

Book reviews

Strange Natures: Conservation in the Era of Synthetic Biology by Kent H. Redford & William M. Adams (2021) 296 pp., Yale University Press, London, UK. ISBN 978-0-300-23097-0 (hbk), GBP 25.00.

Synthetic biology is a mindset rather than a technology: it is about the transformation of biology into an engineering discipline. In their new book, *Strange Natures*, Kent Redford and Bill Adams pose questions such as: Should engineered organisms be considered part of nature? Could they be a valid conservational tool?

In an attempt to answer these questions, the authors deconstruct the meaning of the term nature. Throughout the book, we are constantly asked to reconsider what nature is in the 21st century, to such an extent that one needs to ponder whether the term and concept themselves are useful in the context of such a project. To be fair, the authors never ask us to go as far as to completely drop the concept of nature, as some other scholars do, but as the title of the book suggests, nature is becoming strange.

By their own account, Redford and Adams spent the last decade researching and discussing conservation in the era of synthetic biology. They encountered all kinds of opposition and counter-arguments, which informed and shaped this work. It is argumentative in parts and defensive in others, which makes for interesting reading. Although relatively short, the book is comprehensive and for the most part well-informed and well-researched. Drawing from a wide range of sources, it gives a balanced primer on the many issues that need to be considered when approaching the potential use of genetic technologies and synthetic biology for conservation. It covers current and potential technologies, careful in most parts to qualify the claims of synthetic biology and maintain an objective approach. However, occasionally it subscribes to the hype. It is perhaps not surprising, considering its subject matter and dual authorship, that there appear to be two voices in the text: one that is cautionary and less certain, and one that is almost hyperbolically confident in the potential of synthetic biology to contribute to conservation efforts.

The authors highlight the fact that life worthy of conservation is a complex network that includes all life forms, from bacteria and archaea to megafauna and -flora. In fact, Redford and Adams go further and argue that genes are the essential units of conservation efforts: ‘...the most fundamental element in nature’s diversity... is the gene... It does its

work unseen, unremarked, and underappreciated... Without genes, biology simply doesn’t work’ (p. 16). This leads to the book’s focus on gene-editing technologies. Hence, engineering the genome of an organism to increase its chances of survival is justified from a conservation point of view because ‘almost all the rest of the genetic information encoded in its DNA, evolved over millions of years of evolution, would still exist’ (p. 207).

There is a desperate and urgent tone to this book. Human action, accidentally and purposely, already affects all conceivable ecosystems on Earth, and conservationists have been using a range of technologies and management systems to preserve the functioning of these ecosystems and the biodiversity within them. Are genetic technologies that different? The gene genie is already out of the bottle and in the wild. Can genetic technologies be intentionally used to support a resilient and thriving biosphere, or is the risk of unintentional genetic contamination a price too high to pay?

Redford and Adams acknowledge the complexity and dynamic nature of living systems, while maintaining an underlying sense of hope, a hope that deliberate genetic interventions for conservation will result in some form of intelligently designed nature. The nagging questions are: How intelligent is the designer? After whose image will these designed (or strange) natures take shape? Are current engineering and management convictions and decisions the right ones, and how will they affect the deep time cascade of evolution? In the long run, will human interventions in evolution be seen as yet another random mutagenic event? Although the authors adopt the rational mindset of engineering, the book also has some aspirational hopes that this time, technological intervention will somehow undo and fix past mistakes.

A concept that is not addressed in this book, but needs consideration, is the question as to whether, if we accept engineered life as part of conservation, we should also be looking at conserving engineered life in the new, human-induced ecologies? However, the importance of this book lies in its ability to open up a conversation. Although some of the claims regarding the power and precision of new gene-editing techniques need to be taken with a grain of salt, the questions Redford and Adams pose are significant, relevant and urgent. Anyone who is interested in the future of life on Earth and its conservation should read this book.

Presumably by some proofreading error, quite early in the book (page 49), when

discussing the evolution of life on Earth, the terms ‘millions’ and ‘billions’ are used interchangeably. This mistake erodes the confidence of the reader in some of the data and claims in this book. I hope that this will be fixed in future editions, because the book should be read with the confidence that the authors’ thoughtful, thorough and extensive research deserves.

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Bears of the World: Ecology, Conservation and Management edited by Vincenzo Penteriani & Mario Melletti (2021) 406 pp., Cambridge University Press, Cambridge, UK. ISBN 978-1-108-48352-0 (hbk), GBP 110.00.

The Editors of this book, Vincenzo Penteriani and Mario Melletti, have assembled an impressive list of contributors to cover a wide range of topics for scientists and managers working with bears around the world. Beyond this professional audience, the book is also an informative reference source for lay individuals interested in the life histories of these charismatic carnivores. That said, the relative abundance of technical jargon might make it difficult for many lay persons to understand some of the more complex concepts and relationships.

Part I provides an overview of the evolutionary history, systematics and genetics of the Ursidae family and its cultural significance to people. The importance of molecular genetics to taxonomists illustrates the complexity in the current and historical relationships between species as they evolved during glacial and interglacial periods. This section also provides information on mating strategies, case studies on interspecific interactions between brown bears and other carnivores, notes on adaptations influencing the distribution of Asian bears, and abundance estimates of American black bears in North America. These chapters are peripheral to the primary thrust of the book, but will be interesting for some readers.

The species accounts in Part II facilitate comparisons among the eight extant species of bears, including separate chapters for North American and Eurasian brown bears. Each account describes the taxonomy, physical, behavioural and habitat characteristics associated with each species. This section is an important resource, with current information