

**THE NEW ECOLOGY:
RETHINKING A SCIENCE
FOR THE ANTHROPOCENE**

by Oswald J. Schmitz. Princeton University Press, Princeton, NJ, U.S.A., 2016. 256 pp. Trade. ISBN: 978-0691160566.

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Although global-scale human influence on the environment has been recognized since the 1800s, the term *Anthropocene*, introduced a decade or so ago, was only accepted formally as a new geological epoch or era in Earth history in August 2016. Then an official expert group said that humanity's impact on the Earth is now so profound that a new geological epoch—the Anthropocene—should be officially declared. Ironically, this geologic term, frequently associated with ecology in the public's mind, is generally attributed to Paul J. Crutzen, a Nobel Prize-winning atmospheric chemist. Crutzen, who is obviously neither a geologist nor an ecologist, explains its beginnings as follows:

The Anthropocene could be said to have started in the latter part of the eighteenth century, when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane. This date also happens to coincide with James Watt's design of the steam engine in 1784 [1].

Perhaps it is because Crutzen and Oswald J. Schmitz, the author of *The New Ecology: Rethinking a Science for the Anthropocene*, come from different backgrounds that there is a noteworthy difference in how each embraces the term. Schmitz's emphasis in *The New Ecology* is on optimism, despite what many see as a global environmental crisis. Crutzen, by contrast, sees more reason for concern, claiming that the discovery of the ozone hole over Antarctica served as defining evidence that human activity has moved us into

a new epoch. Indeed, one of the defining features of *The New Ecology* is Schmitz's assertions that the idea that Earth's biota are doomed is incorrect: "The New Ecology reveals that species may rapidly evolve and adapt to their changing environmental conditions," and, perhaps more importantly given the concerns of many today, "[t]his gives hope that the future may not be as dire as it is often portrayed" (p. 104). In other words, while some see a grim picture, Schmitz, a professor of ecology at Yale University, declares, "the realization that evolutionary and ecological processes operate contemporaneously offers some hope that species have the capacity to adapt and thereby sustain ecological functioning" (p. 102). In support of this view, Schmitz further argues that new computational tools now allow us to account for feedbacks and nonlinearities. With the ability to understand the dynamics of complex ecological systems, he claims, we are able to use models to predict how feedbacks propagate throughout food webs in response to disturbances such as harvesting. Researchers can also explore different scenario outcomes.

Chapter 1, "The Challenge of Sustainability," uses the well-known debates about the short- and long-term impacts of mining the Bristol Bay region of Alaska to introduce how competing human values complicate ecological issues. Schmitz expands on this idea in Chapter 2, noting that even as we "pay attention" to known variables, there are many impacts we cannot evaluate in terms of valuing species and ecosystems. Of particular importance is that we must account for the fact that any action humans take reverberates through the rest of the interdependent chain. The difficulty in terms of scale and specific traits is the subject of Chapter 3, where the author turns to biological diversity and ecosystem functions. As he points out, the scale of a function as well as functional redundancy among species makes ecosystem evaluation even more challenging.

"Domesticated Nature," the topic of Chapter 4, extends this to the

complexity of evaluating human activity. A key point of this chapter is that, in his view, there is currently an incorrect tendency today to "blame" nature's reordering on human actions despite the abundant evidence that environmental change is often engineered by species. Using beavers and termites as examples, the author argues that ecosystems often change when species perform ecosystem engineering without human intervention. He also points out that humans are unlike other species in generating transformations geared to steer primary productivity to just one species, their own. Thus, the end result is that human activity supports less biotic diversity. Schmitz's key point here is that how humans restructure the environment can contribute to a loss of diversity. He is also arguing that human influences need not be harmful; how we interface with the environment has an impact on the environment we have. In addition, population growth and shrinking habitat size means that we have less living space, and it is more fragmented.

By Chapter 4 it begins to become clear that Schmitz is presenting a particular approach to ecology—the New Ecology. While agreeing with its basic parameters, I had hoped for more of an entry into the nuances of ecological debates about global warming than a volume promoting a generalized ecological position on the New Ecology. The New Ecology stresses change more than constancy, in contrast to the old classic paradigm of ecology. According to Schmitz, the Old Ecology, though not named as such in the volume, saw nature as static because ecologists used to believe that ecosystems are self-contained, self-supporting systems. This kind of thinking led them to hold the view that anything that happened outside the boundaries of an ecosystem, including changes caused by humans, was irrelevant to the ecosystem's inner workings. Whereas I am inclined to agree with many of this author's positions, I nonetheless found his promotion of the New Ecology a bit too simplified given the

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historical, philosophical and multi-dimensional elements of ecological thinking. Perhaps my resistance to this chapter indicates there is a downside to writing a book for the general public or it may simply be a result of how much I dislike umbrella terms like the New Ecology.

Having established the need to focus on change, Chapter 5 promotes a socioecological systems thinking view as a counter to the old human/nature divide that Schmitz claims harmed earlier ecological thinking. The components are further unpacked in Chapter 7. Schmitz's proposals rest on the claim that understanding how things operate can help avert future collapses of exploited systems, but his socioecological presentation only includes humans in the abstract. Essentially, he is proposing an ecological approach that is increasingly interwoven with city planning. The gist of this is that we need to remain flexible. We must manage for changeability, rather than constancy, for the system to remain resilient. In doing so, we will have the capacity to creatively adapt as new scientific understandings emerge. He advocates recognition of telecoupling—socioeconomic and environmental interactions over distances—and an environmental stewardship ethic. The idea is that we start with small projects and then scale up. While not offering details, he notes that environmental decisions must account for global connectivity and requires we build partnerships:

In the past, the hesitancy to build partnerships between conservation and industry in the interest of common cause or purpose has been attributed, in part, to the absence of critical science. But The New Ecology can offer the needed science . . . can help craft ways to implement technology alongside maintaining species interdependencies and ecosystem functioning (p. 152).

In ecological vernacular, open systems can be sustainable only insofar as raw materials and energy are supplied in unlimited quantities. This

condition will not be met for systems that depend on nonrenewable materials and energy (e.g. fossil fuels and mineral elements). Environmental stewardship, for Schmitz, is the correct approach because it includes promoting sustainable technologies, planning ahead and building a circular economy (an industrial economy that incorporates closed systems). For example, while a linear economy is a “take, make, dispose” model of production, a “recycling” factor offers circularity to the system.

Environmental stewardship respects various ethical positions and the nature of the social systems that determine them. It is an intermediate between anthropocentrism on the one hand and ecocentrism on the other. Essentially, humans have ethical obligations to one another that are mediated through their mutual relationships with the environment. Unlike historical conservation and management, stewardship includes minimizing potential damages created by society as it exploits ecosystems as well as improving environmental performance. In practice this is accomplished by protecting entire ecosystems, not just their parts. Therefore, we need to develop policies/regulations that minimize risks and maximize opportunities to sustain and restore natural ecosystems for current and future generations. Ethical stewardship is also an ecocentric ethic to some degree: “An ecocentric ethic thus recognizes that if humans are to be considered part of nature, they, like all other species, should have the right to exploit it.” In other words:

Humans as biotic species are functional parts of complex adaptive ecosystems. While recognizing humanity's right to exploit nature, such an ethic is not intended to give humanity license to exploit ecosystems without regard to sustainability. Systems thinking teaches us that to maintain sustainability of the whole system, humans must act in ways that preserve food web structure, and also

preserve the dynamism created by species interactions and feedbacks (pp. 145–146).

Chapter 6, “Hubris to Humility,” shows how difficult it is to design ecosystems in a real sense. This chapter begins with Biosphere 2 (the Earth is Biosphere 1), a science experiment in the 1990s that took place in a fully enclosed glass facility near Tucson, Arizona. The enclosed space contained several miniature ecosystems, heating and cooling systems and space for human habitation and agriculture. Eight people were sealed into the facility for two years. The project included monitoring their health, the air, water and soil functioning. The problems the experiment exposed show how difficult it is to engineer a functional natural economy. Humans complained of hunger the first year, although they did adapt in the second. The ecosystems became underdeveloped or transformed because of unforeseen limitations related to how the crafted environment evolved. The most significant challenge was maintaining balanced levels of carbon dioxide and oxygen. The experiment, which cost about US\$200 million, was halted after two years because many species died and the humans began to experience apnea and chronic fatigue.

While I appreciate Schmitz's expression of the need for humility and his notations that the New Ecology offers an approach by humans and for humanity, a major reservation I had as I read was that humans in this book are more conceptual than “actual,” because he treats humanity as if it is of one piece. People interested in learning about how an ecologist sees this vocation will no doubt enjoy this book, particularly those who desire a view that counters the idea of a global environmental crisis. Even so, it is hard to avoid concerns about the human enterprise, as Schmitz's comments about global climate change remind us:

Layered upon all of this, with potentially conflating effects, is global climate change. Domestication of nature by humans increases

greenhouse gas emissions through land clearing and resource exploitation, land conversion for agriculture, rearing livestock, production and use of cement for infrastructure development, energy generation, and transportation of humans, their goods, and their materials. A warming Earth selects for those species with the suite of physiological traits that allow them to adapt to changing conditions. Those that are incapable go extinct (p. 84).

In summary, Schmitz's arguments, while sensible, are presented without the cacophony of human voices. I would have liked him to critique his own proposals, to name competing ideas about proposed policies that aim to combat climate change and to have named theories to a greater degree (e.g. the Jevons paradox). I am not suggesting he should have given voice to environmental skeptics. Rather, as Schmitz tells us, scientific understanding of urban environments remains rudimentary. His discussion read like a story detailing ecology through his eyes; critical evaluation was sparse. Schmitz's urge for innovations and a scientific approach to urban design, while compelling, did not include enough about human complexity. Perhaps this will come in another book? Suffice it to say, I was hoping *The New Ecology* would provide scientific details that would open entry into the issues circling within the implementation debates when environmental questions arise. Schmitz, instead, punts:

The specter that humans can instigate rapid evolutionary change is well appreciated in an environmental stewardship ethic. . . . But what it means operationally for the interplay between changes in ecological systems and social institutional change remains beyond current comprehension. . . . What is humanity's obligation to ensure that evolutionary capacity—central to ensuring resilience—is sustained? It is humbling, even to think about all of this (p. 202).

Reference

1. Paul J. Crutzen, "Geology of Mankind," *Nature* 415, 6867 (2002) p. 23, <www.nature.com/nature/journal/v415/n6867/full/415023a.html>. Also see Paul Crutzen and Eugene F. Stoermer, "Opinion: Have We Entered the 'Anthropocene?'" *IGBP.net*: <<http://www.igbp.net/news/opinion/opinion/haveweenteredtheanthropocene.5.d8b4c3c12bf3be638a8000578.html>> (accessed 29 January 2017).