

reasons, including low rainfall and low volcanic ash input.

For the most part I concur with Diamond's analysis, but he leaves out one critical factor. We know from the work of David Steadman, an avian paleontologist who has studied bird extinctions on Pacific islands, that when Rapa Nui was first discovered by Polynesians it hosted more than 20 species of seabirds (only 2 species survived into the historic period). These seabirds must have been a huge source of nutrient inputs to the island's forests, as they harvested fish at sea and dropped their guano—rich in phosphorus, nitrogen, and other key elements—onto the land. Early generations of Rapa Nui people decimated these seabird populations until virtually no birds were left, thus eliminating this key nutrient source. That the original forests of Easter were unable to recover and that the island became so deforested resulted from a slightly more complex set of interlinked ecological processes than Diamond's account reveals. Nonetheless, I agree with his critical conclusion: that the Rapa Nui gradually followed a pathway leading to societal terror and collapse not because they were "eco-vandals" but because they lacked critical understanding of how their island's environment functioned and thus failed to take steps which might have averted their fate.

In chapter 3 Diamond turns to three islands due west of Rapa Nui, including Pitcairn of *Mutiny on the Bounty* fame, to make a case for collapse which is "triggered by the breakdown of an environmentally damaged trade partner" (p. 121). Here the societies of remote Pitcairn and Henderson Islands depended upon a long-distance exchange "lifeline," as the work of Marshall Weisler has so clearly shown. The larger island cluster of Mangareva was the "damaged trade partner" where, as in Rapa Nui, deforestation in late prehistory led to severe social problems and the abandonment of annual voyages to Pitcairn and Henderson. As in the Rapa Nui case, Diamond again does not sufficiently recognize the key role of seabirds in Mangarevan ecology. My recent excavations in Mangareva have revealed that diverse populations of seabirds abounded at the time of Polynesians' arrival, only to be extirpated by human activities. Again, a critical component of nutrient cycling was disrupted, setting off a chain of consequences that would extend beyond Mangareva to isolated islands hundreds of kilometers to the east.

In chapter 9, Diamond examines the case of Tikopia as an instance of long-term sustainability, in which an island population managed to persist over three millennia without incurring deforestation or social collapse. Here Diamond draws not only upon my archaeological work but the classic ethnography of Raymond Firth to stress the role of cultural means of population regulation in this particular historical scenario. By controlling population size (sometimes by draconian means) and by acting as a "bottom-up" decision-making community that recognized that everyone had a stake in the outcome of collective decisions, the Tikopia avoided the tragic fate that befell some other island societies.

Has Diamond been successful in pulling my data and those of my students into a broader synthesis, addressing

problems and issues extending beyond the shores of a Tikopia or Mangareva? While I do not completely agree with every detail in his chapters and while I might point to the relevance of some factors he overlooks, in general I give him high marks. He has drawn upon these island cases as "model systems" to tease out patterns and processes of general relevance and not just as unique historical scenarios. Most important, he has managed to bring a disparate and formerly disconnected set of academic research studies together, to weave an interconnected whole, and to advance an argument that by understanding our past humanity just might influence our collective future. And he has done this in a book that is based on solid scientific research presented in an approachable style that is being read by tens of thousands of people. Some academics will not hesitate to critique Diamond for errors or misplaced emphasis on particular causal factors, and it is important that they set the record straight when this is warranted. But I credit him with boldly doing what too few of us in academia attempt: venturing beyond our tightly patrolled disciplinary boundaries, trying to connect the dots, and inspiring broad public interest and debate around issues that are of the utmost urgency for the future of humanity and our planet.

RICHARD MC ELREATH
Department of Anthropology, Graduate Group in Ecology, Animal Behavior Graduate Group, University of California, Davis, One Shields Ave, Davis, CA 95616, U.S.A. (mcelreath@ucdavis.edu). 5 VII 05

Diamond begins *Collapse* by noting that the book is the counterpart to his previous *Guns, Germs, and Steel* (1997). Whereas the earlier work explored why social evolution proceeded at different rates and in different ways in different parts of the world, *Collapse* focuses on societal failures. These are obviously two sides of the same causal coin, so the reader might hope from this early statement that *Collapse* would not only examine failures but also synthesize knowledge about why the social arrangements and institutions that exist today in our species are the ones that survived the hazards of social evolution. How has history made our own societies well or poorly equipped to handle environmental challenges?

This does not seem to be the purpose of the book. I do not fault it for having a different agenda, but for a reader hoping for more of the courageous synthesis of *Guns, Germs, and Steel* it is a disappointment. The final chapters list the logically possible kinds of mistakes societies may make and briefly review classic work by people such as Elinor Ostrom (1990), but this book attempts no broader theory that might tell us why societies are good at the things they are good at and bad at solving other problems. A theory of social evolution that will help us understand why societies fail must take a stand on the reasons they succeed. Like Robert Wright's more optimistic *Nonzero* (2001), *Collapse* neglects the importance of the specific mechanisms by which social evolution proceeds. There are many nominations of influ-

ences and allusions to historical process, but nowhere is order made of the collection.

This will be frustrating for those who enjoyed *Guns, Germs, and Steel* because it took intellectual risks by pushing the limits of the comparative method. Diamond's case studies in *Collapse* could be recruited to the same enterprise. Chapter 9's study of the success of Tokugawa Japan in preventing deforestation is illuminating. For those interested in gaining insight into our own problems and how to solve them, the discussion is valuable, but without synthetic explanations we are reduced to possibly over-fitting historical circumstances to our own.

Those who want an effective modern environmental movement need working theories of social evolution. It makes a difference whether societies succeed because they conquer their neighbors or because they survive droughts. In the first case, we might expect existing societies to be good at defense and warfare but not necessarily prepared for environmental crisis. In the second, we might expect the opposite. No single answer will suffice for all parts of the world in all times, but it is useful to explore the possibilities, when each might be important, and the relative rates of social evolution each might generate. I outline four macro-evolutionary mechanisms here, ignoring only because of limited space the essential question of why persistent variation in social arrangements and institutions is so common among human societies. These are possible mechanisms by which different coordinating and cooperative institutions might spread at the expense of others.

First, social evolution might proceed by differential extinction. If some social arrangements are more likely to survive environmental calamities, these arrangements might increase in frequency among human societies. Here it is a game of society-versus-environment. How information flows through a society, how quickly it can respond to information, and how it mediates and suppresses internal conflicts of interest might all contribute to survival, as Diamond notes.

Second, social evolution might proceed by differential growth. Ammerman and Cavalli-Sforza (1984:109–13) and Sokal, Oden, and Wilson (1991) have argued that agriculture spread into Europe mainly through the spread of farmers, not the spread of farming. If some societies demographically replace others because of fecundity, this might lead to the spread of social institutions that encourage population growth. Richerson, Boyd, and Bettinger (2001) argue that agriculture, once present in a region, spread partly because numerically superior farmers could always defeat foragers in contests over territory.

Third, social evolution might proceed by differential conquest, even when groups are of comparable sizes. In his book about the rise of European world powers, *The Pursuit of Power* (1982), William McNeill argues that competition for control of land and resources between rather small European polities created a ratchet for the development of modern military institutions, technologies, and goals of elites, and these fueled the later colonial ambitions of European states. Kelly's (1985) synthetic study of the Nuer conquest of the Dinka suggests

that differences in institutions do spread because of differential conquest.

Fourth, social evolution might proceed by differential influence. Societies sometimes willingly adopt the social arrangements and beliefs of their neighbors. David Boyd (2001) documents the decision-making process through which the Irakia Awa of Papua New Guinea eventually adopted the economic and ritual institutions of their neighbors, the Fore. The Irakia Awa observed that the Fore were better-off, and they set out to imitate them at the institutional level. Similarly, it is arguably true that the Japanese willingly adopted some aspects of Western society because of their perceived advantages. These transformations might operate without extinction, replacement, conquest, or coercion. Exactly what makes societies favorable in these comparisons matters, of course. If rates of extraction and consumption are what is driving social evolution, then we should not expect societies to be well-equipped to manage their environments.

How important are these different mechanisms for explaining the history of human social evolution? Geography may be important. As *Collapse* suggests, islands may foreground environmental problems. Island societies that succeed may be those that effectively manage their environments and their own impacts. Because of their relative isolation, social evolution may be slower on islands as well (*Guns, Germs, and Steel* suggests this). But the different mechanisms imply quite different internal rates of change, as well. Soltis et al. (1995) surveyed New Guinea ethnographic history to estimate the rate at which social competition (mechanism #3) might spread institutions. They concluded that social complexity would spread very slowly, requiring on the order of many hundreds of years, by this mechanism. Differential extinction by environmental failure certainly interacts with direct group competition, as Diamond notes, but its rate seems unlikely to be more rapid. In contrast, differential influence (mechanism #4) might diffuse innovations rather quickly (Boyd and Richerson 2002) because it is limited by the rate of social comparison rather than the rate of tragedy or violent conflict.

This reframing of *Collapse* is for anthropologists interested in theories of social evolution. *Collapse* is not really for these social theorists but for people who want to be better prepared to argue with those who are not concerned about environmental crisis. Those who want more of attempts at a theory of social macro-evolution should instead read the unique, difficult, and worthwhile *Historical Dynamics* by Peter Turchin (2003).

JOSEPH A. TAINTER

Rocky Mountain Research Station, 333 Broadway SE, Suite 115, Albuquerque, NM 87102, U.S.A. (jtainter@fs.fed.us). 5 VII 05

Empires being neither up nor down do not fall.

—ABBÉ GALLIANI, 1744

Biologists have long aspired to contribute to social the-