

Eco-epidemiology

Health and Climate Change: Modelling the Impacts of Global Warming and Ozone Depletion

by Pim Martens

Earthscan: 1998. Pp. 176. £15 (pbk)

George A. Gellert

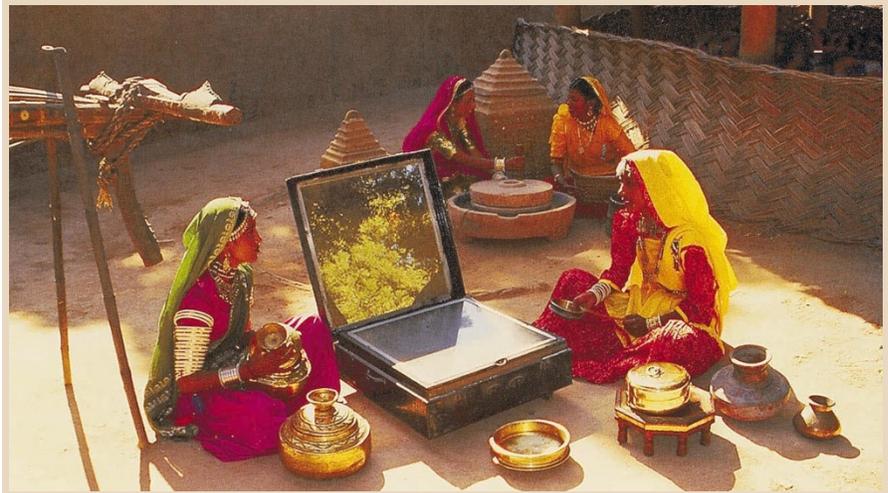
Modelling the effects of environmental health hazards presents scientists with unusual problems. With global climate change it is impossible to rely on empirical data as they are not readily available. In addition, even if non-alarmist projections are true, mankind may not have the time to risk standard prospective research on so potentially deleterious a set of health issues.

Pim Martens has provided a rigorous introduction to the purposes and practices of eco-epidemiology. The objective of this field is to increase competence in projecting the future effects of current trends in order to anticipate the negative effects of global atmospheric change. In developing such projections and estimates, new strategies and techniques are required to manage scientific uncertainty, and this is the focus of the book; the primary technique or tool it explores is simulation modelling. Martens sets out to look at the dynamics underlying the health effects of climate change and ozone depletion, along with their intrinsic uncertainties.

The rationale behind eco-epidemiological modelling is a need to provide a conceptual framework and analytical tools for evaluating situations and phenomena that extend beyond documented experience. Martens considers the development of multidisciplinary, integrated assessment models. His models incorporate projections of global environmental changes and extrapolations of the resulting effects on the health of individuals and populations derived from epidemiological data, biological knowledge, models of societal response, and historical experience. This brief and readable treatment is an introduction to the field and the modelling tools, and provides real-world illustrations of the use of the approach.

Martens begins by providing a succinct summary of the main differences between conventional epidemiological research methods and the systems-based assessment of global atmospheric changes. He then describes the main constructs of eco-epidemiological modelling, before moving quickly through several important areas of environmental threat.

Three potential consequences of global climate change are examined using eco-epidemiological modelling: shifts in the geography of vector-borne infectious diseases (malaria, dengue and schistosomiasis); alterations in exposure to thermal stress



Hard sell for the Sun

An Indian entrepreneur is trying to popularize a small solar cooker by hiring Rajasthani dancers to display it in the compound of a hotel. From *The Timeless Energy of the Sun* edited by

Madanjeet Singh (Thames and Hudson, £18.95). The book begins by describing how ancient peoples worshipped the Sun and goes on to describe the latest developments in solar power.

within urban populations and consequent thermal-related mortality (for example, cardiovascular and respiratory mortality); and increased incidence of skin cancer associated with increased ultraviolet levels resulting from ozone depletion. The progression of chapters and models builds added sensitivity and complexity into the method. For example, the second model presented on malaria refines the approach by including a simulation of adaptive processes.

Martens concludes with an attempt to translate the results of the methodology into useful information and a discussion of future lines of research.

In general, the book successfully achieves its objectives. One of its strengths is that it incorporates facets not usually covered in methodological reviews, such as a chapter providing estimates of the attributable population burdens of disease or mortality that may result from the global changes analysed. This information helps to make clear the critical link between the adverse effects modelled and their magnitude and specific health impacts.

But, if the book's breadth and effort to appeal to readers of diverse backgrounds and degrees of technical sophistication is a strength, it is also a weakness. The book seems to suffer an identity crisis, being neither introductory or interdisciplinary enough for the generalist, nor conceptually or methodologically deep enough for the expert. Is it a primer for the uninitiated or a case-studies reference for the practitioner? Nevertheless, this drawback is outweighed by a well organized and thoughtful presentation, along with an astute and effective use of graphics and tabular summaries. The book also makes extensive use of reference cita-

tions, but the topical index is so abbreviated as to have almost no value.

Martens recognizes the limitations of the models presented, including their immature stage of development, an inability to focus on local outcomes, and a lack of validation. He acknowledges the need for rapid evolution in the methodology, but points out that his case studies demonstrate the feasibility of such efforts to quantify systematically the health impacts of global climate change and ozone depletion. He has provided a solid contribution to an important, underexamined and scientifically complex discipline. □

George A. Gellert is at 1 Franklin Plaza, 200 North 16th Street, Philadelphia, PA 19101, USA.

Wherein blue genes?

Mood Genes: Hunting for Origins of Mania and Depression

by Samuel H. Barondes

W. H. Freeman: 1998. Pp. 237. \$24.95

George Fink

"Mania is a sickness for one's friends, depression for one's self. Both are chemical." This quotation from Robert Lowell sums up mood disorders, which are common and frequently lethal. According to the September 1997 report of the National Institute of Mental Health's Genetics Workgroup, chaired by Samuel H. Barondes, the lifetime risk of manic depression (bipolar disorder) is about 1% in the United States with no sex difference, whereas for a major depressive episode (unipolar disorder) the risk is 13% in men and 21% in women. Both illnesses contribute significantly to the high incidence of suicide.

Studies of twins show that the concordance rate for manic-depressive disorder is 80% in monozygotic twins compared with 8% in dizygotic twins. Together with adoption studies, these findings suggest that genetic factors are involved in the familial transmission of bipolar disorder. Although less compelling, the results of twin and adoption studies suggest that genetic factors are also involved in major depression. In *Mood Genes*, Barondes lucidly encompasses the development of modern psychiatry and genetics, and shows how the two are coupled in the quest for the genetic basis of mood disorders.

He starts with the story of Michael, a molecular biologist whose mother, Flora, is a writer with severe manic-depressive illness; she has bouts of profligate spending and sexual promiscuity followed by crashes into hopeless depression. When manic, she writes for at least 15 hours a day, producing 300 typed pages in just three weeks. Flora considers mania to be her "gemlike flame," reminiscent of the madness that drove many creative minds, as essayed by Kay Redfield Jamison in *Touched with Fire* (Simon and Schuster, 1993), which is a perfect complement to *Mood Genes*. Flora's brother, who is depressive and who has attempted suicide on several occasions, her father and Michael's son also exhibit signs consistent with manic-depressive illness. In his fifties, Michael feels down and takes the antidepressant Prozac, which throws him too into mania. It is on this family, affected by manic-depressive disorder in four successive generations, that Barondes builds the riveting story of psychiatry and genetics.

He explains how Emil Kraepelin tried to classify psychiatric disorders, as Rudolph Virchow had done for medical diseases. Kraepelin concluded from pedigree studies that manic-depressive insanity was a hereditary trait. To pursue this proposition he established in 1917 a Genealogical and Demographic Department in the Kaiser Wilhelm Institute for Psychiatry in Munich. But his work was undone by Ernst Rudin, appointed head of the department by Kraepelin, who was instrumental during the early Nazi era in drafting the infamous Law to Prevent Hereditarily Sick Offspring, which led to the compulsory sterilization of hundreds of thousands of people with real or constructed hereditary or congenital disease.

This tarnished Kraepelin's reputation and brought to an abrupt halt the development of psychiatric genetics, opening the way for Sigmund Freud's more compassionate, but arguably less rational, psychoanalytical approach to become the predominant force in psychiatry. The renaissance of interest in the classification of psychiatric disorders did not occur until the 1970s, forced in part by the development of powerful psychotropic drugs including lithium, the most effective drug for controlling manic symp-

tom. Preparation for the gene hunt is completed by the familiar account of the development of human genetics, from the peas of Gregor Mendel to the double helix and the genetic code.

The important concept of gene penetrance is introduced by reference to the genetically transmitted illness porphyria, which allegedly affected King George III and is expressed in only about one in ten carriers of the disease allele under conditions of 'biochemical overload'. Porphyria has heuristic value for understanding the genetic transmission of complex diseases, such as high blood pressure, diabetes and manic depression, in which factors extrinsic to the genome trigger the expression of the disease allele. This seems to have been the case for Michael, as he devel-

oped mania only after taking Prozac.

Barondes dismisses rather peremptorily the candidate gene approach (looking for genes that appear biologically relevant to the disorder) in the hunt for mood genes. Although it has found genes involved in other diseases, he says it has failed to find mood genes. But many studies are now in progress, and three recent reports link a polymorphism in the gene encoding the serotonin transporter, the target for Prozac, with mood disorders. Barondes instead focuses on the linkage approach, beginning his explanation with the studies of Thomas Morgan on the fruitfly, and underscoring the importance of restriction fragment length polymorphisms as gene markers.

James Gusella and Michael Conneally

Higher planes



In the words of internationally renowned photographer Emmet Gowin, the landscape "is always, in some sense, our home". For the past ten years, Gowin has used aerial photography to document man's mark on the Earth in images of industrial agriculture, mining explorations and nuclear test sites of the American West. In some sense, the aerial perspective provides the gift of seeing our own history, although known to us, for the first time. The exceptional beauty of the photographs is sometimes at odds with what they depict, and we are gently reminded that we are connected to, not separate from, these places. Gowin wishes simply to bear witness to

this reality, and his work is full of reverence for life. With the recent tragic halt to nuclear non-proliferation in Asia, let us hope that this philosophy finds global expression.

This photograph, "Subsidence Craters and the Yucca Fault, Northern End of Yucca Flat, Nevada Test Site", is part of an exhibition of Gowin's work taking place at the Pace Wildenstein MacGill Gallery in New York City until 13 June. A book of 250 of Gowin's photographs is planned.

Lisa Satterwhite is in the Department of Molecular Biology, Schultz Laboratory, Princeton University, Princeton, NJ 08544, USA.

discovered just such a polymorphism on chromosome 4, which is linked to Huntington's disease, after screening with only three probes. That this led to the identification of the genetic disease locus made linkage analysis seem relatively easy and highly effective. But the hunt for mood genes has so far proved to be a dismal failure. Claims made for linkages to the X chromosome and chromosomes 11 and 18, based on studies of Amish, Israeli and Costa Rican pedigrees respectively, have not been substantiated. Frustrated, Barondes turns to Alzheimer's disease, susceptibility to which is increased by the presence of the apolipoprotein A4 genotype, to reassure us that gene linkage can be useful in studying mental disorders.

Because the linkage approach has failed to identify mood genes, the peremptory dismissal of the candidate gene approach is puzzling. However, this and other inconsistencies do not detract from the overall importance of *Mood Genes* as an interim account of an exciting gene hunt, written in comfortable and in parts racy prose by an authority in the field. The evidence for the genetic transmission of mood disorders is incontrovertible, so the hunt must go on. □

George Fink is in the MRC Brain Metabolism Unit, Department of Pharmacology, University of Edinburgh, 1 George Square, Edinburgh EH8 9JZ, UK.

Animal anomalies

The Garden of Ediacara: Discovering the First Complex Life

by Mark A. S. McMenamin
Columbia University Press: 1998. Pp. 284.
\$29.95, £23.95

The Crucible of Creation: The Burgess Shale and the Rise of Animals

by Simon Conway Morris
Oxford University Press: 1998. Pp. 242.
£18.99, \$30

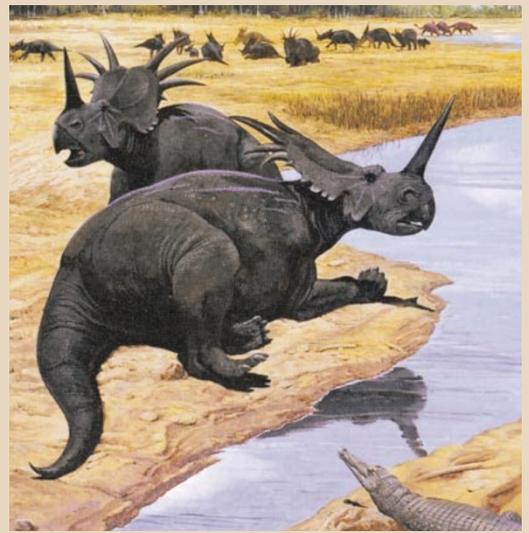
Douglas Palmer

Writing for a wide readership about obscure and extinct organisms without common names or modern analogues is peculiarly difficult. Nevertheless, the discovery of such fossils, especially when they are the remains of some of the earliest complex multicellular organisms, is so important that it warrants any serious attempt to tell their story. At least a book provides the scope to go beyond the constraints of the media soundbite.

The pitfalls of gross generalization and misrepresentation are only too well known. Recently, the main morning news programme on British radio raised the question of whether 'intelligent' life, as it was put, had evolved twice in the distant past. Furthermore, it was claimed that the first wave of 'innocent and peaceful, sentient beings' was

Past masters

Artist's impression of two resting *Styracosaurus albertensis*, taken from *The Horned Dinosaurs: A Natural History* by Peter Dodson, which is now out in paperback from Princeton University Press at \$19.95, £15.95. A "comprehensive" and "even-handed" work, wrote Angela Milner in a review of the original hardback edition (*Nature* 384, 426; 1996).



wiped out by the second wave, consisting of our ancestors, armed with tooth and buckler.

Behind the 'news' story is the publication of Mark McMenamin's *The Garden of Ediacara*, a popular account of his interpretation of the problematic soft-bodied organisms called the Ediacarans. He has based his ideas on those of the German palaeontologist Dolf Seilacher, who coined the term Vendobionta to describe what he sees as the curiously alien nature of these fossils as neither animals nor plants. Accordingly, the Ediacarans were a failed evolutionary experiment and were unceremoniously hustled off the stage of life by the advent of the more familiar Cambrian biota of arthropods and 'shelly' molluscs. Ediacarans have been found around the world, mainly in late Precambrian marine sediments dating from 600 million to 544 million years ago, but they are now known to have survived into Cambrian and possibly younger deposits.

It is a hard task to inform a non-specialist reader about the Ediacarans with their unusual mode of preservation in sandstones. The task is made even more difficult because there is now an intellectual free-for-all on the Ediacarans, unconstrained by much in the way of data. Ediacarans have variously been ascribed to lichens, protozoans, cnidarians, annelids and arthropods.

McMenamin is at his best when he has a good story to tell, such as his 1995 discovery of *Cyclomedusa* fossils from late Precambrian sediments 600 million years old in northern Mexico. A traditional tale, it has a sequence of trial and tribulation for the narrator 'hero' in his quest for the 'holy grail'. But too often his narrative approach as journalist, observer and confidant is not as satisfying as that adopted by Simon Conway Morris in *The Crucible of Creation*.

Conway Morris is concerned mainly with exploring the nature of the Burgess Shale organisms of middle Cambrian age, around 520 million years old. But his wide-ranging experience of other Cambrian deposits and

their biotas allows him to tell with authority a much broader story of their role in animal evolution. No doubt some academics' eyebrows will be raised by the intrusion of personal belief but, as much as anything else, this book is an account of an intellectual journey and not an academic paper. His authorial voice is a complex mix of omniscient narrator and guide/teacher, at times demanding or dismissive but always enormously informative and questioning.

Conway Morris has the advantage that the Burgess Shale fossils are now better defined than the Ediacarans, with plentiful, biologically based data and a good understanding of the taphonomy (*post mortem* processes of burial and fossilization) of the animals, both essential prerequisites for interpreting the fossil record. This has not always been so: as little as 20 years ago there were considerable misconceptions about some of the weird and wonderful creatures of the Burgess Shale, such as *Anomalocaris* and *Hallucigenia*.

When Stephen Jay Gould published his *Wonderful Life* in 1989, he claimed that so many of the forms of life present at that time were wiped out by extinctions that, if the tape of life were replayed, there would have been a very different set of survivors. Furthermore, chance would mitigate against humans being among them. Conway Morris argues against Gould's historical contingency, claiming that "it does not have such a meaningful effect on the totality of life" and "a different message can be read from the Burgess Shale".

Part of this argument extends back to the Ediacarans. Conway Morris makes a strong claim for at least one biological contact between the Ediacaran *Charniodiscus* and *Thaumaptilon*, a sea-pen from the Burgess. Perhaps the difficulties will be resolved only if other Ediacarans are found in a similar mode of preservation to the Burgess. □

Douglas Palmer is at 31 Mawson Road, Cambridge CB1 2DZ, UK.