Anthropology and Global Environmental Change

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The most striking general conclusion to be drawn from the cultural ecological data in the anthropological record is that the speed and scale of resource depletion and environmental degradation accelerates with increases in the scale of culture and the concentration of social power (Bodley, J H (1994) A Cultural Scale Perspective on Human Ecology and Development, in Advances in Human Ecology, *Vol. 3, ed L Freese, JAI Press, Greenwich, CT, 93–112; Bodley, J H (2000)* Cultural Anthropology: Tribes, States, and the Global System, *3rd edition, Mayfield, Mountain View, CA; Bodley, J H (2001)* Anthropology and Contemporary Human Problems, *Mayfield, Mountain View, CA). It is significant that people living in small-scale cultures were better able to maintain long-term, relatively resilient relationships with the natural environment than peoples living in larger scale cultures. Cultural resiliency is a key feature of successful long-term human adaptability. It is the cultural ability to minimize human-caused detrimental impacts to the environment, while smoothing out the human impact of natural environmental fluctuations. Cultural resiliency also means minimizing destabilizing fluctuations in human population and human demands on the natural environment. The concept of resiliency is more than that of balance or equilibrium, because it emphasizes the dynamic aspects of human and natural system. These conclusions are contrary to long established beliefs about evolutionary progress, and they challenge the popular ideology that unlimited growth, especially economic growth, is a natural process, and the best way to improve human well-being.*

Anthropologists have always been concerned with the relationship between the people they studied and the natural environment. Since the late nineteenth century, the first professional anthropologists focused their research on tribal peoples who were directly dependent on natural resources for their survival. The environment was obviously too important to be ignored. Initially, anthropologists studied how people exploited the environment, then they asked how culture might in turn be shaped by the environment, or by the nature of the human–environment relationship. Nineteenth century anthropologists were often natural historians, and it was common then, and still today, for them to be very broadly interdisciplinary, with interest, and sometimes formal training, in geography, geology, zoology, and botany. During the first half of the twentieth century the anthropological interest in environmental issues led to the identification of cultural ecology as a distinctive sub-discipline. Contemporary prehistoric archaeologists often maintain a focus on environmental issues.

Most early academic anthropologists rejected any simple environmental determinism, but they grouped similar cultures into large culture areas that often reflected underlying common cultural adaptations to generalized natural areas. Before 1950, pioneer cultural ecologist Julian Steward, cautiously observed that over time people tended to organize themselves in similar ways to exploit similar environments, thus producing broadly similar cultural types in widely separate areas of the world. By the late 1960s, cultural ecologists began to apply equilibrium models to small-scale cultures, treating them as human systems in balanced, adaptive relations with natural ecosystems. These functionalist approaches were largely abandoned because they could not explain how systems developed and changed, and they often treated cultures as artificially closed systems. Since the 1980s, cultural ecologists have increasingly situated the peoples they study within the national and international political economy, and interest has shifted to approaches that will help local peoples defend their resources and subsistence economies. Many contemporary anthropologists continue an environmental focus, but it has broadened to include contemporary commercially organized, and global scale cultures, as well as existing indigenous peoples with small-scale societies.

CULTURAL EVOLUTION AND HUMAN ADAPTABILITY

One of the longest-running theoretical debates in anthropology concerns the nature of cultural evolution. The orthodox view as originally developed by Morgan (1877), and refined by White (1949, 1959) and others (Sahlins and Service, 1960), was that general cultural evolutionary progress was an inevitable and beneficial process of growth and development leading stage by stage to more complex societies, using more energy more efficiently, and with greater adaptability and security. Cultural evolutionists thought that evolutionary progress was such a self-evident human benefit that they did not demonstrate it. White (1949) emphatically declared that culture evolved "as the amount of energy harnessed per capita per year increased." The assumption was that cultural evolution gave people greater control over nature, and this was good for people. However, it is significant that the most enthusiastic anthropological exponents of these measures of cultural progress wrote before the energy shortages of the 1970s, and before the United Nations Brundtland Commission (WCED, 1987) report on sustainable development. Thoughtful reconsideration of all the standard measures of cultural evolutionary progress suggests that it must be a maladaptive process.

Leslie White attributed the most recent step in cultural development to the switch to fossil fuels and nuclear

energy, but it is now obvious that the advantages of this may prove illusory. Cultures can be arranged in a progressive general evolutionary sequence of increased energy use running from 5000 to 12 000 kcal per capita per day in small-scale band and village societies, 26 000 kcal in pre-capitalist agrarian civilizations, and 230 000 kcal consumed by Americans in the 1970s (Cook, 1971). However, critics pointed out that this sequence does not account for the eventual depletion of fossil fuels, the serious deficits in using non-renewable energy to produce food energy, or the costs of the waste by-products of energy production and consumption. Hubert (1969) predicted that global petroleum production would peak in 1995, and that the supply would be virtually exhausted by 2075. The most telling criticism was the calculation that if energy consumption increased at 5% a year for 200 years, the waste heat produced would equal the heat of incoming solar radiation and the earth would burn up. Fortunately, before such a *Sun Day* the polar ice caps would melt and rising sea levels would flood out most of the power plants (Luten, 1974). Human reproductive success would also be an unattractive measure of human evolutionary progress. If the production of larger, more complex cultural systems is the measure of evolutionary success, then the process still seems maladaptive for long-term human survival, because fewer, larger, more homogenous, and less durable cultures have replaced more numerous, more diverse, and more durable small cultures. Greater cultural complexity creates a human survival problem in part because larger, more complex cultural systems incorporate and subordinate smaller systems.

Some of the evolutionary theorists recognized that small-scale cultures might actually be better adapted to particular local ecosystems than large-scale cultures. White (1949) observed that foragers, with the simplest cultures, may have had "the most satisfying kind of social environment that man has ever lived in." Sahlins (1968) noted that foragers were successful because they limited their wants to the consumption levels that their environment and technology could support and they lived satisfying and affluent lives. As the contemporary environmental crisis began to unfold, many anthropologists commented on the connections between self-sufficient small-scale societies and greater social equality, and relative equilibrium with the environment (Bodley, 1975). This suggested the possibility that increased social scale caused inequality, poverty, and global environmental change.

More recent biocultural evolutionary theory shows how cultural evolution could become a maladaptive process that would undermine the resiliency of both natural and human systems. From the biocultural perspective, cultural evolution is produced by changes in culture, which is conceived from the ideas that human behavior is directed in the same way that genes create biological organisms. Cultures change as shared symbolic information changes. The important difference between genes and culture is that individuals intentionally produce and transmit culture, and they can borrow from many sources (Boyd and Richerson, 1987). However, the scale of culture influences how it is created and transmitted. Cultural transmission is frequently biased, because people emulate the beliefs and behavior that appear to be most successful. Cultural emulation is easy and efficient, but it can lead to maladaptive runaway economic growth and power aggrandizement, which in turn cause global environmental change.

In small, domestically organized societies the members of each household are daily making cultural decisions about technology, production, and consumption. In larger scale, politically organized societies, cultural evolution becomes a political process in which a single ruler can direct the actions of thousands, or even millions of people (Durham, 1991). Household-level decision making is inherently more responsive to local social and environmental conditions, but it can be over-ridden by political rulers who may be far removed from the environmental consequences of their decisions (Rappaport, 1977a,b). Thus, it is not surprising that large scale agrarian civilizations directed by political elites, frequently collapse because they exhaust the resource base, generate social conflict, or become too costly to maintain.

THE UNIQUENESS OF THE CONTEMPORARY ENVIRONMENTAL CRISIS

Bennett (1976) describes a seemingly inevitable ecological transition from environmental equilibrium to disequilibrium. From this viewpoint there is nothing particularly unique about global environmental change. Bennett placed small-scale, tribal societies at the equilibrium end of the continuum, but argued that all people had the same behavioral propensities that would lead to drastic environmental change. However, this mixes human means, ends, and secondary consequences. Biocultural theory maintains that all people are driven by a human nature that seeks domestic security and the future welfare of one's children. People living in small-scale societies achieve these human ends cooperatively by remaining small, consuming resources sustainably, and resisting aggrandizing individuals who would promote security-reducing growth in consumption. Some people in commercially organized cultures competitively elevate their consumption levels in order to obtain these same ends for themselves. Bennett argues that equilibrium cultures are "only pauses in the overall historical tendency toward exponential increases in environmental use and impact." However, historical tendencies are not inevitable; they are the outcome of particular events and individual decision-making.

By the 1980s, as global economic growth and environmental problems intensified, some anthropologists began to

argue that people have never been in equilibrium with the environment. For example, Rambo (1985) called Malaysian shifting cultivators "primitive polluters," because they put carbon dioxide into the atmosphere and lived in smoke-filled houses. He declared that primitive and civilized societies interacted with the environment in essentially the same way. In a similar vein, Krech (1999) maintains that Native Americans were not always conservationists, and were in the process of exterminating the bison before Europeans arrived. These revisionist anthropologists, and many others (Headland, 1997) were reacting against the widespread tendency of some environmentalists and deep ecologists to attribute a mystical oneness with nature and an ecological nobility to tribal peoples. The mistaken implication of such romanticism of the human past, would be that our only salvation is a return to the Stone Age. This is a misleading issue because anthropologists have abundant evidence that tribal peoples were pragmatic materialists who burned on a large scale, sometimes killed more animals than they needed, felled trees to harvest fruit, and were not always guided by the spiritual sanctity of nature. There is also evidence that prehistoric humans hunted some animals to extinction, and may have contributed to the extinction of the Pleistocene megafauna, such as New World elephants, although there is much controversy on the details (Martin, 1984).

These facts need to be viewed in a larger perspective. The reality is that until 8000 years ago, when the world was still domestically organized and inhabited by only 8 million people living mostly in mobile bands at extremely low densities, there was no need for deliberate conservation practices. Likewise, optimal foraging theory suggests that intentional over-hunting would have quickly proven unproductive, because as prey species become scarce, hunting them becomes inefficient (Smith, 1983). Archaeological evidence that Australian aborigines successfully lived as hunters and foragers for at least 60 000 years (Roberts *et al.*, 1990), and aboriginals in Southern Africa successfully survived as a people for 130 000 years (Klein, 1979) leaves little doubt that people living in very small-scale societies produced resilient cultural systems able to successfully maintain very long-term balances with their natural resources. The archaeological record needs to be compared with the estimates at the end of the twentieth century showing a high proportion of plants and animals threatened with extinction, or nearing threatened status (Baillie and Groombridge, 1996; Tuxill, 1999). Nothing in human prehistory or history compares with the present rate of global environmental change.

It is remarkable that the scale of global change corresponds directly with increases in the scale of culture. This was dramatically confirmed by the ARCHAEOMEDES project, an interdisciplinary investigation of 30 000 years of environmental change in the Mediterranean region initiated by the European Union in 1992. Researchers found that the measurable rate at which land degradation could be observed from land clearing, erosion, and dessication increased progressively by orders of magnitude from tens of millennia during the Paleolithic, to millennia during the Neolithic, to centuries during the Roman era, and to decades under industrial capitalism since 1850. In one region of Spain, researchers found that half of all the erosion over the past 10 000 years had occurred in the past 500 years, and it had accelerated over the past 150 years (Leeuw, 1997).

THE DRIVING FORCES BEHIND GLOBAL ENVIRONMENTAL CHANGE

The most widely accepted anthropological explanation for the rise of cultural complexity and intensified environmental problems has been population pressure on carrying capacity. Carrying capacity must be defined in relation to particular environments and technologies, and is not a constant (see **Carrying capacity**, Volume 4). Population pressure is also a variable that can be different under different consumption demands and distribution patterns. Nevertheless, population pressure remains a powerful explanatory model. It is a variation on Malthus' (1895) observation that population has the potential to grow at a faster rate than food production. Population pressure and subsistence intensification have been used to explain the Mesolithic to Upper Paleolithic transition (Hayden, 1981), the domestication of plants and animals leading to the transition from the Upper Paleolithic to the Neolithic (Cohen, 1977), increased energy input and technological innovation in agriculture (Boserup, 1965), and the origin of the state and civilization (Carneiro, 1970; Steward, 1949). All of these changed the environment. Population pressure has also been explicitly linked to contemporary environmental problems (Ehrlich, 1968; Homer-Dixon, 1991).

The problem with all of these population pressure explanations is that often they do not explain population pressure itself, and they do not deal with the social inequality that also produces scarcity. The archaeological record demonstrates that for most of human prehistory population growth was minimal, not because of high mortality, but because fertility was culturally limited (Hassan, 1981). In domestic-scale cultures in the absence of political pressures women opted for small families, because extra children were a disadvantage. Only in politically organized and commercial societies are there strong externally imposed incentives for population growth. When anthropologists have looked at extreme examples of supposed population pressure producing environmental stress and human misery, whether in Bangladesh (Hartmann and Boyce, 1982), Brazil (Scheper-Hughes, 1992) or El Salvador (Durham, 1979, 1995), they have found that social inequality, not population, was the problem.

Viewed from a culture scale and biocultural evolutionary perspective, the driving force behind global environmental change is the natural human desire of individuals to improve the material security of their households under cultural conditions of economic scarcity produced by social inequality and competitive striving. The important point is that economic scarcity and environmental problems are produced culturally by social inequality, they are not natural conditions.

ANTHROPOLOGISTS, INDIGENOUS PEOPLES, AND ENVIRONMENTAL CHANGE

Cultural ecological researchers have often helped indigenous people defend their ecosystems and natural resources against deterioration caused by the uninvited intrusion of outside commercial interests. The most important anthropological support, from both archaeologists and cultural anthropologists, has been in helping indigenous communities document their long-term use of particular places and resources, in order that extensive, traditionally owned and used territories can be legally titled to communities and protected. In some cases it has been useful to document that traditional uses were sustainable. Anthropologists have also helped demonstrate that indigenous communities have highly developed knowledge of their ecosystems, including the names and natural histories of plants and animals. Some indigenous communities have asked researchers to help them with the difficult problem of managing natural resources for both subsistence and commercial uses. Other communities have sought to protect portions of their territories for eco-tourism (see **Indigenous knowledge, people and sustainable practice**, Volume 5).

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