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"Alive in the Sea of Information"

The concept of "media ecology" relies on a metaphorical transfer that media theorists took over from urban sociology, where "human ecology" had in its turn developed out of a translation of categories from biological ecology. I would like to begin by exploring some of the implications of this double transfer obliquely, by way of a literary rather than a theoretical text: Gary Snyder's poem "Walking the New York Bedrock" (1987). In this poem, Snyder describes the densely populated and artificial environment of Manhattan in terms of natural metaphors that assimilate it to a biological ecosystem. At a literal level, he points to the natural organisms that inhabit the city, from the "spiderwebs, fungus, lichen" of subway tunnels to birds and gingko trees in parks and streets; metaphorically, he compares the movement of visitors in Manhattan's art museums to that of fish or planets, the back and forth of helicopters "[t]rading pollen and nectar" to that of insects, and the stratified human habitats, from the street level of the homeless to the top floors of skyscrapers, to plant growth of varying heights in a forest, the top ones being exposed to more sunlight and thereby able to perform "[m]ore photosynthesis."[1]

Even though many of the individual metaphorical transfers between city and nature that Snyder performs are amusing and innov-

1. Gary Snyder, "Walking the New York Bedrock Alive in the Sea of Information," in *Mountains and Rivers Without End* (Washington, D.C.: Counterpoint, 1996), pp. 99, 100, 101. Further parenthetical references in the text are to this edition.

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ative, the overall idea of the city as organism is hardly original. One of the metaphors that is most insistently repeated in the poem, however, goes a step beyond simply considering urban space on its own as a more or less functional organism; several times, Snyder compares New York City to a living creature that is itself part of a larger ecosystem:

> Glass, aluminum, aggregate gravel,
> Iron. Stainless steel.
> Hollow honeycomb brain-buildings owned by
>
> Columbia University, the landlord of
> Anemone
> colony
> Alive, in the Sea of Information (p. 98)

In the first stanza, the verbless juxtaposition of nouns and the paired alliterations—glass/gravel, aluminum/aggregate, stainless/steel, hollow/honeycomb, brain/buildings—both typical of Snyder's descriptive style, convey a sense of the rock-solid materiality and architectonic constructedness of the buildings he observes, even as the last line of this stanza transposes this constructedness from the hardness of iron and steel to the softer and "hollow" one of bees building a hive with wax and honey. At the same time, the metaphor of the "brain-buildings" designates the university as the brain of the organism that is the city. But the next stanza subtly transmutes this image of the beehive city with a university brain to a different one, casting the city in its entirety as only a cluster of organisms in a much larger habitat: again modulating the metaphor with alliterations ("Columbia/colony," "anemone/alive"), Snyder here portrays New York City as just one set of marine organisms, a "colony" in a much wider and more abstract network of connections, the "Sea of Information" constituted by flows of data across the country and the globe. Clearly, the diffuseness and fluidity that this metaphor implies stand in stark contrast to the self-confident materiality of the built environment in the previous stanza: however much the architectural surface of the city may impress the observer with its massive solidity and clear boundaries, its "aliveness" is grounded in the informational and economic "liquidity" that merges it with the invisible environment surrounding it.

On one occasion, Snyder substitutes for the "Sea of Information" the "Sea of Economy" (p. 99), another national and international network of connections and transfers. At the end of the poem, he returns to the image of information-exchange flows as a kind of liquid habitat:

Soft liquid silver,
Beautiful buildings we float in, we feed in,
Foam, steel, gray
Alive in the Sea of Information. (p. 102)

The techniques deployed here resemble those of the stanza quoted earlier—heavy alliteration ("soft/silver/steel/sea," "float/feed/foam," "beautiful/buildings"), juxtaposition of nouns and adjectives, and play with spacing and indentations to set apart crucial terms and metaphors—but focus even more on the city's loss of materiality when it is considered as a node in an informatic network. Again, Snyder emphasizes that the beauty of the dense urban space resides not only in its internal functionality as an organism of sorts, but in the way its materiality and solidity dissolve in certain perspectives (a forty-story front of windows, in a certain light, turns into a surface of "soft liquid silver") to reveal that its basic existential structure relies on something much more fluid and immaterial, the "flow" of information. In the virtual realm of Information, the passage suggests, material differences between even such antithetical substances as foam and steel are assimilated into the abstractness of the color gray. Snyder's poem, then, cannot be reduced to a simple equation, urban space = living organism. Rather, it operates with two layers of metaphorical meaning: on one hand, the built environment of the metropolis is envisioned as an ecosystem; on the other hand, that ecosystem itself forms part of a larger ecological network that consists of exchanges of information.[2]

In lyrical form, "Walking the New York Bedrock" evokes a metaphorical language that has become quite common in analyses of information and communications media over the last four decades: the idea of a media or information ecology. Based on the assumption that media are not mere tools that humans use, but rather constitute environments within which they move and that shape the structure of their perceptions, their forms of discourse, and their social behavior patterns, media ecology typically focuses on how these structures change with the introduction of new communications technologies.

2. Snyder's representation of the city would deserve a more detailed discussion and critique in terms of how it sublimates and avoids the less attractive sides of the late twentieth-century metropolis (among others, the naturalization of social inequality in the poem, or the elision of the urban system's impact on the surrounding landscape), and how it fits into Snyder's more general perspective of the relationship between nature and city. My point in discussing "Walking the New York Bedrock" here, however, is not so much to evaluate it on its own terms as to show how this description of a city by a nature poet metaphorically fuses the natural and the built environments in their relation to the emergent virtual landscape of information.

Yet the implications of this metaphorical transfer from ecology to technology turn out to vary quite significantly in different media theories: while some media theorists recur to ecological vocabulary so as to emphasize that media technologies form a *system* whose impact has to be understood holistically, others see the ecological metaphor, on the contrary, as a way of avoiding the determinism of an analysis that emphasizes the power of technological systems at the expense of human agency. Ecological concepts, in other words, are invoked either to drive home a systemic perspective on media technologies, or to propose an alternative to such a view. This opposition points to fundamentally different interpretations of what the notions of "system" and "environment" mean, in the study not only of technological, but also of natural habitats, and it thereby raises the question of how the role of the natural should be envisioned in the context of a technological "ecology." To put it somewhat differently, the rifts in the interpretation of media ecology allow one to bend the metaphor back to its literal context, and to investigate the interplay of technology and nature in a more broadly understood spatial ecology that encompasses both material and virtual habitats.

System and Countersystem in Media Ecology

Media theorist Joshua Meyrowitz has suggested that three metaphors underlie current studies of media, each of which focuses on quite different dimensions of communication: media as conduits, media as languages, and media as environments.[3] While the conduit metaphor leads one to investigate what content is transmitted by media, and the language metaphor to investigate what methods and techniques of presentation (i.e., what "grammar") go into shaping the transmission of content, envisioning media as environments "focuses specifically on advancing our understanding of the ways in which the differences among media make a difference."[4] Using this metaphor, Meyrowitz argues, leads one to such questions as:

> What are the characteristics of each medium . . . that make it physically, psychologically, and socially different from other media and from live interaction . . . ? . . . What social, political, and economic variables encourage the development and use of media with some features over media with other features? How does the addition of a new medium to the existing matrix of media alter the function and use of older media? How does the rise of new forms

3. Joshua Meyrowitz, "Images of Media: Hidden Ferment—and Harmony—in the Field," *Journal of Communication* 43.3 (1993): 55–66.

4. Ibid., p. 61.

> of media alter social roles and institutions whose structure and functions were dependent in some way on the characteristics of previously dominant media? How do the characteristics of each medium interact with cultural codes and customs?[5]

It is the consideration of such large-scale questions that focus on the structure of different media and their cognitive, linguistic, cultural, and social impact that came to be called "media ecology" in the 1960s and 1970s. "Media ecology," as Neil Postman has summarized it, "is the study of media as environments":

> Its intention is to study the interaction between people and their communications technology. More particularly, media ecology looks into the matter of how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival. The word ecology implies the study of environments: their structure, content, and impact on people.
>
> An environment is, after all, a complex message system which imposes on human beings certain ways of thinking, feeling and behaving. . . . In the case of media environments . . . the specifications are more often implicit and informal, half concealed by our assumption that what we are dealing with is not an environment but merely a machine. Media ecology tries to make these specifications explicit.[6]

Elsewhere, Postman insists similarly that "the means by which people communicate comprise an environment just as real and influential as the terrain on which they live."[7] This type of approach to the study of media is usually associated with theorists such as Harold Innis, Marshall McLuhan, Walter Ong, Eric Havelock, Jack Goody, John Phelan, Meyrowitz, Postman, and others who have followed their lead, even though not all of them explicitly adopted the metaphor of ecology.

As Lance Strate has pointed out, the concept of a media ecology as it appears in McLuhan and Postman derives not from a direct transfer from the biological sciences, but from the adaptation of the notion of "human ecology" as it had been developed by the Chicago School of sociologists in the 1910s and 1920s—notably by Robert

5. Ibid.

6. Neil Postman, "The Reformed English Curriculum," in *High School 1980: The Shape of the Future in American Secondary Education*, ed. Alvin C. Eurich (New York: Pitman, 1970), pp. 160–168, quotation on p. 161. This definition is repeated almost verbatim in Neil Postman and Charles Weingartner, *The Soft Revolution*: *A Student Handbook for Turning Schools Around* (New York: Delacorte, 1971), p. 139.

7. Neil Postman, *Teaching as a Conserving Activity* (New York: Delacorte, 1979), p. 31.

Park, Ernest Burgess, and Roderick McKenzie. They first pursued the idea that urban environments might function in certain respects like ecological communities, and attributed an important role to technologies of transportation and communication in shaping such ecologies.[8] McKenzie's seminal essay, "The Ecological Approach to the Study of the Human Community," directly transposes the conceptual vocabulary of Frederic E. Clements's classic work *Plant Succession* (1916) to his discussion of the development of urban neighborhoods by exploring how such notions as "succession" (the replacement of one species or set of species in a given habitat by another) or "climax" (the maximum development of a population given the environmental resources) might serve to describe social, economic, and demographic processes characteristic of cities. "The plant ecologist is aware of the effect of the struggle for space, food and light upon the nature of a plant formation, but the sociologist has failed to recognize that the same processes of competition and accommodation are at work determining the size and ecological organization of the human community," McKenzie points out in justifying this transfer.[9]

The Chicago School's interest in the role of technologies in shaping urban communities provided a natural enough point of departure for media theorists' investigation of communication and information technologies as a conditioning environment for human cognition and behavior. The surge of public interest in ecology that accompanied the emergence of environmentalist movements in the 1960s, which moved a relatively specialized and obscure discipline into the limelight of politics and culture, may also have contributed to the easy availability of ecological vocabulary as a source of metaphors. But just as ecological concepts have been appropriated for a variety of contexts and agendas over the last four decades, media analysts have interpreted the meaning of the ecological metaphor in fundamentally different ways.

For Marshall McLuhan, probably to this day the best-known and most widely read theorist of electronic media, ecology is associated with a mode of thinking that emphasizes multiple connections between simultaneously occurring phenomena and leads to a perception of cultural and social processes as a unified totality. "The electric extension of the nervous system creates the unified field of

8. Lance Strate, "Containers, Computers, and the Media Ecology of the City," *Media Ecology*: *http://raven.ubalt.edu/features/media_ecology/articles/96/strate1/cybertime_1. html.*

9. Robert McKenzie, "The Ecological Approach to the Study of the Human Community," in *The City*, ed. Robert E. Park, Ernest W. Burgess, and Roderick McKenzie (Chicago: University of Chicago Press, 1925), pp. 63–79, p. 64.

organically interrelated structures that we call the present Age of Information. . . . We are confronted with a situation that invites simultaneous or configurational and ecological awareness instead of the older awareness of sequential and linear cause and effect," McLuhan argues, emphasizing an organic holism in the late twentieth-century mediascape that he perceives to be in opposition to the specialized and fragmented perception of the mechanical age.[10] His insistence that new technologies are leading to a "new awareness of structures, of total fields in interplay, and to ecological approaches in general"[11] culminates in his claim that ecological thinking in its global reach does away with nature in its older meanings:

> Perhaps the largest conceivable revolution in information occurred on October 4, 1957, when Sputnik created a new environment for the planet. For the first time the natural world was completely enclosed in a man-made container. At the moment that the earth went inside this new artifact, Nature ended and Ecology was born. "Ecological" thinking became inevitable as soon as the planet moved up into the status of a work of art.
>
> Ecological thinking and planning have always been native to preliterate man, since he lived not visually but acoustically. Instead of having external goals and objectives, he sought to maintain an equilibrium among the components of his environment in order to ensure survival. Paradoxically, electronic man shares much of the outlook of preliterate man, because he lives in a world of simultaneous information, which is to say, a world of resonance in which all data influence other data.[12]

In one of his typical, surprising twists of argument, McLuhan here seems to dissociate the concept of ecology from the study of nature and to link it instead to the perception of artworks.

As so often in McLuhan's writings, the details of the argument remain elusive while the overall thrust of his reasoning is clear: the emergence of satellite technology enables a view of the planet Earth from space that reveals it to be a self-contained, total whole that can be grasped only by the kind of holistic thought supposedly fostered by ecology; furthermore, in such an autonomous space, homeostasis, the maintenance of equilibrium among its various elements, becomes a paramount objective. Needless to say, these ideas are not

10. Marshall McLuhan, "The Role of New Media in Social Change," in *Marshall McLuhan: The Man and His Message*, ed. George Sanderson and Frank Macdonald (Golden, Colo.: Fulcrum, 1989), pp. 34–40, quotation on p. 35.

11. Ibid., p. 37.

12. Marshall McLuhan, "At the Moment of Sputnik the Planet Becomes a Global Theater in Which There Are No Spectators But Only Actors," in *Marshall McLuhan* (above, n. 10), pp. 70–80, quotation on p. 71.

based on any precise understanding of concepts that ecology as a scientific discipline was building on at the time; but they reflect quite accurately some of the notions—holism, homeostasis—that were associated with ecology in public discourse. James Lovelock's widely received Gaia hypothesis popularized similar notions and derived them from an identical source of inspiration: the view from space of Earth as a unified whole that first became possible in the late 1950s and early 1960s.[13]

Ecological thinking understood as a mode of reasoning that foregrounds the whole in its internal interconnectedness and equilibrium also entails an emphasis on how changes in a single variable alter the configuration of the whole. This argument, which recurs frequently in media-ecological writings, appears with particular force in the work of Neil Postman:

> Technological change is neither additive nor subtractive. It is ecological. I mean "ecological" in the same sense as the word is used by environmental scientists. One significant change generates total change. If you remove the caterpillars from a given habitat, you are not left with the same environment minus caterpillars: you have a new environment, and you have reconstituted the conditions of survival; the same is true if you add caterpillars to an environment that has had none. This is how the ecology of media works as well. A new technology does not add or subtract something. It changes everything. In the year 1500, fifty years after the printing press was invented, we did not have old Europe plus the printing press. We had a different Europe. After television, the United States was not America plus television; television gave a new coloration to every political campaign, to every home, to every school, to every church, to every industry.[14]

William Kuhns similarly argues that "[i]n an ecosystem, such as a large valley, the introduction of any new organism, change in the landscape, or alteration of the weather creates a fresh factor that alters the system. . . . the ecological conceptions of systems, of biological and chemical interplay between species, and particularly of the probable outcome of specific changes provide a badly needed model by which we can begin to locate and map the conduits of technological change."[15] Postman and Kuhns share with McLuhan a sense of media as a totally connected configuration in which even a minor

13. James E. Lovelock, *Gaia: A New Look at Life on Earth*, rev. ed. (Oxford: Oxford University Press, 1995), pp. x, xiv.

14. Neil Postman, *Technopoly: The Surrender of Culture to Technology* (New York: Vintage, 1993), p. 18.

15. William Kuhns, *The Post-Industrial Prophets: Interpretations of Technology* (New York: Weybright and Talley, 1971), pp. 4–5.

change redefines the functioning of the whole.[16] Different media technologies, in this view, are not coincidentally but *systematically* related, and the ecological metaphor becomes a way of explaining how this system operates—especially considering that its existence and mode of functioning, just like that of ecosystems, is most of the time invisible to its inhabitants.[17]

Through the metaphor of ecology, then, media theorists have tended to foreground three aspects of information and communications technologies: first, the way in which such technologies form a cultural environment that most of its inhabitants take for granted, but that nevertheless shapes their cognitive possibilities and social behavior in significant ways; second, the ways in which changes in one individual technology change the media configuration and its manner of operation as a whole; and third, the ways in which such technologies function as systems with a logic of their own. Obviously, this last point is also one that has attracted intense criticism to the work of such theorists as Innis and McLuhan. As their critics argue, a view of media as an ecology of its own omits an analysis of how media evolution and usage are guided by human intentions and agency, and how access to and control of particular media technologies are unevenly distributed. When media are portrayed as cybernetic, self-regulating, and self-perpetuating systems, in other words, they are made to seem independent of political, social, and cultural interests and organization patterns. Marxist critic John Fekete sums up such criticism when he points out that in McLuhan, "[s]ocial theory is . . . reduced to technological ecology, and history is dissolved in an apparently spontaneous generation of technologies, and in a homeostatic interchange between (human) organism and (technological) environment."[18] If one accepts such criticism,

16. Joshua Meyrowitz similarly points out in his discussion of Innis and McLuhan that in their view of media development, "the addition of a new medium to a culture alters the functions, significance, and effects of earlier media. . . . The important underlying principle is firmly rooted in systems theory and ecology: When a new factor is added to an old environment, we do not get the old environment plus the new factor, we get a new environment. . . . the new environment is always more than the sum of its parts" (*No Sense of Place: The Impact of Electronic Media on Social Behavior* [New York: Oxford University Press, 1985], p. 19).

17. Kuhns, *Post-Industrial Prophets* (above, n. 15), p. 159.

18. John Fekete, *The Critical Twilight: Explorations in the Ideology of Anglo-American Literary Theory from Eliot to McLuhan* (London: Routledge and Kegan Paul, 1977), p. 140. From a different political perspective, Lewis Mumford argues similarly that "McLuhan and his technocratic contemporaries . . . replace human autonomy in every form by an up-to-date electronic model of the megamachine" (*The Myth of the Machine,* vol. 2, *The Pentagon of Power* [New York: Hartcourt Brace Jovanovich, 1970], p. 296).

the central problem of the ecological metaphor in media theory is that it casts humans as mere components of a quasi-biological system that they cannot control, and does not seem to offer any obvious point of departure for theorizing human agency and intention in the creation and usage of technologies.

But in approaches to media theory that are not directly influenced by the Toronto School of Innis and McLuhan, the concept of ecology has been deployed in quite different ways. Such an alternative understanding of what the metaphorical implications of an ecological system might be emerges in an issue of the on-line journal *Electronic Book Review* entitled *Critical Ecologies* that appeared in winter 1996/97. As editor Joseph Tabbi explains in his introduction to this issue, he and his co-editor, Cary Wolfe, had originally called for contributions that explored "the figure of 'ecology' in criticism and culture"; two types of ecology gradually emerged in this project: "biological, organic ecologies—what we usually just call 'the environment'—and . . . abstract, inorganic, informational and digital systems and networks."[19] In my response to and review of this issue, I pointed out that these two categories are by no means self-evident, since the metaphor of ecology could have been equally well explored in the context of quite different and much more "material" cultural systems—studies of organizations or of the urban environment, to name two obvious examples.[20] Somewhat surprisingly, Tabbi, who worries whether "half of our contributors [were] carried away by a metaphor,"[21] does not mention the work of the Toronto School, whose usage of the same metaphor was most likely the model for the many critics featured in the issue who chose to address questions of media rather than other sociocultural ecologies.

But Tabbi does implicitly address critiques of the Toronto School, such as Fekete's, when he defends the use of the systems concept by arguing that it is "a term that continues to be associated with all things technocratic, alienating, and inhuman, but one that may in fact be less disabling, politically, than any of its humanistic alternatives."[22] How Tabbi envisions the political potential of the systems concept does not become entirely clear, since he seems to equate the

19. Joseph Tabbi, "Introduction," *Electronic Book Review 4: Critical Ecologies* (Winter 1996/97), ed. Joseph Tabbi and Cary Wolfe: *http://www.altx.com/ebr/ebr4/tabbi.htm*.

20. Ursula K. Heise, "EcoLogic: A RiPoste," review of *Critical Ecologies*, ed. Joseph Tabbi and Cary Wolfe, *Electronic Book Review* 5 (Spring 1997): *http://www.altx.com/ebr/riposte/rip4/heise.htm*.

21. Tabbi, "Introduction" (above, n. 19).

22. Ibid.

"humanistic alternatives" he rejects with the clichéd idea of an individual hero battling against the System—an idea that hardly represents the core of humanist ideals. But an outline of this political dimension does emerge when he argues that "social and environmental problems are not separate from one another. . . . advocates for a green politics have yet to imagine a many-issue political platform that would regard the human and its various environmental Others together, as mutually dependent actors sharing the same fate."[23] The ecological vocabulary of systems and environments would, in this view, provide a tool with which to envision the mutual interdependence of human and nonhuman actors, and thereby a means of resistance to the forces that would want to ignore this interconnectedness. Far from excluding human agency, the ecological metaphor here becomes a means of encouraging it, and of emphasizing the grounding of media technologies in the material and social world: "The various Internet technologies are grounded ineluctably in both the political sphere and the natural world."[24] While the precise forms in which such agency should be envisioned in an ecology-based media theory are not spelled out in detail, it is clear that Tabbi and Wolfe understand media ecologies as closely interconnected with human intentions and social forms. Ecological systems, rather than reducing the significance of the human component, become a trope for thinking its active and creative connections with other elements.

This tendency to envision ecology as a concept that makes room for theorizing human agency and values is even more pronounced in Bonnie Nardi and Vicki O'Day's *Information Ecologies: Using Technology with Heart* (1999), a study that integrates a theoretical consideration of information technologies with case studies of their practical use in such contexts as libraries or hospitals. Nardi and O'Day are extremely self-conscious in their choice of metaphor and compare the figure of ecology in some detail to competing tropes that cast information technologies as tools, texts, or systems.[25] It is the conception of technology as a large-scale system with its own logic of development that they object to most vigorously, and their argument aims, in its theoretical as well as its applied dimensions, at bringing technology back to a scale and context where human choices can be seen to matter. They therefore criticize in particular such theorists as

23. Ibid.

24. Ibid.

25. Bonnie A. Nardi and Vicki L. O'Day, *Information Ecologies: Using Technology with Heart* (Cambridge, Mass.: MIT Press, 1999), esp. chap. 3.

Jacques Ellul, Langdon Winner, and Nicholas Negroponte, who tend to describe technology as a more or less autonomous macrosystem, a "force of nature":[26]

> The systemic view of technology leaves us with sense [*sic*] of the inexorability of technological change. If we look at technology as a system in which we are all deeply involved, we can see why understanding technology choices and consequences is so difficult. The technological system is the water we swim in, and it has become life-sustaining and almost invisible to us. . . . This view does not address with enough force the possibility of local and particular change. . . . the problems Ellul, Winner, and others depict are so large-scale and complex that it is hard to imagine solutions of the appropriate magnitude.[27]

Nardi and O'Day pit their own choice of ecology as a guiding metaphor against this "systemic" understanding of technology; again and again, they present it as a figure that foregrounds the local, the specific, and the individual:

> We introduce the concept of the information ecology in order to focus attention on relationships involving tools and people and their practices. We want to travel beyond the dominant image of the tool metaphor, an image of a single person and his or her interactions with technology. And we want to capture a notion of locality that is missing from the system view. . . . An ecology responds to local environmental changes and local interventions. An ecology is a place that is scaled to individuals. We can all name the ecologies we belong to and participate in. In an ecology, we are not cogs in sweeping sociological processes. Instead, we are individuals with real relationships to other individuals. The scale of an ecology allows us to find individual points of leverage, ways into the system, and avenues of intervention.[28]

From a biological viewpoint, quite a few of these statements are rather surprising, especially since Nardi and O'Day persistently use the broad concept of "ecology" rather than the more limited one of the "ecosystem," which would correspond to their description somewhat more closely. But of course, the use of the term "ecosystem" would have blurred the sharp distinction they wish to draw between the systems view and their own approach.[29] That the notion of ecology is in their view tied to the local may seem understandable,

26. Negroponte, quoted in ibid., pp. 23, 41.

27. Ibid., p. 43.

28. Ibid., p. 50.

29. It is noteworthy that this avoidance is shared by the other media theorists who use the metaphor of ecology: the notion of the ecosystem is not explored in any of the theorists I have mentioned.

though it should be noted that ecological connections are by no means always local, but can function also at a regional or even global level. The claim that an ecology is "scaled to individuals," however, seems extremely dubious, since the ecological study of natural habitats typically focuses on the interrelation between species, and between species and the inanimate parts of their environment, rather than on individuals. Similarly, the idea that humans consciously know the ecologies that they form part of seems all too easily refutable.

One might also note that Nardi and O'Day themselves, in spite of their avoidance of the term "ecosystem," point out that "[a]n information ecology is a complex *system* of parts and relationships";[30] and indeed, ecology as a discipline has had quite close connections with systems theory at certain times.[31] If this observation might tend to attenuate the sharp distinction between an ecological and a systems approach to media, so does the repeated identification of the systems view, sometimes even in Nardi and O'Day's own rhetoric, with metaphors drawn from the natural world ("force of nature," "the water we swim in"). None of these observations on my part are meant to imply that Nardi and O'Day's call for a theory of technology that foregrounds human values and agency is unclear or ill-conceived, or that their argument would have gained force from being more scientifically accurate as far as biological ecology is concerned. Rather, what I would like to point out is that their deployment of the ecological metaphor to emphasize local manifestations of technology, and possibilities for individual human intervention in shaping them, puts their approach at the opposite end of the conceptual spectrum from "classical" media ecologists such as McLuhan or Postman, who use the same metaphor to foreground the large-scale, systemic implications of technology and the way in which human perception, cognition, and social behavior are being reshaped by particular technologies. In other words, envisioning media as an environment leads different theorists to radically divergent conclusions: to an emphasis on the generality, systematicity, and autonomous logic of technological change, on one side, and to an emphasis on the local implantations, changeability, and social logic of technologies, on the other; ecology, therefore, functions in media theory as a metaphor for technology as an all-encompassing system or, in contrast, as an image that counteracts this kind of system.

30. Nardi and O'Day, *Information Ecologies* (above, n. 24), p. 50 (emphasis in original).

31. See Robert P. McIntosh, *The Background of Ecology: Concept and Theory* (Cambridge: Cambridge University Press, 1985), esp. chap. 6.

The question that arises from this contrast is not so much which view is more compatible with what an ecological approach signifies in the natural sciences, since the accuracy of the metaphorical transfer in and of itself does nothing to confirm or invalidate either perspective. Rather, one must ask why theorists with such contrasting views all end up invoking ecology as a trope to bolster their approach. As an interdisciplinary field that brought together the more specialized findings of multiple individual branches of scientific inquiry—from geology and climatology to biology—ecology was successful in making visible many of the less apparent and perceptible connections between natural phenomena at a regional and even global level. The aspiration behind the use of ecological terminology in media theory is in part no doubt the analogous one to develop a vocabulary that would be able to trace the new global realities of emergent media technologies. More specifically, in this context, the study of media and the discipline of ecology as it has been received in the cultural imagination share a broad metaphoric vocabulary of links, interrelations, local and global webs and networks that facilitates the terminological transfer from one sphere to the other, and enables an understanding of the natural and media worlds as in some sense structurally homologous.

But ecology itself has undergone significant disciplinary shifts since the 1960s and 1970s, when it was mainly associated with Gaian ideas of holism, global connectedness, and an emphasis on homeostasis and the maintenance of a harmonious balance in ecosystems. As Donald Worster has shown, many of the concepts that appear to nonexperts to lie at the core of ecology were seriously questioned in the discipline itself in the course of the 1980s and 1990s—among them, the notion of competitive balance, and even that of the ecosystem itself.[32] In Worster's account, the idea that gave a new kind of cohesion to ecological endeavors in the 1990s was the greatly increased urgency to maintain biodiversity.[33] Some of this changed understanding is reflected in Nardi and O'Day, who indicate that one of the reasons that they prefer the concept of "ecology" to that of "community" in their description of media practices is that it puts greater emphasis on diversity and dynamic evolution over time; in addition, "ecology" is in their view associated with a sense of urgency for intervention that the notion of community

32. Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 2d ed. (Cambridge: Cambridge University Press, 1994), chap. 17.

33. Ibid., p. 417.

does not evoke.[34] My argument here is not that Nardi and O'Day are consciously aware of the shifts that disciplinary paradigms have undergone within ecological research itself, but that they draw on a somewhat altered public image of the ecological: centrally, a shift from a dominant emphasis on balance and connectedness to a more marked foregrounding of diversity and the urgency to preserve it. One of the most striking aspects of this shift is a change in spatial imagination: whereas McLuhan tends to envision media as systems that span the globe, Nardi and O'Day focus instead on local microsystems to which individuals have immediate access.

Along with this shift in the scale at which media environments are defined, one also detects a change in how the ecology of information technologies is viewed in its relation to other kinds of habitats. The main reason why ecology turned from a relatively specialized scientific discipline into a focus of public attention in the 1960s was the rise of the environmental movement and the attendant spread of the perception that the natural world, in many of its dimensions, was structurally challenged and threatened by technological progress. Ecology, in the public imagination, is not only associated with multiple connections between very diverse phenomena and holistic approaches to nature, it is also linked to the discovery of widespread pollution, the destruction of natural landscapes and habitats, and the imminent or already complete extinction of a wide variety of species.[35] One must therefore ask to what extent the trans-

34. Nardi and O'Day, *Information Ecologies* (above, n. 25), p. 56.

35. This aspect of ecology, while it is not generally emphasized in media theory, does occasionally surface—for example, in David Shenk's discussion of the "data smog" that envelops members of the information societies of the late twentieth century, by which he means an overload of information that cannot be assimilated by the user of media technologies (*Data Smog: Surviving the Information Glut* [New York: HarperEdge, 1997]). It also appears in Régis Debray's call to preserve and memorialize extinct technologies just as we attempt to preserve endangered biological species and natural places:

> Consider a letterpress printer's workshop using lead type in its distinctiveness as the locality of a culture, or a film editing room with its technicians. Are not such places as precious, and precarious, as a patch of green in a suburban district of concrete? Cannot colorization, or the heavy further editing of films that is done to accommodate interruptive television advertising, be likened, *mutatis mutandis*, to the pollutions or eyesores of a stretch of high-speed train track in the Provençal countryside, or a nuclear waste preprocessing plant? We speak about Earth Day. Why not tomorrow, no pleasantry intended, a day devoted to celebrating celluloid, vellum paper, or vinyl records? To Nagra, the professional use of tape recorders, the Steadicam, the portable camera, or the Rolleiflex? (*Media Manifestos: On the Technological Transmission of Cultural Forms,* trans. Eric Rauth [London: Verso, 1996], pp. 113–114)

fer of vocabulary associated with the study of a declining natural world to the burgeoning sphere of information technologies at least implicitly invites a perception of media ecology as a replacement for biological ecology. This tendency is difficult to trace in the writings of media theorists themselves, who generally waste no words on the state of the natural environment. But it is visible in books such as popular writer Bill McKibben's *Age of Missing Information*, which reflects with considerable anxiety on what kinds of information are conveyed by the incessant flow of images on television, as opposed to the perceptions during a day spent in the outdoors: "an awful lot of people have come to see this 'information ecology' as a sort of substitute for the other, older, natural ecology," McKibben sums up.[36] A similar sense emerges in literary works ranging from Don DeLillo's *White Noise* and Karen Tei Yamashita's *Through the Arc of the Rainforest*, both of which reflect on the relationship of the mediascape to natural environments, to an entire genre such as cyberpunk, which replaces the Wild West of the American frontier with the virtual landscape of cyberspace.[37] If indeed the use of the environmental metaphor in media theory derives some of its plausibility from the (conscious or unconscious) perception that the complex networks that constitute the mediascape of the turn of the millennium have taken the place of natural environments, then the question arises not only how this metaphor shapes our perception of information and communications technologies, but also, inversely, how the application of ecological metaphors to such technologies transforms our understanding of natural environments.

Territories: From System to Space

If the ecological metaphor can serve to articulate both systemic and antisystemic perspectives in theories of media, it is because ecology offers both a holistic dimension that foregrounds universal connectedness, and a local one that points to the specificities of partic-

See also the website dedicated to "dead media" that was created by students of the Vancouver Film School following an idea proposed by cyberpunk novelist Bruce Sterling: *http://griffin.multimedia.edu/~deadmedia/*.

36. Bill McKibben, *The Age of Missing Information* (New York: Random House, 1992), p. 22. McKibben quotes Mark Fowler, director of the Federal Communications Commission under the Reagan administration, as saying during an appearance on C-SPAN that "'as the ecological system has deteriorated . . . the man-made information ecology—the ebb and flow of words, voice, data—has vastly improved'" (p. 22; see also Strate, "Containers" [above, n. 8]).

37. Don DeLillo, *White Noise* (New York: Penguin, 1986); Karen Tei Yamashita, *Through the Arc of the Rainforest* (Minneapolis: Coffee House Press, 1990).

ular ecosystems. Yet in both of the two different approaches to media ecology that I have discussed above, humans' relation to information and communications technologies is usually separated out as that which is "ecological" in the sense that it shares certain features with the functioning of natural environments. There is, of course, nothing wrong with a metaphorical transfer that limits its field of application in this way so as to ensure a focused analysis. But in a somewhat broader perspective, the implications of the ecological metaphor could lead to a different and, in my view, more complex account of media environments that would ultimately link media theory to comparative cultural studies and to ecocriticism. That is, if media do indeed function in some sense as environments for human thought, perception, and action, then a properly ecological approach to their study should include a consideration of how they relate to other types of environments.

To illustrate at least in outline what such an approach might look like, let me return briefly to the poem "Walking the New York Bedrock" that I discussed at the beginning. In comparing an urban environment to a natural ecosystem, Snyder in reality alludes to a series of phenomena that range from architecture and institutions to socioeconomic relations; the "urban environment," in other words, consists of a set of subsystems all of which together, in Snyder's lyrical imagination, amount to an ecology. The global network of information flows is hinted at as yet another dimension that compares to a more large-scale ecological system. Snyder's attempt to envision the city as a whole series of environments that are juxtaposed to or embedded in each other is, I believe, what makes for the ecological vision of his poem, more than his individual comparisons of urban and informatic with natural processes.

If we were to apply a similar vision to the study of media, we might begin by noting that the metaphor of the "environment" implies a spatial perception or experience. This dimension is particularly obvious with regard to the most recently introduced media, television and the computer, both of which are routinely experienced as windows or portals that open up onto realms difficult to conceptualize in other than spatial terms. McKibben foregrounds this spatial dimension in his experiment with twenty-four-hour TV: "If my endless day of television reminded me of anything, it's that electronic media have become an environment of their own—that to the list of neighborhood and region and continent and planet we must now add television as a place where we live."[38] Or, as one of the

38. McKibben, *Age of Missing Information* (above, n. 36), pp. 52–53.

characters in Don DeLillo's *White Noise* puts it more concisely, "'For most people there are only two places in the world. Where they live and their TV set.'"[39] The vocabulary associated with the World Wide Web, with its "virtual space" and "websites" that one can "go to," persistently encourages the user to think in terms of spatial categories, as do the visual scenarios that make up most video and computer games. An ecological approach to the study of media would attempt to understand how this kind of spatial experience relates to the other kinds of environments that individuals encounter in the course of their daily activities, including both built and natural spaces. In such a study, one would ask questions such as: How do encounters with different types of environments—natural, urban, virtual—alternate in the course of everyday routines? How do individuals and groups make the transition from one type of environment to another? Is the transition experienced as a connection or as a more or less abrupt disjuncture? To what extent can activities in one type of environment come to replace those in another (for example, visiting the *nytimes.com* website instead of going to the newspaper stand around the corner, or vice versa), and to what extent are they conceived of as equivalent? When more than one environment is available, which one is chosen, and for what reasons? (For example, an item of clothing might be purchased at a local store, ordered from a catalog, or on-line; one might decide to see a movie at a theater, or to wait until it comes out in video or DVD format; an afternoon outing might take the form of walking or roller-skating in a park, visiting the mall, or surfing the Web.) What such an approach—perhaps one could call it a "functional ecology"—would circumvent is the technological determinism that often surfaces when media are understood as an autonomously evolving system, but also the restriction to a particular local ecology of the kind studied by Nardi and O'Day.

This approach is not, of course, new: it harks back to some aspects of Meyrowitz's definition of media ecology quoted earlier, even as it particularly emphasizes the spatial dimension implicit in an understanding of media as environments. Meyrowitz's own brilliant study of the impact of television, *No Sense of Place*, addresses some of the issues raised here when he analyzes how the experience of geographically distant places from one's own living-room has altered notions of public and private space. Sherry Turkle's *Life on the Screen*, to name another example, investigates how the possibilities of simulating human identity in robots or the virtual space of the Internet

39. DeLillo, *White Noise* (above, n. 37), p. 66.

affect users' sense of self between the digital and the "real." Ken Hillis's *Digital Sensations*, in its turn, studies forms of computer-based Virtual Reality and the experiences of space, vision, and identity it enables.[40] These studies, and many others, make invaluable contributions to our understanding of how media reshape our experience on the border of mediated and real worlds, of virtual and actual space. Yet they typically tend to focus on one particular medium, without paying much attention to its interrelation with other media or, in some cases, to the diversity of environments that make up the nonmediated world. Envisioning media as environments among others in an overarching ecology of spatial and quasi-spatial experiences would, I believe, usefully complement the studies already undertaken.

Such an approach might also highlight how the use of certain information and communications technologies varies depending on the cultural contexts in which they are embedded. Which environments are preferred for particular activities, and what values are attributed to them, is likely to differ as a function not only of convenience and technological access, but also of more general cultural patterns. The uses and metaphors associated with the virtual space of computer networks, for example, might turn out to vary considerably when one compares, say, Japanese, German, and Hispanic cultural contexts, just as the valuations and images that are attached to the relationship between natural and built environments differ significantly even between Western industrialized societies. To the extent that a media-ecological approach as outlined here would be able to highlight patterns of cultural difference and similarity, it would make an important contribution to comparative cultural criticism.

Lastly, a media ecology that takes into account the interrelation of different types of spatial and quasi-spatial experience might shift the terms in which environmentalists and ecocritics address the issue of media technologies. Environmentalists have often reacted to the increasing detachment of social and cultural practices from their roots in specific locations (a process that Néstor García Canclini and John Tomlinson refer to as "deterritorialization")[41] with a call to a return

40. Meyrowitz, *No Sense of Place* (above, n. 16); Sherry Turkle, *Life on the Screen: Identity in the Age of the Internet* (New York: Simon and Schuster, 1995); Ken Hillis, *Digital Sensations: Space, Identity, and Embodiment in Virtual Reality* (Minneapolis: University of Minnesota Press, 1999).

41. García Canclini's and Tomlinson's notion of deterritorialization should not be confused with Deleuze and Guattari's, which encompasses both geographical and metaphorical meanings of space. See Néstor García Canclini, *Hybrid Cultures: Strategies for Entering and Leaving Modernity*, trans. Christopher L. Chiappari and Silvia L. López

to the authenticity of local knowledge and the unmediated encounter with nature. This tendency is clearly visible in the work of environmentalist poets and novelists such as Wendell Berry and Scott Russell Sanders, deep ecologists such as Arne Naess, and bioregionalists such as Kirkpatrick Sale. For the majority of urban-dwelling populations in Western countries, however, such a return would seem neither viable (for practical as well as philosophical reasons) nor desirable (since a dispersal of large masses of people from urban agglomerations would arguably lead to a significant ecological deterioration of the regions they would inhabit instead). Rather than opposing the superior quality of natural environments to the shortfalls of human-made ones, it seems to me of paramount importance to investigate what respective roles such environments play in actual sociocultural practice. Advocating for the preservation of natural environments arguably stands a better chance of being effective if we understand how nature functions in a broader cultural ecology of space of the kind that I have outlined above. But the reverse also deserves emphasis: the analysis of the virtual territories of media environments remains incomplete without a consideration of the competing material territories of built and natural environments. Just as environmentalists need to address the ways in which recent technologies have altered our experience and conceptualization of the natural, media theorists need to find ways of relating the global connectedness of virtual space back to the experiences of physical space that individuals and communities simultaneously undergo. Such a move toward a more general ecology of space would be an important step in the "greening" of media ecology, as well as in the investigation of "posthuman" identities that unfold at the interface of nature and technology.

(Minneapolis: University of Minnesota Press, 1995); John Tomlinson, *Globalization and Culture* (Chicago: University of Chicago Press, 1999), chap. 4.