ENVIRONMENT

Gaia: The Growth of an Idea

By Lawrence E. Joseph. 1990. St. Martin's Press, New York. 276 pp. U.S. $19.95; $27.95 in Canada.

Anyone interested in the conservation of our planet should become acquainted with the "Gaia concept." Named for a Greek Goddess roughly equivalent to "mother earth", the Gaia concept hypothesizes that our planet Earth behaves as a self-regulating organism with an outer membrane. As a corollary, the evolution of living organisms and their environment is an inextricably coupled process with feedback mechanisms. Such biological homeostasis is nicknamed "Daisyworld."

Lawrence Joseph gives us a balanced historical account of the development of the Gaia and "Daisyworld" concepts by the eccentric British genius, James Lovelock, whose greatest invention, in 1957, was the electron capture detector (ECD). The ECD allowed detection of chemicals such as DDT in part per trillion and made possible Rachel Carson's 1962 landmark book, *Silent Spring*. In 1971-72 Lovelock and two collaborators on a voyage to Antarctica used Lovelock's homemade gas chromatograph to measure gases in sea and air. They were the first to demonstrate that indestructible chlorofluorocarbons (CFCs) were accumulating worldwide — but three times as common in air blown from Europe as from the open sea. Lovelock also discovered that tiny ocean phytoplankton release the dimethyl sulfide that rises into the atmosphere and, transformed into condensation nuclei, aids cloud formation and transports needed sulfur to land.

To Lovelock and his co-worker, bacteriologist Lynn Margulis, symbiotic cooperation between organisms is more important than competition. Margulis has studied bacteria that desalinate tidal pools, varnishing salt so that it can't redissolve; lipids secreted by the bacteria in turn reduce the impact of waves that crash onto the lagoon. Lovelock believes that self-regulating systems have maintained the earth's oxygen at an ideal 21% and the ocean at optimal salinity over 500 million years. Biodiversity has practical survival value; destruction of marine life would destroy the earth's thermostat.

Our ozone layer, part of the protective membrane around our planet, is threatened by CO_2, by CFCs, and by methane. Biologists studied termites without appreciating the amount of methane they released, while upper atmosphere scientists noticed the methane there but didn't realize its origin. Lovelock's approach ties everything together. Lovelock, although he invented the instruments and designed the experiments to show the hazards of CFCs, which deplete the stratospheric ozone layer, at first had too much faith in Gaia's self-regulating ability.

Lovelock draws our attention to the dangers of the "four Cs: cars, cattle, chainsaws, and coal." He fears the ill-effects of agriculture (cows pass a lot of methane) as much as those of industry. He stresses that nuclear energy is environmentally friendly as compared to coal as an energy source.

We can benefit from opening our horizons even if the Gaian concept is as much metaphor as science. Read Lawrence Joseph's interesting account and decide for yourself. We violate Gaia, mother earth, at our peril.

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Dynamic Biogeography

By R. Hengeveld. 1990. Cambridge Studies in Ecology, Cambridge University Press, New York. xiv + 249 pp., illus. U.S. $54.50

Dynamic biogeography is defined by the author as the analysis and understanding of spatial biological phenomena in terms of past and present factors and processes. This broad subject was approached with the condition of being "very much a personal synthesis". Although this is an interesting perspective, it makes for a book that is neither novel nor comprehensive. The format of the book takes a top-down approach of exploring species' distributions by first examining broad-scale biogeographic patterns and processes, and then finer-scale phenomena.

The book reviews a selection of methods used in biogeographical classification. This review is not exhaustive, and the discussion of the methods varies from a detailed explanation of cluster algorithms to a brief comparison of ordination techniques. Despite an attempt to avoid a "cookery book", the author falls into the trap of limiting the readers' options by limiting the number of methods discussed. One interested in quantitative methods of biogeographical classification would be better served by more extensive works such as Ludwig and Reynold's *Statistical Ecology* (1989).

The remainder of the book examines geographical trends at various scales from species richness to intraspecific variation; areography (the analysis of species ranges); and, the dynamic structure of species ranges. These topics are surveyed largely through a series of interesting examples. However, a more detailed discussion of the concepts underlying