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Between Science and Anti-Science
A Response to Glen A. Love

Readers of Glen A. Love's "Science, Anti-Science, and Ecocriticism" (*ISLE* 6.1) who expect a response such as this to leap to the defense of a strong culturalist critique of scientific practice may be disappointed by what follows. I agree with the broad contours of Love's article: that humanists would do well to school themselves in the fundamentals of modern science, that the evolutionary paradigm is here to stay, that the prospects for a new alignment of science, especially the life sciences, and the humanities are at least modestly encouraging. As someone up to his chin in evolutionary biology, ecology, and cognitive science, I'm all for the kind of alliance Love recommends to readers of *ISLE*.

For my part, however, I think any emerging consensus should also seek to make its peace with the kind of theoretical and cultural styles of argument about which Love displays no little ambivalence. To his credit, Love does not simply identify with those who defend science against a lunatic fringe of anti-science social constructionists. He points to ecology itself as "one of the most important correctives from the critics of science," not just for the new methods of scientific practice it promotes, but also for cultivating a "way of thinking which reminds us that everything is connected to everything else, and that science cannot be insulated from either the concerns of society or our rootedness in the natural world" (69). I appreciate, then, the qualified admiration Love allows to recent attempts by Paul R.Gross, Norman Levitt, Alan Sokal, and others to defend science from postmodern social constructionists. What Love seems most to appreciate in these works is their strong defense of scientific method, which he characterizes as "the best means we have for freeing ourselves from dogma, prejudice, and er-

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ror" (70). Such a method of critical thinking, he adds, "cannot be postmodern or masculinst or feminist or Marxist or whatever." Science, in this view, is aligned with objectivity and truth, whereas theory is associated with an intellectually suspect and increasingly pervasive cultural relativism.

I consider myself an advocate of experimental science and of the usual standards of rational intellectual inquiry. I believe experimental methods, and experimental intelligence more generally, offer extraordinary tools with which to investigate our world and, when necessary, to intervene so as to modify or otherwise improve the physical and social conditions in which we live. I also agree with Love that many of the attempts to align recent scientific theories with varieties of poststructuralism and postmodernism often amount to bad science. But the problem implicit in Love's narrow formulation of a scientific method that somehow transcends the taint of cultural interest should be apparent to anyone concerned with the future of the environment: what is the relationship between the "pure science" of impartial, objective investigation and the frequently unexamined "progressive" assumptions about science and technology implicit in our culture of seemingly endless modifications and interventions?

Some, for example Alan Sokal and co-author Jean Bricmont, suggest that we should distinguish between science and its sometimes misguided (and often disastrous) social applications. Such a distinction, however, obscures the extent to which Western societies have fostered a singular and unprecedented culture of scientific and technological optimism, progress, and faith. We are, for good and ill, a scientific culture: unlike other people in the world, past and present, we believe, semi-automatically, that scientific methods reveal something more "true" about the world than, say, spiritual disciplines. We turn to science to resolve our problems and to shape our dreams and ambitions. Though we sometimes acknowledge a spiritual or moral dimension of experience, we by and large still allow science to dominate our day-to-day lives, valuing it precisely for having no moral or spiritual dimension. So long as our understanding of the kind of insight delivered by science is limited to physical or mechanical processes, science does indeed provide something like dependable evidence of what the world is like. For many, however, including many drawn specifically to ecological science, this is to reinforce one, decidedly narrow kind of science and in doing so to submit the earth and its inhabitants, human and nonhuman alike, to a regime all the more tyrannous for disclaiming any specific interest or partiality toward the "objects" of its investigation.

This is why so many literary critics trained in theoretical and cultural studies have been drawn to those sciences that are in themselves critical of

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the more narrowly scientistic dimensions of scientific practice, from theoretical physics to systems theory. As Love acknowledges, ecology, in proposing a more holistic approach to a broad community of interactions and interrelations, offers a style of analysis that points science towards a healing rapprochement with matters of ethical and spiritual concern. Systems theory, despite the many odd mutations it has undergone over the past several decades, also offers new ways of thinking about the relationship between cultural values and the physical and biological conditions in which they arise. To think (and act) from the perspective of relations is not in the least anti-scientific: it is rather to shift the emphasis of scientific investigation from a model based on isolated or autonomous units and their one-directional cause-and-effect relations to one grounded in the working or unfolding of interactive and multi-level, multi-directional systems. Such a view is not anti-experimental, but it does incorporate a sense of the limitations of traditional experimental programs.

In his recent book *The Web of Life: A New Scientific Understanding of Living Systems*, Fritjof Capra describes the shift to a living systems perspective:

> According to the systems view, the essential properties of an organism, or living system, are properties of the whole, which none of the parts have. They arise from the interactions and relationships among the parts. These properties are destroyed when the system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, these parts are not isolated, and the nature of the whole is always different from the mere sum of its parts. (29)

Systems are holistic in the sense that every individual part of the system is constituted by means of its relationship to the system as a whole. For Capra, such a holistic perspective effectively counters the isolation and fragmentation that are the twin legacy of modern subjectivity and scientific materialism:

> The origin of our dilemma lies in our tendency to create the abstractions of separate objects, including a separate self, and then to believe that they belong to an objective, independently existing reality. To overcome our Cartesian anxiety, we need to think systemically, shifting our conceptual focus from objects to relationships. Only then can we realize that identity, individuality, and autonomy do not imply separateness and independence. (295)

The challenge to isolation is, for Capra, a challenge to prevailing modes of consciousness that have set us disastrously at odds with the earth. The new scientific paradigm, far from being grounded in a neutral critical methodology, is itself one instrument of a newly emerging cultural paradigm.

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Lest anyone mistake him, Capra is not saying that there is no world out there for science to describe, or that even if there is such a world, science cannot hope to describe it. Rather, he is saying that the traditional model, with its abstract emphasis on isolated parts or properties, fails to account for the ways in which properties emerge interactively and interrelationally. Furthermore, he is suggesting that the traditional model only alienates us (similarly abstracted) from the world we investigate, whereas a systems approach, with its primary emphasis on relationship, underscores our relatedness to the world we investigate. Science, on this view, cannot possibly be neutral or impartial, since the leading insight of such a systems view is that all organisms are implicated in larger systemic structures. Partiality—an invested interest in the whole—is the only game in town. Culture, as many evolutionary biologists are now suggesting, is simply one complex level of systemic structure that emerges, and evolves over time, through interactions among members of a human community (though there is a vigorous debate about what this actually means).

Capra, who is best known as the author of *The Tao of Physics*, may seem to some a dubious authority. But something like a systems view has been developing among mainstream scientists and philosophers of science for at least a century. In his often-cited 1887 paper "The Lake as a Microcosm," ecologist Stephen A. Forbes refers to the "close community of interest" that ties the life histories of "two seemingly deadly foes" inhabiting the same lake (26). Forbes even invokes the same language of system (albeit very loosely) in the conclusion of his paper: "If the system of life is such that a harmonious balance of conflicting interests has been reached where every element is either hostile or indifferent to every other, may we not trust much to the outcome where, as in human affairs, the spontaneous adjustments of nature are aided by intelligent effort, by sympathy, and by self-sacrifice?" (27). Ecology would develop over the next century as the science specifically dedicated to approaching biological phenomena from the point of view not of the organism (the isolated individual) but of the community as a whole.

More recently, Ernst Mayr, one of the giants of contemporary biology, has insisted on the revolutionary importance of systems thinking. In *This Is Biology: The Science of the Living World*, he claims that the "two major pillars in the explanatory framework of modern biology," missing from the earliest presentations of biological holism, were the genetic program (which scientists finally began to unravel in the mid-1940s) and emergence ("that in a structured system, new properties emerge at higher levels of integration which could not have been predicted from a knowledge of the lower-level components" [19]). As Capra points out, the philosopher C. D. Broad coined the term "emer-

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gent properties" for "those properties that emerge at a certain level of complexity but do not exist at lower levels" (29). Mayr, more grounded in the history of the evolutionary paradigm, points to Lloyd Morgan's 1923 book, *Emergent Evolution* (19). Whatever the source, emergence has played a key role in a variety of contexts in twentieth-century science. Whitehead invokes the term in his formulation of his process perspective in his important 1925 volume, *Science and the Modern World*: "The organic starting point is from the analysis of process as the realization of events disposed in an interlocked community. The event is the unit of things real. The emergent enduring pattern is the stabilization of the emergent achievement so as to become a fact which retains its identity throughout the process" (152). The concept of emergence has also proven valuable, more recently, to developments in cognitive science. As neuroscientist Vernon B. Mountcastle succinctly comments in his introductory essay to the Spring 1998 special issue of *Daedalus* devoted to "The Brain," "Things mental, indeed minds, are emergent properties of brains. Those emergences are not regarded as irreducible but are produced by principles that control the interactions between lower level events—principles we do not yet understand" (1). Emergence enables Mountcastle and a host of other neuro- and cognitive scientists to "explain" consciousness, either as a purely physical process or as an irreducible and unique phenomenon that emerges, at a higher level of organization, from those same physical processes.

Though Mayr does not seek the kind of spiritual analogues that are the distinctive mark of Capra's work, he shares with Capra a sense of the strong ethical implications of the systems perspective. Utilizing the newly popular co-evolution model, which suggests that culture evolves alongside biological forms, Mayr offers an account of what he calls the "emergence" of altruistic behavior, suggesting that ethics are simply a high-level pattern of complex behavior. He refers to humankind's sense of "a responsibility toward nature as a whole" as an ethical notion "that seems to have originated remarkably late" (268). Despite potential problems with his dating of this particular emergence, Mayr echoes many radical environmentalists when he suggests that "we must reduce the selfish tendencies in our current value system in favor of a higher regard for the community and for the whole of creation. This requires a rejection of the ideal of continued growth, and its replacement with the ideal of a steady-state economy, even if this were to entail a reduction in our standard of living" (268-69). In other words, emergence (which is to say, in this case, cultural evolution) must be allowed to continue, so that our ethical ideals can meet the environmental crisis we have created. Though his vocabulary is more strongly evolutionary than systems-oriented, Mayr's understanding of evolu-

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tion is grounded in the basic premises of systems thinking. And it is especially telling that these premises lead him, just as they lead Capra, to promote specific social and political values.

Interestingly, it is on just this point of growth that Love criticizes the recent wave of anti-social constructionist science writing, what he calls, referring to Gross and Levitt's *Higher Superstition*, the "too easy acceptance of the science and technology-driven engine of economic growth" (69). He also criticizes Gross and Levitt's "tendency to attack what they regard as the excesses of environmentalism rather than taking more seriously than they do the threats to the environment" (69). But Love's own effort to draw a line between scientific method and socio-political values suggests that our values can and should be derived in isolation from the processes by which we form (and reformulate) our knowledge about the world. This assumption, for all its apparent value-neutrality, is itself the product of a particular cultural value, one associated with the same science that has issued in our present environmental crisis. The assumption that value-neutral scientific methods can provide endless instrumental fixes can only reinforce our optimistic faith in unlimited technological progress. A different attitude, especially one with a more restrained conception of steady-state systems, will require a radically different understanding of scientific practice.

As to the recent science wars, I more or less side with Love. Much of what passes as science studies is plainly ignorant of science, and what's worse, offers nothing to replace outmoded objective values that would secure a reader's assent even to the science studies arguments themselves. But my own sense is that a respect for the methods and insights of science is not necessarily at odds with an attempt to integrate theoretical and cultural analyses of the ways in which "objectivity" is bound up with social and cultural values. Indeed, I am reminded of John Dewey's effort on so many fronts to mingle the considerable virtues of scientific method with a critical (but optimistic) sense of the irreducible social embeddedness of any scientific or intellectual practice. He comments characteristically in the concluding chapter of *Experience and Nature*: "All knowing and effort to know starts from some belief, some received and asserted meaning which is a deposit of prior experience, personal and communal. In every instance, from passing query to elaborate scientific undertaking, the art of knowing criticizes a belief which has passed current as genuine coin, with a view to its revision." It terminates, Dewey adds, "when freer, richer and more secure objects of belief are instituted as goods of immediate acceptance" (320). What is especially revealing in this formulation is Dewey's sense that science, or what he often prefers simply to call intelligence, functions as an instrument of expansive self- and communal-realization.

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The idea of a neutral, objective science is, for Dewey, an invention of a peculiar (and distinctly arrogant) style of scientific imagination. Dewey's aptly phrased "art of knowing" is, by contrast, at once biological and cultural.

In fact, many scientists have themselves been trying to understand the relationship between science and our various social, aesthetic, ethical, and spiritual values. The appeal of ecology and systems thinking, as well as the new evolutionary and cognitive paradigms, is, for many (though clearly not for all), precisely that these scientific models embrace the emergence and ongoing evolution of values within the parameters of natural and biological processes. To continue to invoke "objective" truths that are seemingly unsituated is only to obscure our relationship, and the relationship of our brains and minds, to the environments and systems within which we dwell. This is why I would encourage readers of *ISLE* to recognize a space between "science" and "anti-science," one that is cultivated by scientists and humanists alike in the always permeable boundary between science and culture and dedicated to the frank pursuit of a more responsive and responsible scientific imagination.

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