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THE NEW NEW (BUDDHIST?) ECOLOGY

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The New New (Buddhist?) Ecology

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"In theology everything stands, in science everything falls, and in Buddhism everything burns."--*Science and Buddhism* by P. Dahlke (quoted by Harold Morowitz)

ABSTRACT: Simultaneous with the emergence of an "environmental crisis" and attendant widespread environmental consciousness and conscience in the1960s, Eugene Odum, then dean of the field, announced the advent of the "New Ecology." Odum's new ecology was based on the ecosystem concept as its organizing idea and reiterated the classic notion of nature, unperturbed by human disturbance, as in a steady state of dynamic equilibrium. This New Ecology is now old. The classic "balance-of-nature" paradigm has been replaced by the "flux-of-nature" paradigm in which ecosystems are open, human influence has been ubiquitous and long-standing, and natural disturbance is multifaceted, widespread, and frequent. If not in Buddhism, then certainly in ecology "everything burns"—that is, everything is subject to periodic disturbance, of which fire is so common an instance as to be symbolic. However, most laypersons are unaware of this paradigm shift in ecology, which was consolidated over the last forty years. Any plausible and up-to-date articulation of a Buddhist ecology should be informed by the new New Ecology and not the old New Ecology.

The Environmental Crisis, the Rise of Ecology, and the Ecology-Buddhism Connection

A perceived "environmental crisis" emerged in the 1960s—certainly in the United States, in much of the Western world, and around the globe. Why it did was partly a matter of sensory experience and partly a matter of deliberate consciousness raising. Increased international ocean transport of petroleum resulted in increased oil spills that fouled beaches and killed marine life and sea birds—all there to be seen and smelled. Rivers and harbors became palpably polluted with industrial waste and municipal sewage. Air over big cities became choked with smog—that was visible as well as smellable. Soil erosion increased (further contributing to palpable water pollution). Mountains were strip mined and tailings dumped into valleys and their streams. Forests

were clear cut and bald hilltops dotted the landscape. All these things were apprehensible to the senses. And they were appearing on an unprecedented scale. Barry Commoner (1971) attributed their advent in the late 1940s and '50s to destructive technologies developed for war—high-combustion and jet engines, heavy machinery, nuclear energy, pesticides—being redirected, for peacetime use, to mankind's age-old campaign to conquer nature.

As to consciousness raising, the name of the phenomenon itself probably devolved from the title of a book, *The Quiet Crisis,* written by Stewart Udall, Secretary of the Interior during the John F. Kennedy Administration. Udall (1963) implicitly compared the gravity of the threat of protracted environmental destruction to the noisy crisis that haunted the world in the depths of the Cold War—sudden nuclear holocaust. No one, however, had a greater influence in heightening awareness about the stepped-up human assault on the environment than Rachel Carson (1962). Carson's apocalyptic classic called attention to the insidious damage not only to human health and life but to other life forms caused by pesticides. Indeed her title, *Silent Spring*, evoked what E. O. Wilson (1984) later called "biophilia" and invited us to imagine what it would be like to live in an aurally diminished world devoid of birdsong—and birds. Both Carson's book and Udall's invoked multiple layers of ethical concern—for human life and health, for the aesthetic and psycho-spiritual amenities afforded human being by a whole and flourishing natural environment, for the pain and suffering of other sentient beings, and for the loss of intrinsically valuable species and biotic communities.

While invoking ethical concern for all these things, neither Carson nor Udall had developed a well-articulated conceptual scheme for supporting their multi-layered ethical

invocations. People increasingly turned to Aldo Leopold's *A Sand County Almanac* for a more sustained ethical response to the environmental crisis—a book published more than a decade before widespread environmental angst began to dawn, and largely ignored during that interval. In *Sand County*'s capstone essay, "The Land Ethic," Leopold (1949) sketched a non-anthropocentric environmental ethic grounded in evolutionary biology and ecology (Callicott 1989). Ecology rose from relative obscurity and anonymity in the panoply of sciences to a place of prominence and popularity during the 1960s (McIntosh 1985). That may have been in part because Leopold connected ecology and environmental ethics and in part because ecology appeared to be the science most crucial to understanding the effect of human technologies on the environment—certainly on the biota.

Buddhism may have initially become associated with environmental consciousness because of a casual remark by Lynn White, Jr. in his enormously influential *Science* screed, "The Historical Roots of Our Ecologic Crisis." White (1967) traced the roots of the environmental crisis first to the emergence of "modern technology," which was distinguished from pre-modern technology by its marriage to science. Then he claimed that both aggressive technological development and sustained scientific inquiry are Western in provenance, nurtured by the Judeo-Christian worldview. Salient in that worldview is the belief that God created the physical world and "man" was created in the image of God. And if—as generally posited in late Medieval and early modern philosophy—reason is the image of God in man, it would be possible for man to understand the rational plan God implemented in the physical creation—"to think God's thoughts after Him." Thus did Christianity nurture science. Further, God gave man

dominion over the rest of creation and charged him to subdue it. Thus did Christianity nurture technology. And while modern (that is, science-enhanced) technology has produced many wonderful things, it has also produced the environmental crisis.

More generally, White (1967) argued that what we do in and to the natural environment depends on what we think about it—that is, how we conceive of the nature of nature, human nature, and the human-nature relationship. Corollary to that, White (1967) argued that in order to change what we do in and to the natural environment, we have to change how we think about it. And one possible way we might effect changes in the way we think about the nature of nature, human nature, and the man-nature relationship is to adopt the worldview of another religion. And, White (1967, P. 1206) suggested, Zen Buddhism might be just what a worldview doctor might prescribe to cure Western environmental ills: "The beatniks, who are the basic revolutionaries of our time, show a sound instinct in their affinity for Zen Buddhism, which conceives of the man-nature relationship as very nearly the mirror image of the Christian view." White (1967: 1206) does not explain this cryptic comment or further elaborate the Zen conception of the man-nature relationship, presumably because he "is dubious of its viability among us"—since Zen "is as deeply conditioned by Asian history as Christianity is by the experience of the West."

Zen Buddhism had been introduced to the American intellectual community by Daisetsu Taitaro Suzuki, a Japanese Zen Master, who spoke and wrote English fluently. After a distinguished career in Japanese universities, Suzuki went on a lecture tour of American universities in 1951 and joined the faculty of Columbia University from 1952 to 1957. Suzuki's work became the source of Western popularizations of Zen Buddhism,

most notably those of Alan Watts and Gary Snyder, the latter a celebrated poet and essayist of the Beat Generation (doubtless the reason for the "beatnik" association made by White). Snyder was a serious exponent of Zen Buddhism, studying and meditating in Kyoto monasteries between 1956 and 1968. The linkage of Zen with the nascent environmental consciousness of the 1960s might be rooted in the way Suzuki (1956) foregrounded East-Asian as opposed to the South-Asian Buddhist practice. While the latter emphasized the lifestyle of the solitary, begging mendicant, the former emphasized that of the member of a monastic community of monks, engaged not only in study and meditation, but also in the mundane chores of gardening, cooking, cleaning in close and harmonious contact with nature. The association of Zen, not only with the then new environmental consciousness, but also, more specifically, with the science of ecology, was established in a collection of essays titled the *Subversive Science*, edited by Paul Shepard and Daniel McKinley (1969). That anthology juxtaposed White's bombshell, Leopold's seminal essay, an essay by the eminent Yale ecologist, G. E. Hutchinson, and Alan Watt's Buddhist-inspired essay, "The Individual as Man/World" (first delivered as a lecture, incidentally, to the Social Relations Colloquium at Harvard University in 1963), among many others.

The Old New Ecology

The title of that anthology was borrowed from an essay, "Ecology—A Subversive Subject," by Paul B. Sears that appeared in a Special Issue on Ecology of *BioScience* in 1964. That issue also contained an essay titled "The New Ecology" by Eugene P. Odum—arguably the most influential ecologist of the mid-20th century, if for no other

reason than that he was the author of the most popular textbook in the field between the mid-1950s and the mid-1970s, *Fundamentals of Ecology*. In that influential paper, Odum put forth the ecosystem concept as the architectonic idea in ecology uniting all its theretofore disparate studies—scientific natural history, population biology, community ecology, biogeochemistry, bioenergetics—into a single unified science. "Ecologists," Odum (1966, p. 15) wrote, "can rally around the ecosystem as their basic unit, just as molecular biologists now rally around the cell, another important basic unit of structure and function."

The ecosystem concept had been introduced by Arthur Tansley (1935) in a paper provocatively titled, "The Use and Abuse of Vegetational Concepts and Terms." Tansley's target was the claim—by the dean of early 20th-Century ecology, Frederic E. Clements (1916), and his followers—that ecosystems were organisms of the third kind. In other words, just as increasingly close, symbiotic associations of single-celled organisms, eventually evolved into multi-celled organisms, so symbiotically associated multi-celled organisms had evolved into super-organisms. That is, as,

cells : multi-celled organisms : : multi-celled organisms : super-organisms.

And as

organs : multi-celled organisms : : species : super-organisms.

That is, just as clusters of specialized cells (muscle cells, nerve cells, liver cells, skin cells etc.) form organs in multi-celled organisms, so specialized clusters of organisms (various species populations) form the functional units of super-organisms. The ecological study of these functions in super-organisms was analogous to physiology; the ecological study of the development of super-organisms, which Clements (1916) called "succession" and

in which he was particularly interested, was analogous to ontogeny; the ecological study of the composition and structure of super-organisms was analogous to anatomy; and so on.

Because of the many disanalogies between Clements's putative super-organisms and organisms proper—no evident skin-like boundaries, no genetic material, salient among them—Tansley suggested abandoning such far-fetched analogies altogether and positing *sui generis* objects of ecological study. He named such objects *ecosystems*—"real 'wholes,' often highly integrated wholes, which are the living nuclei of *systems* in the sense of the physicist" (1935, P. 297). That Tansley evoked physical systems and apparently abjured Clementsian organicism led some historians to conclude that the tradition of ecosystem ecology was inherently mechanistic and reductive (Worster 1977). But a close reading of Tansley reveals otherwise. Tansley (1935, p. 300) opined that while ecosystems certainly were not organisms, they were indeed "quasi-organisms"; and that under the regime of "a kind of natural selection of incipient systems" those exhibiting "the most stable equilibrium survive." To well-evolved ecosystems he attributed a "greater integration and stability" and a "dynamic equilibrium."

In a much more technical paper published in *Science*, "The Structure of Ecosystem Development," Odum (1969) implicitly returned ecosystem ecology to its Clementsian super-organismic roots, but at a greater level of scientific sophistication and abstraction. Succession is the developmental process (ontogeny) of ecosystems. In the later stages of succession, as ecosystems approach climax: they achieve greater species diversity, and as a result, greater stability and resistance to external disturbance; greater control over their physical environments; lower entropy and higher "information"; and

greater equilibrium, a balance between primary production or growth and respiration. Mature ecosystems are not only diverse, stable, and balanced, they are "self-maintaining" (Odum,1969).

In relation both to Clements's putative super-organisms and Odum's ecosystems, "man" is an outsider. Not so, in the case of Tansley's ecosystems—the difference perhaps owing to the fact that Clements and Odum were American and Tansley British. Really, just until the early 1990s, the American mind was thoroughly enthralled by the wilderness myth—the essentially colonial belief that the Western Hemisphere was "discovered" by a European navigator in 1492, prior to which it was largely uninhabited and in a pristine or purely natural condition, unaffected by human agency (Callicott and Nelson 1999). Sure, there was a smattering of Indian populations, but stone-age Indian technology was too ineffectual and/or Indians were too environmentally ethical to have had much impact on nature in the Western Hemisphere. Nature in Tansley's Britain, on the other hand, was very much intermingled with and shaped by human culture. In any case, Clements and Odum thought of human beings as external to super-organismic ecosystems; or, to say the same thing the other way around, they thought of "natural" super-organismic ecosystems as excluding humans. Thus, undisturbed by humans, natural ecosystems would mature and remain in their steady states unless thrown out of kilter by some catastrophic external force. And such external natural disturbances were rare events.

Deconstructing the Old New Ecology

The Clements-Odum super-organismic ecosystem is a putative object (indeed according to Odum, *the* object) of ecological study. Anatomical ecologists study their composition (various plant and animal species) and structure (mainly trophic relationships among those species), just as anatomical biologists study the composition (bones, muscles, sinews, nerves, etc.) and structure (mainly spatial and functional relationships among those body parts) of organisms. Taxonomical ecologists classify types of super-organismic ecosystems, just as systematists classify types of organisms proper or species. Henry Gleason, a contemporary of Clements, doubted the existence of super-organisms. He argued that while the existence of types (species, as it were) of what then were called "plant associations" —prairie, pine forests, hardwood forests, tundra, and the like—seemed obvious to the untutored eye, close examination of these putative types revealed much more blending and blurring than one finds among species of organisms. An actual inventory of the species composing two instances of the same putative type of super-organism indicates considerable differences in their composition and structure. Spatial boundaries between types are rarely sharp, nor are temporal boundaries between successional seres any sharper. The actual landscape practically anywhere one might look appears to be more a mosaic of ragged patches than a uniform continuum. Revisiting the same place from year to year reveals compositional and structural changes that are not necessarily successional (or developmental) in kind. In light of all this (and more), Gleason (1926, p. 107) asked rhetorically, "Are we not justified in coming to the general conclusion, far removed from the prevailing opinion, than an association is not an organism, scarcely even a vegetational unit, but merely a *coincidence*?" (emphasis in original).

In opposition to Clements's holistic theory of ecology, Gleason (1926, p. 107) suggested that "we must revert to the individualistic concept of plant communities." The variety of plant species that one finds together in the same place are each individually adapted to similar environmental gradients—soil pH, moisture, temperature, etc. One does not always find the same plant species in places exhibiting similar environmental gradients because their seeds may not have all made their way there and some of the plants in all places are at the limits of their ranges for one or more environmental gradients.

Gleason was ignored in his own time and the Clementsian view continued to prevail. But by mid-century, the tide began turn and Gleason's individualistic theory began to be confirmed by increasingly systematic and quantitative study of plant associations (Curtis and McIntosh 1951; Whitaker 1962). Direct empirical confirmation of the individualistic theory was bolstered by indirect evidence. As Tansley (1935, P. 302) noted—assuming Clements's super-organism theory were correct and the components of these entities were tightly connected, similar to the way organs are connected in an organism, then—"If a continental ice sheet slowly and continuously advances or recedes over a considerable period of time all the zoned climaxes which are subjected to decreasing or increasing temperature will, according to Clements's conception, move across the continent 'as if they were strung on a string,' . . ." Study of the pollen record indicates otherwise. Prior to the most recent glacial episode plant species formed different associations than we find today; during the glacial period various species were driven to different southern refugia; and after the glacier retreated they returned north from different directions at different rates and recombined in different

associations (Davis 1969). By the mid-1970s, neo-Gleasonianism had replaced Odum's neo-Clementsianism.

In plant ecology, the balance-of-nature idea was most clearly expressed by Odum (1969) in terms of a production/respiration ratio of one in a mature forest. That is, daily capture of carbon from the atmosphere by photosynthesis is equaled by daily release of carbon to the atmosphere by oxidation. In animal ecology, the balance-of-nature idea was most clearly exemplified by predator-prey relationships that—in theory, at least—could be described by the Lotka-Volterra logistic equation (Gause 1934). As populations of predators grew, those of their prey fell, occasioning a subsequent fall in the populations of predators, followed by a rise in the populations of prey . . . and so on and on through such rising/falling oscillations about a mean. Or, if predators evolved devices for stabilizing their populations—such as territoriality or low fertility rates—then predator-prey population oscillations might be damped and the coupled predator-prey populations would respectively remain roughly the same year in and year out. However, neither observations of wild populations nor carefully controlled laboratory experiments confirmed the predictions of theory (Botkin 1990). While undoubtedly their predators have effects on the populations of their prey, predator-prey populations rarely exhibit anything like steady-state stability or oscillating periodicity.

In the 1980s, ecologists began better to appreciate the extent and frequency of natural disturbance (Pickett and White 1985). Wildfire, windstorms, floods, irruptions of herbivorous insects, disease epidemics were more common than Clements and Odum had represented them to be. They were so commonplace and ubiquitous that a new ecological concept was coined—the disturbance regime. Such disturbances occurred with some

measurable and predictable periodicity—wildfire might run through a given forest, for example, every so often, say every ten years on average; a given stretch of Atlantic or Gulf coastline might be ravaged by a hurricane on average every seventy-five years or so; floodwaters might regularly rise over river banks—a little every year for a little while, more extensively every decade on average, very extensively approximately every century. Complex relationships between leaf-eating insects, insectivorous birds, and foliage density might account for periodic episodes of pestilence in forests. At small spatial and temporal scales, such disturbances appear to be exogenous events. At larger spatial and temporal scales, they are "incorporated" and become a necessary functional element in ecosystems (Pickett and White 1985).

In the 1990s, after a couple of decades of controversy, demographers began to reach a consensus about the human population in the Western Hemisphere immediately before the voyages of Columbus (Denevan 1992). Previous estimates had failed to account for the severe impact of Old World epidemics in the New World, which, it is now believed, reduced the Sixteenth-century population of the Americas by ninety per cent (Crosby 1991; Dobyns 1983). Thus the late-Holocene human population of the Western Hemisphere is now thought to have been ten times larger—about fifty-four million total—than it was thought to have been by the demographers contemporary with Clements (Denevan 1992). The ecological impact of American Indians, prior to the European conquest, was also under estimated. Anthropogenic fire, cultural predation, silviculture, horticulture, and irrigation radically altered otherwise natural conditions in the Americas (Cronon 1983; Kretch 1999). The most dramatic and irreversible anthropogenic ecological changes in the Western Hemisphere occurred soon after the

migration of spear-wielding, big-game-hunting humans across the Bering land bridge, about eleven thousand years ago. Thirty genera of animals—including two elephant species as well as camels and horses—were then hunted to extinction (Martin 1984). With the proliferation of synthetic chemicals and the advent of global warming during the Twentieth Century, the ecological impact of human beings has now become ubiquitous (McKibben 1989).

The New New Ecology

Steward Pickett and Richard Ostfeld (1995), two contemporary ecologists with a philosophical bent, summarize the major paradigm shift that consolidated over the last half of the Twentieth Century. "The classical ecological paradigm," they write, "comprises six key points that form a network of closely related background assumptions:

"[1] Historically, ecological systems were considered to be closed,

"[2] self-regulating,

"[3] and subject to a single stable equilibrium. . . .

"[4] Changes in communities or ecosystems through time were thought to occur by successions that must always pass through the same phases.

"[5] Any disturbances that might affect natural systems were considered to be exceptional events and

"[6] humans were excluded from the roster of normal ecological factors" (Pickettt and Ostfeld 1995, p. 113).

As to (1) "closed," Picket and Ostfeld note that that concept is relative. Of course, "classical" ecologists recognized that ecosystems were open to energy and water inputs, but they tended to regard the "nutrient capital" of an ecosystem to be "derived from the local bedrock; and the organisms involved in important mutualisms [to] be local residents only" (Pickett and Ostfeld 1995, p. 113). That ecosystems were thought to be (2) self-regulating follows from the belief that they were closed. For example, "local cycling of nutrients would govern productivity; within-community interactions would account for species coexistence; internal interactions within populations would regulate the density of the population" (Pickett and Ostfeld 1995, p. 113). They call this the "balance-of-nature paradigm."

The new "flux-of-nature paradigm" contradicts the balance-of-nature paradigm on each of its six characterizing features.

(1) Not only are ecosystems open to energy and water, but to nutrients and pollution entering by means of a variety of vectors, as well as to invasive organisms.

(2) Important regulatory factors are often external to ecosystems. In addition to climate, migrating organisms—such as bison passing through prairies—can have regulative effects on ecosystems.

(3) Ecosystems manifest no single, stable point of equilibrium, but they do often manifest multiple potential domains of ecological attraction. For example, at mid-elevations, the American southwest was formerly characterized by open coniferous forests with a grassy

understory; it was “flipped” by fire suppression and stock grazing to dense brush and dog-hair pine forests, which persist despite efforts to return it to its former condition.

(4) Succession from bare ground to forest, where climate and soils permit, occurs, absent frequent disturbance, but rarely follows any repeatable sequence of component species, nor ends in any predictable complement of species. There is no Aristotelian *telos* to succession any more than there is to evolution. The only certainty is change itself.

(5) Disturbance is common and incorporated.

(6) “And finally, landscapes that have not experienced important human influences have been the exception for hundreds if not for thousands of years” (Picket and Ostfeld 1995, p. 115).

Another subtler feature of the new flux-of-nature paradigm is to relativize the ontology of ecology. Far from being super-organisms, plant associations, according to Gleason, are a mere coincidence. While plant species are undoubtedly adapted to edaphic and climatic gradients, some are adapted to other plants (to partially shade their seedlings, for example) and to animals, especially pollinators and seed dispersers. Animals are even more obviously and certainly adapted to the presence of certain plants, as sources of food or cover; and predators and their prey are adapted to one another. Biotic communities are thus not wholly discredited and discarded entities—like phlogiston or the luminiferous ether—of an obsolete science, but neither are their components as thoroughly linked and orchestrated as the components of cells or the parts of multi-celled organisms. Their boundaries remain indistinct and highly porous, nor are they readily sorted into distinct types.

Ecosystems are even more post-modern, ontologically speaking. Ecosystem ontology is driven by epistemology—and has been from the first introduction of the concept. Tansley (1935, p. 300) points out that ecosystems are hierarchically nested—the smaller within the larger—and that they also "overlap, interlock, and interact." Therefore, the ecologist must "isolate systems mentally for the purposes of study" (Tansley 1935, p. 300). Despite having declared that ecosystems were "real 'wholes,' often highly integrated wholes," he concedes that the "isolation is partly artificial" (Tansley 1935, p. 300). For example, when an ecologist studies a pond ecosystem—as, classically, did Raymond Lindeman (1941)—the object of study is somewhat arbitrarily and artificially isolated from the watershed, the airshed, the biome, and so on up of which it is a part. Moreover, how the ecologist isolates the object of study, depends on what ecological questions are posed. If, like Lindeman, the ecologist proposes to study the energy flow of an ecosystem, then the pond itself is the natural isolate. If he or she proposes to study the nutrient load of the same pond then the isolate must be much larger and include nutrient input from the drainage into the pond, nutrients brought in by migrant animals, those borne on the winds and so on.

Implications of the Flux-of-Nature Ecological Paradigm for Environmental Ethics

The old balance of nature paradigm made environmental ethics less complicated. Pristine ecosystems—that is, ecosystems unaffected by human disturbance—in their steady states of dynamic equilibrium could serve as norms for ethically assessing human impact. The classic challenge for environmental ethics was to find a meta-ethical theory that would morally enfranchise the natural norms given by ecology. And that was no

small task. Take, for example, the line of meta-ethical theory derived from the Utilitarian axiom that pleasure is good and pain is evil. It takes ethics beyond its typically Western anthropocentric limits. It morally enfranchises animal suffering (Singer 1977). But it is unable to morally enfranchise damage to ecosystems—because ecosystems per se do not experience pleasure or pain. Working to expand the Utilitarian line of meta-ethical theory and allowing satisfaction and frustration of interests to be regarded as good and bad respectively, still doesn't reach out and ethically touch ecosystems—because ecosystems are not the sorts of entities to which one can meaningfully attribute interests (Taylor 1986).

As I have argued elsewhere, Aldo Leopold's land ethic is best suited to morally enfranchise ecosystems or at least their associated biotic communities (Callicott 1989). The land ethic is located in the Communitarian tradition of meta-ethics, according to which duties and obligations are generated by community membership. Leopold points out that in addition to the many human communities that each of us is a member of, we are all also members of a biotic community. Leopold (1941, p. 203) states the general Communitarian foundations of ethics thus: "All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts." He goes on to note that ecology "simply enlarges the boundaries of the community to include soils, waters, plants and animals, or collectively: the land" (Leopold 1941, p. 204). From these two premises there follows "a land ethic" that "changes the role of *Homo sapiens* from conqueror of the land community to plain member and citizen of it" and that "implies respect for his fellow members and also respect for the community as such" (Leopold 1941, p. 204). The summary moral maxim or Golden Rule of the land ethic is

“A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise” (Leopold 1941, pp. 224-225).

The new flux-of-nature paradigm in ecology poses a different challenge for environmental ethics. Biotic communities are hardly stable; rather they are constantly subject to disturbance, natural as well as anthropogenic; and they are ever changing. Moreover, biotic communities lack integrity; component species come and go, and mix and match, catch as catch can. That leaves only the beauty of the biotic community as a moral norm—a standard for assessing whether a thing is right or wrong—for the Leopold land ethic. We usually think of beauty as subjective, as existing only in the “eye of the beholder”—in which case it would make for a very weak reed on which to lean the land ethic. However, Leopold likely had in mind something of a more sociobiological conception of beauty, which equates beauty with perceptible health. So by the beauty of the biotic community, Leopold (1999) probably meant what he alternatively called “land health.” And by land health, he meant normal ecosystem functions—the production of biomass, recruitment and cycling of nutrients, soils building, the modulation of the movement of water, the purification of water, the provision of habitat for a variety of species, and so on. The idea that there are normal ecosystem functions remains relatively unimpugned by the flux-of-nature paradigm, and is closely connected with the more anthropocentric concept of ecosystem services, which is currently much in vogue (Mooney and Reid 2003). Still, by itself the beauty of the biotic community is a flimsy natural norm on which to erect an environmental ethic.

Pickett and Ostfeld (1995, p. 24) are keenly aware that the flux-of-nature paradigm in ecology is problematic for environmental ethics:

> For all its scientific intrigue and poetic beauty, the flux of nature is a dangerous metaphor. The metaphor and the underlying ecological paradigm may suggest to the thoughtless or the greedy that since flux is a fundamental part of the natural world, any human-caused flux is justifiable. Such an inference is wrong because the flux in the natural world has severe limits.

Some human-caused changes are biogeochemically unprecedented—the introduction into ecosystems of various synthetic chemicals, for example. Other human-caused fluxes exceed the temporal and spatial scales of natural disturbances. Examples are the temporal scale (the rate) of anthropogenic species extinctions and the spatial scale of land-use/land-cover changes. Accordingly, I have suggested editing the summary moral maxim or Golden Rule of the Leopold land ethic to read: *A thing is right when it tends to disturb the biotic community at normal spatial and temporal scales; it is wrong when it tends otherwise* (Callicott 1999*)* In this formulation the ubiquity of flux is acknowledged. And in place of the natural norms of stability and integrity—which have no place in the new New Ecology—the standard of normal temporal and spatial scales of flux is substituted.

Buddhism and the Flux-of-Nature Paradigm in Ecology

As noted, the connection between Buddhism and ecology is traceable to the dawning of widespread environmental consciousness and conscience in the 1960s. Since then there has been a steady stream of work in the area culminating in the book, *Buddhism and Ecology: The Intersection of Dharma and Deeds*, edited by Mary Evelyn

Tucker and Duncan Ryuken Williams (1998)—which provides a bibliographic essay by Williams charting that stream. As a world religion, Buddhism is multifaceted. So any discussion of Buddhism and ecology must be preceded by the question, What Buddhism?—Theravada, Mahayana; Buddhism as it existed in ancient India, in classical China, in modern Japan, Thailand, and Korea. But just as important, and perhaps not so obvious, any discussion of Buddhism and ecology must be preceded by the question, What ecology?

As also noted, for secular Western environmental ethics the paradigm shift in ecology from the balance of nature to the flux of nature has posed a challenge, if not a threat, to the whole enterprise of environmental ethics. The neat norm that closed, teleological, self-regulating, stable, self-sustaining, equilibrial systems afforded environmental ethics is passé in ecology. But it seems to me that the advent of the flux-of-nature paradigm in ecology might represent a welcome shift from the point of view of Buddhist environmental ethics. A longing for permanence, stasis and a dread of change and flux characterized the Axial-age cauldron in which Buddhism was forged. Such a longing and such a dread are evident not only in the Advaita Vedanta metaphysical tradition, to which Siddhartha Gautama reacted and out of which Buddhism evolved dialectically, but also in ancient Greek metaphysics. The being posited by Parmenides is changeless and eternal; Plato's forms have similar properties; even Heraclitus, the ancient Greek process philosopher, posited the existence of a transcendent Logos that governed flux. Indeed, the very essence of Heraclitus's Logos is a law of dynamic equilibrium between opposed forces. Actually, Heraclitus anticipates contemporary process philosophy less than he does mid-twentieth-Century ecological philosophy. For the

balance between opposed forces—such as the fertility of prey species and the mortality inflicted on them by predators, governed by the Lotka-Volterra Logistic equation—and the great natural ecological cycles of water, carbon, and the like are thoroughly Heraclitean in spirit.

Buddhism however fully embraces change—flux—and abjures any desire for any state of being beyond change, any static order in change, or any transcendent law of change. *Pratityasamutpada*, dependent arising, perfectly captures the way phenomena manifest themselves in the flux-of-nature paradigm in ecology. Especially in the ecological phenomenon of succession, later seres arise dependently on earlier ones, as well as on the vagaries of weather, seed dispersal, fire, grazing, and competition—but follow no predetermined order toward a predetermined end-point or *telos*.

Buddhism also rejects any doctrine of essences and affirms the emptiness, *sunyata*, at the core of all phenomena. This metaphysical idea seems to me to be compatible with the ontological indefiniteness of ecosystems and biotic communities in contemporary ecology. Buddhism is not an other-worldly worldview. The soul is not dwelling in a tomb of flesh and passing through a veil of tears, a *maya*, on its way to some other and better place or transcendental state of being. In fact, there is no substative soul. Nor is *nirvana* is a place, nor is it a transcendental state of being, but an enlightened way of being in this world. Though the comparison may seem far-fetched, in the balance-of-nature paradigm in ecology, humans are transcendent—not a part of this world. In the flux-of-nature paradigm in ecology, on the other hand, humans are regarded as just one of many natural ecological processes and forces.

So, all in all, the new New Ecology may be a more Buddhist-friendly ecology than the old New Ecology.

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