed alarming proportions, threatening the well-being of the human race in the twentyfirst century.

An expression of the global awareness of this problem is the coming into operation of a large number of international scientific programmes which address specific aspects of this most complex and multifaceted phenomenon of the 'Earth system'. By and large they are all single- or two-discipline-related problems, such as the Global Atmospheric Research Programme, Global Energy and Water Cycle Experiment, Joint Global Ocean Flux Study, Tropical oceans and the Global Atmosphere, Man and Biosphere, etc. In all this there were two important elements that did not receive proper emphasis. In order to study and understand the global environment and the changes occurring in it and which are likely to occur in future, it is necessary to treat the earth and all its subsystems as a single, interactive feedback system. In this the entire geosphere and biosphere elements should find their due place and role. Secondly, if we are to reach ultimately an understanding of the functioning and changing of this global system, a holistic and multidisciplinary approach is necessary. Since human activities can importantly affect the global changes, the human dimensions need also to be suitably incorporated in the modelling efforts which can ultimately lead to the prediction of long-term global changes in a reliable way. The International Geosphere Biosphere Programme is being implemented by ICSU with precisely this objective. It is recognized that it will be the most complex and long-term international programme undertaken by ICSU so far, requiring the participation of all the countries of the world. The need for developing countries to join this programme is all the more important since, among other things, their stakes from the impact of global changes like large-scale shifts in the climatic patterns and sea-level rise are very high; they are likely to affect their economic development and human well-being in a major way.

The present book contains ten articles presented by Indian scientists. The majority of these represent findings on topics relevant to India but of general

importance to global change studies. They cover results from investigations on topics relating to radiation budget of the earth, greenhouse gases, biodiversity, biogeochemical cycles, role of space systems to study global change and palaeoclimate. Some of the articles also contain very useful quantitative information on global and regional parameters. On the whole it is a useful collection of articles relevant to global change studies. On the negative side, the selection of articles based on the presentations at the symposium is such that they relate to different patches of topics and do not build any coherent account of the Geosphere Biosphere Programme envisaged by ICSU.

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## New paradigm

**Energy for a Sustainable World.** J. Goldemberg, T. B. Johansson, A. K. N. Reddy and R. H. Williams. Wiley Eastern Limited, 4835/24, Ansari Road, Daryaganj, New Delhi 110 002. 1988.

A large number of books on energy have been published in the last 20 years. Most of the books published so far have focused their attention on one of the following topics: energy resources, energy supply and demand, energy conversion, energy analysis, energy conservation, energy and environment. There are very few books which have covered all these topics in a comprehensive manner. The book *Energy for a Sustainable World* is refreshingly different in this respect. The authors do not treat energy issues in isolation. They relate the energy problem to other issues such as poverty, development, environment and nuclear weapons proliferation. The authors challenge the paradigm that presumes that energy consumption per capita is linearly related to gross national product.

The book has six chapters. In the first

chapter, the authors demonstrate that the global energy problem is linked to other major problems such as North-South disparities, environmental degradation, climate change, population explosion and nuclear weapons proliferation. In the second chapter, the authors propose an end-use-oriented energy strategy for developed countries. They begin with a criticism of the techniques normally used to predict future energy demands. These techniques extrapolate from past experience and hence do not allow for the increase in energy efficiency through new technology. The authors demonstrate that new technologies can reduce energy consumption in residential, commercial, transportation and industrial sectors. The last section of this chapter provides a detailed account of the end-use-oriented energy future for Sweden and the United States. The authors show that if energy-efficient devices are used the gross national product of the United States can be doubled while reducing the per capita energy consumption to half the present value.

In the third chapter, the authors address the issue of energy strategies for developing countries. They highlight the low level of energy services in developing countries. They discuss in great detail the important role played by non-commercial energy (such as firewood) in developing countries. They demonstrate that a per capita energy consumption of around 100 MJ per day will be sufficient to satisfy all the basic needs of people in developing countries. They arrive at this conclusion after a detailed analysis of the energy consumption pattern in residential, commercial, transportation, manufacturing and agriculture sectors in Western Europe, Japan, New Zealand and Australia. Many developing countries have approached the per capita energy consumption of 100 MJ per day. This indicates that the major problem in some of the developing countries is the inefficient use of energy and the uneven distribution of energy consumption within different classes in these countries.

The authors provide specific guidelines for energy strategies in developing countries. These include the use of animate energy, renewable energy, efficiency improvements and synergism. By synergism, the authors mean the beneficial impact of the combined and cooperative effect of measures taken in

two different sectors of the economy. They illustrate the concept of synergism through a case study of the Brazilian ethanol programme.

In chapter 4 the authors discuss the future global energy demand and supply. They argue that the global energy demand in the year 2020 need not be much higher than that in 1980. This result is quite different from the conventional wisdom of energy planners that the demand in 2020 will be twice or thrice that in 1980. The result obtained by the authors of this book is based on the assumption that the new energy-efficient technologies will be fully utilized. The authors believe that the availability of fossil fuels in the future may be influenced by concerns regarding global warming. They do not foresee a bright future for nuclear power on account of the concern regarding nuclear weapons proliferation. The major conclusion of this chapter is that the economic and social goals of developing and developed countries can be achieved without any increase in the global primary energy consumption. The authors caution that this goal can be achieved if and only if the preoccupation of the energy planners with energy supply is changed. Energy planners must be more concerned with providing energy services more efficiently. The authors reiterate the fact that energy is not an end in itself. The energy is needed to achieve certain economic goals. If the goals can be achieved with less energy expenditure it reduces the pressure on energy supply.

In chapter 5, the authors indicate the policies that will be necessary to implement the energy strategies suggested by them. They provide a detailed account of the various approaches, such as market mechanisms, administrative allocation of energy carriers, regulation and taxes. Many readers of the book may find the approach outlined by the authors to be reasonable but may wonder whether they can be actually implemented. This issue is discussed in the last chapter, wherein the authors contend that market intervention will be necessary to promote more efficient use of energy. The authors have not, however, discussed in detail the problems in adopting a new energy efficient technology on account of the scarcity of capital. The authors claim that the approach advocated by them will be easier to implement than the conven-

tional strategy of continuous increase in energy supply. The book contains two appendices. Appendix A provides a brief overview of renewable energy technology and its potential. Appendix B contains a glossary of terms, useful data, definitions, and energy conversion factors.

The book provides for the first time a new paradigm for energy planning. Anyone concerned with the issues related to energy cannot afford to miss this book. This book has been already cited widely by those concerned with environmental degradation and global warming. It must be made compulsory reading for our energy planners and bureaucrats. I wonder, however, whether energy planners will find it easy to abandon the old paradigm and adopt the new paradigm suggested in this book. The energy planners wedded to the old paradigm may be forced to abandon it because the amount of capital necessary to construct more and more power plants is not easily available.

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## What's hot in biochemistry

**Annual Review of Biochemistry 1991.** vol. 60. Charles C. Richardson. Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303, USA. Price: US \$ 41, elsewhere \$ 47.

Annual Reviews Inc. bring out volumes reviewing areas ranging from anthropology and psychology to astronomy and nuclear science. The appearance of a review is a good indicator that the area has seen a large volume of published work over the previous five years or so. Perusing the *Annual Reviews of Biochemistry*, Vol. 60 (and the current volumes of other areas in the life sciences) I was struck by the large number of articles on a small number of areas. The structure and