Environmental Conservation 24 (2): 200–203 © 1997 Foundation for Environmental Conservation

BOOK REVIEWS

Population Dynamics in Ecological Space and Time

EDITED BY OLIN E. RHODES JR., RONALD K. CHESSER & MICHAEL H. SMITH

vii + 388 pp., 23 × 15 × 2 cm, ISBN 0 226 71057 2 hardback, US$ 50.00, UK£ 39.95; 0 226 71058 0 paperback, US$ 17.95, UK£ 14.25, Chicago, USA: Chicago University Press, 1996

This is the first book in a series organized by the Savannah River Ecology Laboratory. The series intends to focus on critical areas in environmental biology, each book being multiauthored and based on a small symposium so that authors can interact and integrate their contributions. In the present book, the editors have chosen to focus attention on some aspects of space and time in population ecology and genetics.

The choice of subject is timely. Ecologists, although long aware that location of individuals and populations in space has important repercussions for ecological processes, have only recently begun to get to grips with the issues involved in linking time and space. Matters are rather different in population genetics, because of the recognition that spatial location of individuals prevents panmixis and has fundamental effects on genetic structure of populations.

The book is divided into four main sections. Part I deals with population models from the perspective of metapopulations, and sources and sinks. Part II covers some of the associations between life histories of organisms and spatial and temporal variation in the environment. This includes life histories with different stages found in distinct habitats, such as amphibians with aquatic and terrestrial phases; it also covers life histories with long-lived stages that take organisms through periods of poor recruitment (the storage effect), and migratory movements of animals. In part III, several aspects of genetic structure of populations in space and time are considered. The last part is devoted to perturbations to ecological systems generated by human and natural disturbances.

Integrating different subject areas is always going to be a problem in multiauthored texts, and the editors have gone to some trouble to achieve a smooth flow of ideas through the book. Yet some parts of the book cry out for a synthesis that goes beyond the boundaries of single chapters. Take the chapters on metapopulations and source-sink populations for instance. The dynamics of a metapopulation are presumably a mathematical limit of a system of source-sink populations that applies as the rate of movement of individuals becomes large and the variance of local population size becomes small. This needs to be made precise, if the relationship between the different approaches is to be made clear.

But there are many positive features of the book. It is particularly nice to see the barriers between ecosystem and population ecology crumbling away. This division always was intellectually unhelpful, and is increasingly inappropriate for tackling the environmental problems of today. Landscape ecology, the spatially-extended child of ecosystem ecology, illustrates this happening. Here interactions between ecosystems in large neighbourhoods provide the organizing principle, and movement of individuals across the landscape plays a part as do movements of minerals by passive means.

Building on the notion of landscape ecology, the penultimate chapter argues that there is no alternative to organizing conservation of biodiversity at the level of whole landscapes. The argument goes that national parks and reserves with their current disjunct distribution around the world are simply inadequate for long-term conservation, as they cannot permit adaptation and adjustment of species' distributions in response to environmental change. What we need are integrated conservation systems encompassing entire landscapes that preserve natural processes at large spatial scales. It would be nice if politicians were convinced by this; the argument is reasonable and needs to be spelt out loud and clear. But I'm afraid that environmental biologists should also be making contingency plans for ways of maintaining biodiversity in the future that will succeed in a less favourable political climate. With this in mind, we ought not to play down the real and valuable contribution to conservation that even small reserves can play in the short to medium term.

What I find curious about the book, and the research on spatio-temporal processes that it reflects, is the assumption that spatial effects can be treated without explicitly dealing with the location of the individuals or populations concerned. It is a research programme that deals with the effects of space without using space, so to speak. The metapopulation paradigm is a case in point; movement from one location to another is independent of the relative locations of the starting and finishing point. Perhaps this does not matter in the ideal framework of a metapopulation where every local population has the same rate of extinction, and individuals move from one location to any other at a constant rate. But under the conditions that occur in nature, movements typically occur over short distances, and local populations differ in size. In this case, large local populations have correspondingly greater effects on populations in their neighbourhood, and spatial location does matter.

Why has so much effort gone into developing a body of ecology that deals with space in this oblique way? Most likely it is to do with the lack of a firm theoretical foundation on which to build ideas, together with the much greater amount of work needed to measure individuals, populations and communities to the level of spatial location. But times are changing; as we move into an age of satellite and other kinds of remote digitized images, enormous amounts of spatially-referenced data are becoming available. We need a theoretical framework to deal with information of this kind, able to describe the dynamics of communities and ecosystems across ecological landscapes. This framework has yet to be developed.

RICHARD LAW
Department of Biology
University of York
PO Box 373
York YO1 5YW
UK

https://doi.org/10.1017/S0376892997220266 Published online by Cambridge University Press

World Who is Who and Does What in Environment and Conservation

EDITED BY NICHOLAS POLUNIN, COMPILED BY LYNN M. CURME

592 pp., ISBN 1 85383 377 0 hardback, £50.00, London, UK: Earthscan Publications Ltd, 1997

We have long needed a reference book like this one. The community of leading environmentalists has grown in number and influence, and it depends mightily on networking among its thousands of protagonists worldwide. To date there has been no directory of key individuals, a lack which has hampered us at many a turn. A warm welcome, then, for this excellent publication, and hefty congratulations to its editor, Professor Nicholas Polunin, and its compiler, Lynn Curme.

What promises to be the standard work of reference for a good many years contains some 1300 listings of environmentalists, including conservationists. Most entries are concise yet illuminating, with details of basic biography, namely education and professional qualifications, work and experience, specialist interests, career track, memberships and affiliations, achievements, awards, publications, languages, and finally addresses and telephone and fax numbers. At the back of the book is an excellent cross-referencing section, categorized by speciality expertise and home habitat, so that readers can easily check on individuals in any particular field or country.

I am sure I shall need to keep this book within ready reach, since I shall be exploiting its mine of information for all it's worth, and that 'worth' is a great deal by most measures. It is good to see a few entire families listed, such as Adrian, Cassandra and Oliver Phillips. True, there is scope for cavils too. There is no entry for the eminent scientist and long-standing publicist David Suzuki, who has done as much via television and books on the other side of the Atlantic as David Bellamy on this. Nor is there a listing for Bill Conway, redoubtable founder of Wildlife Conservation International in New York with an annual budget of US$ 15 million. Nor is there listing of Warwick Kerr and Eneas Salati, luminary ecologists who have done much to stem deforestation in Brazilian Amazonia. Calestous Juma, a Kenyan energy specialist who now heads the Biodiversity Convention secretariat, is not listed either. David Western, current Director of Kenya Wildlife Services and surely among the top ten systems ecologists worldwide, is unfortunately not listed either.

All in all, however, very nearly all those who should be in are in, and their write-ups are on target. We are thoroughly well-served by this compendium of vital details of those many individuals who make the world go round in what is ultimately the only sense that maters. The book is all the more pertinent at a time when there is a premium on 'networking'. In an era of runaway globalization of economies, cultures and social systems, among others, there is unprecedented need and scope to liaise with colleagues in whatever part of the world and in whatever sector of the environmental vineyard. This book has colonized a long-vacant niche with precision and vigour.

NORMAN MYERS
Green College
Oxford University
Woodstock Road
Oxford OX2 6HG
UK

Return to Resistance; Breeding Crops to Reduce Pesticide Dependence

BY RAOUL A. ROBINSON

xv + 480 pp., 23 × 15 × 2.5 cm, ISBN 0 932857 17 5 softbound, US$ 29.95, Davis, California, USA: agAccess, 1996

In this book on breeding crops with horizontal resistance, Raoul A. Robinson has made an elegant and timely effort to tell us how to produce food in an environmentally-sustainable way. This is centred around advancing and publicizing a pathosystem concept, which, when applied, can lead to an environment less heavily-loaded with toxic pesticides. This concept is advanced around a system of breeding crops for horizontal resistance to their pests and diseases. Dr Robinson's experience of plant breeding of about 40 years distributed in more than 50 countries is well reflected in this groundbreaking effort, written with engaging candour. He proposes that groups of farmers could be created worldwide to develop crop plants which will do well in their localities without dependence on excessive pesticides use. Though the author says that the book is addressed mainly to general readers who are interested in finding out about world food supply and environmental problems resulting from use of crop-protecting chemicals, it would also be of use to specialists.

The book begins with an introductory chapter describing the need of food for everyone and what factors may be responsible for increasing the food supply. The author points out that the three major objectives of plant breeding – yield, quality and agronomic suitability, have been adequately achieved by the scientists, but the fourth objective, i.e., resistance to pests and diseases, has not been given its due share. The author dwells upon this issue in detail.

The main body of the book is divided into three parts, namely, explanations, examples and solutions, of which the first comprises 17 chapters and second and third six each. The first part covers various facets of crop breeding, like the approaches of the Mendelian and Biometrician groups, resistance to diseases and host–parasite interactions. The author successfully advances the ideas based on the conflicts between the two schools in genetics and their impact on crop breeding, right from the very beginning (about the year 1900). The older school of biometricians (bio-metrics = life measurements) measured inheritance of characters that are quantitatively variable (characters that differ in degree with every grade of difference from maximum to minimum), and the Mendelian group studied the inheritance of characters that are qualitatively variable (characters differ in kind, being either present or absent). The first school emphasizes qualitative or single-gene inheritance (monogenic) and the second is concerned with polygenic or quantitative inheritance.

The author keeps on referring to the influence of distortions left by this conflict in genetics while covering various topics in later chapters. From chapter 3 onwards he dwells upon the two types of resistances, instead of the one known as vertical resistance, and on how these resistances are significant in reducing the parasitism. He insists on the supremacy of horizontal resistance over the long-known vertical resistance for disease control. To quote from the book, 'Parasitism can be controlled for a long period only by universally existing horizontal resistance . . . The sole function of vertical resistance is to control the epidemic and to protect the host population as a whole'. In this section, the author also explains the advantages and disadvantages of vertical and horizontal resistance and the disadvantages of crop-protection chemicals, not only in terms of health hazards, but also in cost. Each topic is discussed by giving simple and easily understandable examples.

https://doi.org/10.1017/S0376892997220266 Published online by Cambridge University Press

Section two focuses on examples of selected crop species. Because of his vast experience of working in many parts of the globe over an extended period, when research directions changed rapidly from one decade to another, the author has been able to present many facets of case histories, including comprehensive accounts on the potato parasites, maize in tropical Africa, loss of resistance in coffee and the failure of the green revolution. In each case the author has questioned the usefulness of vertical resistance, which can no longer be used to check the level of parasitism caused by one or a variety of pathogens. He describes the example of the Colorado beetle, which invaded the potato crop in the area and devastated the whole crop. The undesirable effects of recurrent use of extremely-poisonous insecticides such as copper aceto-arsenate and lead arsenate are described, and the need for the development of durable resistant varieties based on horizontal resistance is suggested.

Finally, in the third section, solutions based on the durable resistance varieties are described in detail. Here the importance of using the biometrical approach which works with horizontal resistance is emphasized. The author suggests that plant breeding clubs should be formed for public participation in breeding programmes for disease resistance. A large part of this section is devoted to the various useful techniques. With the help of many examples, the screening of best plants from existing populations and the participation of farmers in the evaluation and selection of durable resistant varieties are described.

As a whole, the book is very useful for anybody interested in crop breeding, disease resistance and a clean environment.

S. P. SINGH
Department of Botany
Cumaun University
Nainital
263 002 Nainital UP
India

Technological Trajectories and the Human Environment

EDITED BY JESSE H. AUSUBEL & H. DALE LANGFORD

viii + 214 pp., 61 figs., 23.5 × 16 × 2 cm, ISBN 0 309 05133 9 hardback, US$ 42.95, Washington, DC, USA: National Academy Press, 1997

The application of technology to improve the human condition often comes at an unanticipated price. Fossil fuels, which stoked the economic expansion of the twentieth century, are now believed to be major precursors of global warming. Nuclear power, originally touted as a miracle source of limitless cheap energy, has instead generated huge cost-overruns and a stockpile of radioactive waste that will last for thousands of years. And the automobile, purveyor of unprecedented freedom of travel, is a leading producer of CO_2 emissions and has led to land-use problems such as urban sprawl.

Now the world faces new environmental challenges on an unprecedented, indeed planetary, scale: burgeoning world population, world-wide climate change, stratospheric ozone depletion, species extinction, rainforest destruction, and the devastation of coral reefs, to name but a few.

Can human technological capability, which has seemingly had a mixed record to date, now or in due course provide the solution to these daunting problems?

The answer, according to *Technological Trajectories and the Human Environment*, is a resounding 'Yes!' This collection of eleven essays, the result of a collaborative effort of the National Academy of Engineering, Electric Power Research Institute, and the Program for the Human Environment at The Rockefeller University, New York, argues that we are now poised with new technologies which will help us to overcome almost all our environmental concerns. Ecological limits to growth are largely irrelevant owing to trends towards efficient use of energy materials and of land. We will decarbonize the global energy system, drastically reducing greenhouse gas emissions. We will dematerialize the economy through more efficient manufacturing processes and improved product design. And we will significantly increase land areas reserved for Nature by raising agricultural productivity elsewhere, even as global population doubles.

How will this happen? The basic tenets of the argument are set forth in the first essay, 'The liberation of the environment', by Jesse H. Ausubel, director of the Program for the Human Environment at The Rockefeller University. Based on an historical review of the trajectories of technological invention, innovation, and diffusion, and on currently existing technologies, he shows how greater technical efficiencies are freeing us from environmental constraints. 'The largest global change is that humans – vulnerable, pathetic mammals when naked – have learned how to control their environment. Science and technology are our best strategies for control, and our success is why we now number nearly six billion' (p. 8).

The next eight essays present a series of arguments to substantiate this thesis: Arnulf Grübler provides an overview of the history of technological diffusion, including examples from the transportation, energy, and manufacturing sectors; Robert W. Kates argues against Malthusian prophesies of doom, and how technological improvement has always enabled humanity to cope with increased population; Paul E. Waggoner investigates the limits to agricultural yields and finds that the global totals of sun, CO_2, fertilizer, and water, can produce far more food than a doubling population needs, while still leaving plenty of land for Nature; Nebojša Nakićenović shows the trend of decarbonization of our energy sources as we move towards a hydrogen economy; Lee Schipper argues that the collective consumption patterns of the individuals within society increasingly shape environmental change; Jesse H. Ausubel and Cesare Marchetti project continued innovation in electrical generation and transmission for centuries to come; Iddo K. Wernick *et al*. discuss the promises of, and obstacles to, the decoupling of material use from human affluence; and Robert A. Frosch suggests an analytic framework for thinking about materials and their flows in the context of industrial waste.

In the penultimate essay, 'Humans in nature: toward a physiocentric philosophy', Klaus Michael Meyer-Abich, a professor of the philosophy of Nature at the University of Essen, Germany, reviews the cultural and conceptual history of Nature, concluding that 'we need to diffuse a new understanding of nature, including our own nature, in order to drive our science. . . . [T]he environmental crisis reminds us that peace is not a matter of humanity being a closed society, but rather ought to be found in siting ourselves in the whole of nature.' (p. 182) This essay stands out from the rest of the text as a clear reminder that the solution to our environmental problems lies not in isolating ourselves through technology, but by incorporating Nature into our very conception of self.

In the concluding essay, 'Sustaining the human environment: the next two hundred years', Chauncey Starr, President Emeritus of the Electric Power Research Institute, reiterates the

https://doi.org/10.1017/S0376892997220266 Published online by Cambridge University Press

optimistic view set forth in our first quotation (by Ausubel). But he also tempers the message with a note of economic and social concern: 'I am very pessimistic about the ability of world governments to formulate global plans centrally when they are deeply deficient in managing their own domestic issues. So, I urge minimal government interference in the management of global resources, and maximum freedom for the development and use of technical options.' (p. 198)

According to this view, technology develops best in a *laissez-faire* system unchecked by governmental or social meddling. To a degree this is certainly true; but technology does not function in a vacuum. Many environmental problems have arisen precisely because they are not addressed in the normally functioning market system. Governments are not perfect, but they are the main institutions we have for resolving societal issues. To place technology outside this realm is, in effect, to abdicate social responsibility for technology development.

The authors offer strong evidence that there are technological solutions to many of our environmental problems. But our environmental crisis is not simply a technical matter: it is also economic, social, and spiritual. It is the failure of technologists to take these broader issues into account that has generated many of today's problems. This book is important in that it shows that the chicken-little scenarios of the environmental doomsayers are not inevitable. And the inclusion of Meyer-Abich's article lends a certain balance to the otherwise techno-centric vision. There is indeed room for optimism, but only if our technological capabilities are applied within the greater social context.

MARC E. NORMAN
1915 Sixteenth Street, NW No. 301
Washington, DC 20009
USA

Groundwater and Subsurface Remediation. Research Strategies for In-situ Technologies. Environmental Engineering Series.

EDITED BY HELMUT KORBUS, BALDUR BARCZEWSKI AND HANS-PETER KOSCHITZKY

ix + 337 pp., 149 figs & tables, 24 × 15.3 × 1.8 cm, ISBN 3 540 60916 4 hardcover, DM 146.81, Berlin / Heidelberg / New York: Springer Verlag, 1996

This book consists of twenty-two papers written by forty-eight experts presented at an international symposium in September 1995 at the University of Stuttgart, Germany. The event coincided with the launching of the VEGAS research facility (Versucheinrichtung zur Grundwasser- und Altlastensanierung, which can be translated as the Research Facility for Clean-up of Ground Water and Old Wastes). Motivating the symposium, book and facility is the recognition that the 'interdisciplinary nature of the problems requires a multidisciplinary approach'. The order of the contributions aims to highlight complimentary (sic) efforts, needs and effects.

The book endeavours to illustrate the role of large-scale experiments in groundwater and subsurface remediation research. It emphasizes the challenge of optimizing existing techniques and the development of novel approaches to *in situ* remediation of contaminated aquifers and soils. This is discussed at all levels, from basic processes to major experiments, and numerical systems' simulations. Various aspects of the processes of contaminant extraction, decomposition and immobilization are described. Examples have been selected from both sides of the Atlantic: Germany, France and The Netherlands on one side, the USA and Canada on the other. We may wonder why no Belgian expert was included, as the country has developed some noteworthy bio-remediation technologies both *in situ* and *ex situ*.

The introduction, by co-editor Helmut Korbus, deals with the VEGAS concept and approach. This topic is taken up again by the two other editors, later in the book, as they describe the research facility. The contributions are grouped under four headings: quantification experiments, technologies interactions and scales, systems numerical models, and applications strategies. Biodegradation is handled in three papers (in parts I and IV), metal-enhanced degradation and the role of geology is stressed in part II, quantitative specialists will find part III challenging, and ten pages (part IV) address ground water remediation.

The well-illustrated book contains some attractive colour photographs. The index is comprehensive. The presentation is of high quality. I doubt that the editors aimed at comprehensiveness, but rather desired a useful volume of proceedings of the symposium. In that they have succeeded.

ROGER H. CHARLIER
Free Univ. of Brussels and HAECON Inc.
110 Deinsesteenweg Drongen
B–9031 Belgium

https://doi.org/10.1017/S0376892997220266 Published online by Cambridge University Press