

Visions of the Land: Science, Literature, and the American Environment from the Era of Exploration to the Age of Ecology

By Michael A. Bryson. 2002. The University of Virginia Press, Box 400318, Charlottesville, Virginia 22904-4318 USA. 228 pages. U.S. \$16.50. Paper.

Visions of the Land, part of an "Explorations in Ecocriticism" series, is an interesting look at the relationship between science, the natural environment and human beings, as expressed in literature published in the United States from, as the subtitle suggests, the period of exploration in the 19th century to roughly the 1960s. Some aspects of that relationship would also apply to Canada.

The authors examined in the book cover quite the range – from explorers John Charles Frémont (American West) and Richard Byrd (polar regions), to author and feminist Charlotte Perkins Gilman, naturalist Susan Fenimore Cooper, and scientists John Wesley Powell, Rachel Carson and Loren Eiseley. The types of writing also vary widely – from exploration narratives and technical reports, to fictional utopias, natural histories, popular scientific literature, and more.

The book is divided into three parts: 1. Narratives of Exploration and the Scientist-Hero (Frémont and Byrd); 2. Imagined Communities and the Scientific Management of Nature (Powell and Perkins Gilman); and 3. Nature's Identity and the Critique of Science (Fenimore Cooper, Carson and Eiseley). The book's sub-title suggests a certain chronological order in the material, but that turned out not to be the case, which made reading and comprehension a little confusing. It was also a little difficult to follow the author's arguments through the themes covered in the three parts. I would have found it more effective had Bryson simply written a chapter on each of the authors.

Nevertheless, there is lots of good content in the book regarding science and connections with human perspectives on the natural environment. Frémont, for example, was the "glamour boy of American westward expansion", the archetypal macho scientist-explorer, who worked and wrote both scientific reports and popular literature at a time when the country was expanding ever faster westward, and when surveying technology and cartographic techniques were continually improving. Frémont's writing combines descriptive and poetic elements with analytical, quantitative

elements. The science he practises and expresses is highly rational and empirical, and the land something to be studied, catalogued and mapped.

John Wesley Powell, featured in Part 2 of the book, is another fascinating character in the history of the American West. An explorer-scientist like Frémont – as well as an ethnologist, philosopher, writer and government leader – Powell was, according to Bryson, "one of the most important and influential scientists of his age." Powell's work emphasises the scientific control of a mechanistic nature while at the same time recognising nature's self-regulating properties and the need for careful settlement and agricultural practices. Powell is aware of and interested in community, particularly with respect to the need for human communities to develop a responsible relationship with nature and to use science wisely.

Susan Fenimore Cooper, featured in Part 3, is one of the two non-scientist writers discussed by Bryson, although she was a dedicated naturalist and keen observer. Her work falls into the 19th century natural history writing tradition which helped inform the ecological science developed in the following century. Her book, *Rural Hours*, published in 1854, combines natural history, cultural analysis and personal stories to create an environmental and social portrait of her home region in central New York state. Bryson finds *Rural Hours* fascinating "not only because it combines multiple strands of the nature writing tradition but also because it provides a complex and fairly substantial critique of the relation between nature and the human community." Fenimore Cooper views science not as something which can be used to objectify or control nature, unlike Frémont or Powell. Science, in her view, is a "system of study meant to foster moral and intellectual connections between the observer and the outside world."

I learned a lot about the evolution of scientific thinking and its influence on the human-nature relationship in *Visions of the Land*. I also discovered some fascinating writers and books – ones I'm sure to look up and enjoy in the future.

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Genetics, Demography and Viability of Fragmented Populations

Edited by A. G. Young, and G. M. Clarke. 2000. Cambridge University Press, 40 West 20th Street New York, New York 10011-4221 USA. 438 pages. Canadian \$63. Paper.

This is another Australian CSIRO (Commonwealth Scientific and Industrial Research Organization) flagship publication of international importance to research and conservation. "The continuing global trend towards non-sustainable exploitation of natural resources means that more, rather than fewer, species are going to be affected by habitat loss, degradation and fragmenta-

tion in the future". The editors of this important book make it clear that the species of this globe will either have to survive in zoos, or in smaller fragments. For instance, the range of many Australian mammals declined already by over 90% and is now confined to off-shore islands; and in New Zealand the native forest cover has already been reduced from 78% in pre-human times to 23% today. Obviously, for many plants and animals in the world, preservation with relatively intact habitats is no longer an option.

Already Darwin (1876) had documented inbreeding depression in both cultivated and native plant species. The two major goals of modern conservation genetics are the maintenance of genetic variation and the avoidance of inbreeding depression.

This book consists of three parts (Introductory Concepts, Animal and Plant Case Studies) and includes 20 research papers from 42 international authors. Most of the contributors come from the southern hemisphere (Australia and New Zealand) as well as from the English speaking research sphere (USA, UK). However, their research applications come from many parts of the world and cover the variety of the animal kingdom (Red-cockaded Woodpecker, Golden Lion Tamarins, Mexican Wolves, Bonytail Chub, Chinook Salmon, Golden Sun Moth, Desert Bighorn Sheep, small mammals) and a variety of plant species. The plant section is of special interest here as plants are used to present genetic mechanisms transferable to animal populations and their conservation. It even includes an endangered dry forest tree species (*Swietenia humilis*) in Central America now listed with CITES (as are two Mahagoni tree species; formerly of major economical value). I also admire the 54 pages of references and a detailed book index.

Although local extinction is not infrequent to observe in nature "Habitat destruction is the most obvious cause of species decline and the most difficult to reverse". Recent fragmentation shaped the global landscape nowadays, which has nothing to do anymore with the original habitat. This book makes a pledge that we need to find a limit how we affect the global environment. "The techniques for doing so will come more from economics, psychology and sociology rather than from biology". However, as the editors show, biology has an important role to play beyond identification of species and ecosystems.

It's a challenge to find the right gene that determines inbreeding in a cost-effective way. The book is full of GGTGCTAGs, Dendrograms, Nei Genetic Distances, Phylogenies etc. The presented papers report in great detail on DNA extraction and processing methods such as PCR, but less so on statistics. Commonly applied software packages and methods to derive evidences are GENPOP, GenAlEx, SPARKS, PROC INBREED (SAS), PCA, bootstrapping, VORTEX and RAMAS. Authors conclude that relying entirely on neural molecular markers is inadequate. Most of the presented gene studies in this book are based on mtDNA and Allozymes; microsatellites might track fragmentation processes quicker.

Concepts and terms like Minimum Viable Populations (MVP) metapopulation paradigm, effective population size, rescue effect, simulation models, demography, transition matrix and the movements of pests, pathogens and predators are discussed as well. Some of the presented studies cover a period of over 10 years.

The well known study on Cheetah inbreeding effects (e.g., population decline, susceptibility to disease) remains controversial. But in Bighorn Sheep, high

heterozygosity is known to be associated with large horn size at sexual maturity, which confers breeding superiority. It is worthwhile to note that over the last 200 years alone 98% of Desert Bighorn Sheep populations have been reduced.

This complex publication makes for a bible on fragmentation as being genetically harmful.

Much of the book deals with the landmark publications by Caughley (1994) and Lande (1988) and provides further evidence and research on these topics. It is in support of the classical conservation arguments; e.g., Those brought forward by Soulé. The book somewhat promotes the Australian conservation view, which might not necessarily be shared world-wide. For instance, the foreword cites Randal O'Toole (1999) who stated that "conservation biology is not a science but a political movement based at least in part of nineteenth-century ideals of what an ecosystem is all about". The reader of this book will definitely learn that genetic loss will have negative effects on economic and physical well-being. "Each extinction erodes the biological legacy, and humanity slips away. Stewardship for the planet and its inhabitants will have been lost, replaced by greed, ignorance, and shortsightedness". Brooks (1997) contemplated already that "while the ship is sinking, conservation geneticists are busy counting the deck chairs". The contributing authors to this book make a case for managing through genetics; they are frank about the fact that many problems with endangered species cannot be solved with genetic techniques alone but that genetics will allow for much more informed decisions. As the authors show, true population estimates are hard to get from field work, and DNA offers major opportunities to infer some basic life-history, demographic and population parameters.

I am very glad that this book stresses the importance of spatial issues for PVA, but true GIS papers are unfortunately not presented. Some papers deal indirectly with what can be defined as Landscape Ecology though. Readers will also appreciate the great summary of the most important elements of a successful PVA. Some really good model philosophy is presented, too. PVAs are coined as a "loaded gun" pointing towards economics and others. The book deals nicely with data uncertainties in PVAs, PVA acceptance in the research community and PVA applications, too. "Incomplete information does not mean that meaningful results are impossible to obtain because there is very significant value in building a model for its own sake", e.g., as a guide for further data collection and bringing stakeholders together. A key argument is that a PVA compares risk, but does not measure it.

Besides the many other interesting and important papers in this book I, personally, really like the one dealing with the faunal collapse and genetic erosion in small mammal communities on islands in the Chiew Lam reservoir in Thailand: it's an island habitat milestone study with a 10 year data set.

The presented plant studies are very valuable because plants as well as their response to habitat loss and fragmentation, are usually understudied. The pollination papers show nicely that fragmentation has to consider pollinators (bees and butterflies), too, besides the pollen-mediated gene flow.

The correlation between population size and genetic diversity is clear. This book supports the view that it is increasingly apparent that the consequences of fragmentation are dependent upon complex interactions of demographic and genetic variables. However, the relative importance of demography vs. genetics for conservation of small populations or rare species is still debated. In either case, inbreeding and reproduction failure alone have limited demographic effects. However, when both are combined, and certainly when applying the “precautionary principle” in conservation, the two result in significantly reduced population persistent times. The authors show well that multidisciplinary approaches are crucial but that there is a large degree of discipline rivalry perpetuated by the structure of university faculties and departments and by the patterns of research funding worldwide. DNA

A Primer of Ecological Genetics

By Jeffrey K. Conner and Daniel L. Hartl. Sinauer Associates, Inc., Publishers, 23 Plumtree Road P.O. Box 407, Sunderland, Massachusetts 01375-0407 USA. 304 pages. U.S. \$47.92.

Recent developments in molecular biology have lead to the application of increasingly sophisticated genetic techniques to ecological questions. *A primer of ecological genetics* serves as an introduction to this rapidly expanding field. The intended readers for this book are advanced undergraduate and graduate students who will find it a valuable resource in their studies. The authors also suggest that professional biologists will benefit from the material presented, but I don't think this audience is as well served.

The book starts with the basic concepts of population genetics, including a review of the most commonly used molecular markers. Conner and Hartl then guide the reader through theoretical and empirical advances gained from two complementary approaches to this field. The first is the study of genetic variation in natural populations. Observed levels of genetic variation are routinely used to assess breeding systems, migration, and differentiation within and among populations, making a sound understanding of this material essential for anyone working in conservation biology. The second approach, quantitative genetics, deals with insights gained from experimental studies. While much of the relevant literature addresses breeding programs, the authors argue convincingly for the value of quantitative genetics in studying natural populations.

A detailed discussion of natural selection follows, and the closing chapter of the book covers some of the major applications of population genetics – con-

servations must remain incomplete as long as prey, predation, landscape and other factors get ignored.

Unfortunately, data reported upon in this book are not freely available in a digital format for the public, nor is that fact anywhere in this book emphasized; the important topic of Metadata is not mentioned either. This does not add to transparent decision making in conservation and should be considered in any study.

As this book once more shows very clearly, “currently, we do have tools available to us that we are not using”. If there is something to criticize in this book then: Why do we produce, and focus on, superb science, whereas most of our governments and the public are over 15 years behind in their actions and implications towards efficient conservation? In the meantime, the global landscape will be further exploited, with book shelves getting bigger. This excellent book calls for action: Management considering genetics is required.

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servation genetics, evolution of invasive species, transgene escape, and the evolution of pesticide resistance. This last chapter is an excellent grounding for the book, providing concrete examples of the value of ecological genetics to real world problems.

Overall the book is well thought out, and the authors succeed for the most part in presenting this complex subject in an accessible way. The prominence of quantitative genetics in the text is refreshing. The demands required for quantitative genetic study have limited its use in a conservation context. Conner and Hartl may persuade some researchers to rise to the challenge and combine observational and experimental work. The determined individuals that do will likely produce some very interesting results!

Some of the discussion was over-simplified. The reader gains a general understanding of the concepts, but will need to refer to the primary literature or a more detailed reference to truly master the material. This is the authors intention, as evidenced by the excellent selection of current references included with each chapter, accompanied by discussion questions. In this light, the book will make a marvellous study guide for a graduate seminar or senior undergraduate course. However, professional biologists and conservation managers are less likely to have the time and energy to devote to the subject. Expanding the treatment to make this book a “one-stop” reference would better serve this audience.

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