

Transitions to an Ecological Age

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We are living in a time of tumultuous cultural upheaval in which the dominant Western worldview of our time, variously called the scientific or modern or industrial, is undergoing a profound re-appraisal. In this essay, I try to summarize as succinctly as possible the dimensions of the transition to an Ecological Age, whose emergence I both perceive and advocate.

The global environmental crisis is serving as a catalyst for far-reaching re-examinations of basic values and assumptions in every area of human knowledge and inquiry. This offers both a challenge and an opportunity for all the disciplines to reformulate some of the fundamental questions and issues in each field. Theologian and ecophilosopher Thomas Berry has often said that the time has come to “re-invent the human at the species level.” I take this to mean that the existing cultural paradigms cannot deal adequately with the issues we are now facing, and that we need to draw on the evolutionary wisdom of the human species, in its interrelationships with all other species and ecosystems. The viability of the human and its mode of adaptation to the natural world are now called into question. Indeed we have brought conditions on the entire biospheric life-system to a dangerous impasse.

It is not necessary to belabour the well-known parameters of the ecological catastrophe we are facing, as these are well-documented in publications such as the annual *State of the World* reports issued by the Worldwatch Institute. The issues and problems of environmental pollution and degradation have passed from the literature of the scientific communities into the mainstream media. Because pollution

does not respect national boundaries, its proliferation lends momentum to efforts at international, even global co-operation. Since, likewise, ecosystem destruction does not respect socio-political boundaries, we are witnessing new calls for social and environmental accountability from all levels of government and the professions including law, business, medicine, and education.

The analysis of environmental degradation and of the need for restoration cuts across the paradigm boundaries of the traditional knowledge disciplines. Whereas older definitions of ecology spoke of the relationship of organisms to their environment, a systems approach goes beyond this dualistic conception, defining it as the study of the complex webs of interdependent relationships in ecosystems. For this reason, ecology, because of its necessarily interdisciplinary character, has been called the “subversive science.”¹ The transition to an ecological way of thinking, systemic relationship thinking, truly involves revolutionary change.

A growing chorus of voices is acknowledging that the fundamental roots of the environmental disaster lie in the attitudes, values, perceptions, and basic worldview that we humans of the industrial-technological global society have come to hold. Many now understand that the worldview and associated attitudes and values of the industrial age have permitted and driven us to pursue exploitative, destructive, and wasteful applications of technology. The modern, industrial worldview was shaped by the scientific revolution of the sixteenth and seventeenth centuries and the industrial revolution of the eighteenth and nineteenth. The outlines of an ecological worldview are being articulated in the natural sciences, the social sciences, and in philosophy and religious thought. In the tables below, the main features of the emerging worldview are summarized and contrasted with those of the currently dominant industrial worldview.

I would like to briefly mention some alternative analyses of the transformation that Western society is presently undergoing. Many social thinkers state that the crucial transition taking place now is from the *industrial* era to the *information* or *electronic* era. While it is true that the advent of personal computers and electronics represent a qualitative shift in technology, with far-reaching effects on the economy, culture, and human relationships, it is, in my view, only a continuation of the mechanistic, technological mindset. Cyber culture and “virtual reality” do not represent a real shift in values, such as is demanded by the environmental crisis.

Other social critics argue that we are moving out of the *modern* age of rationalism and positivism, that begun in the eighteenth century Enlightenment period, into a *postmodern* age of deconstructionist relativism. In the deconstructionist view, all theories and models of reality are socially and historically determined “texts,” and as such are accorded equal validity. None, including the theories of science, can claim “privileged access” to truth or validity. In contrast to this view, I concur with those who believe it is possible to do more than to critique the modern view. A constructive, ecological or systems postmodernism is possible, in which we can recognize some consistent features of the newly emerging worldview. These features can be recognized as those that contribute to sustainability, preservation and restoration of all life-forms and habitats on Earth, not just those of humans, or one group of humans.²

Scientific Paradigms

<i>Industrial Age</i>	<i>Ecological Age</i>
mechanomorphic	organismic
universe as machine	universe as process or story
Earth as inert matter	Gaia: Earth as superorganism
life as random chemistry	life as autopoiesis
determinism	indeterminacy, probability
linear causality	Chaos: non-linear dynamics
atomism	holism and systems theory

In the natural sciences, several new paradigm transitions can be discerned. The “mechanical philosophy” of Newton, Galileo, and Descartes, which began by devising quantitative, mechanical models of physical processes, developed in the course of three centuries into a *mechanomorphic* worldview, in which the universe is erroneously identified with the analogical models originally designed to explain it. This mechanistic worldview is giving way in many circles to an *organismic* view, which sees the universe as an evolving process, a “story” in Thomas Berry's terms. Instead of seeing life as biochemical machinery somehow derived from random molecular combinations, the new biology defines life as self-generating (*autopoietic*), genetically coded process adaptively coupled with the environment.

The Earth, instead of an inert body of dead matter, is seen in the Gaia theory of Lovelock and Margulis as a kind of superorganism, evolving

in homeostatic reciprocal interaction between living organisms and the physico-chemical environment. Some initially criticised the Gaia theory for not offering any “new mechanism,” and instead just changing the metaphor. But this statement ignores the fact that “mechanism” is itself a metaphor. The currently accepted mechanomorphic worldview is usually not recognized as a metaphor. The psychic fixation of scientific thinking on the machine metaphor is demonstrated in even so eminent an ecologist as Paul Ehrlich, who can write a textbook with the title *The Machinery of Nature*.

Quantum physics, with its uncertainty principle, has challenged the old deterministic model of a predictable clockwork universe. Traditional concepts of linear causality and mechanical forces acting on material objects are being superseded by chaos theory, non-linear dynamics, and dissipative structures. The notion of chaos as the epitome of unpredictable disorder has been transformed by new mathematical approaches that yield unexpected orderliness in complex dynamical systems. The atomistic, or “billiard-ball” conception of ultimate reality is giving way to a holistic view, in which reality is analyzed as a *holarchy* (nested hierarchy) of systems with complex multi-level interactions of phenomena at all levels, from sub-atomic wave/particles and atoms to galactic clusters and universe.

Epistemology

<i>Industrial Age</i>	<i>Ecological Age</i>
logical positivism	critical realism
operationalism	constructivism
reductionism	reduction and integration

In epistemology, the older conventional view was that of logical positivism, according to which only sense observations can be meaningful statements. Along with that was the doctrine of operationalism, according to which the meaning of variables lies in the experimental operations. These views have given way to more open-ended approaches that recognize the possible validity of different perspectives (critical realism), and that take into account the fact that theories and models are mental constructions (constructivism). The reductive-analytic strategy of doing scientific research, which looks for explanations “from below,” has, in the conventional paradigm, led to a reductionist ontology in which all the sciences are supposedly ultimately reducible to the physics of elementary particles. In the post-

modern philosophy of science, the reductionist orientation is complemented by integrative, systemic perspectives, including the possibility of causation “from above.”³

The role of the human

<i>Industrial Age</i>	<i>Ecological Age</i>
conquest of nature	living as part of nature
dominion, control	co-evolution, symbiosis
heroic individualism	ecological consciousness
exploit & manage	stewardship, restoration
anthropocentric & humanist	biocentric or ecocentric
nature has instrumental value	nature has intrinsic value

The emerging ecological worldview involves a very different perception of the role of the human in the scheme of things. For thousands of years, since the beginnings of the Neolithic domestication, the human has tended to assume a dominating and exploitative attitude toward nature. Judeo-Christian theology has taught that man was created in God's image, put on Earth to “subdue” and “have dominion” over the plants and animals. Heroic individualism and patrilineal property control have been the dominant value systems of the human, whose self-appointed task has been the “conquest of nature.” This anthropocentric attitude assumes nature is an unlimited repository of resources, to be exploited for man's benefit. Even the conservation movement is largely based on a conservation ethic that assumes natural resources should be conserved or managed for future uses of humans.

In contrast, the influence of ecological concepts of co-evolution and symbiosis has led to an awareness of the evolutionary importance of protecting ecosystem integrity and preserving the diversity of species. The principles of the deep ecology movement teach biocentric or ecocentric values, in which humans are seen as part of nature, not over or against it. The philosopher Arne Naess suggests we have the potential of extending our sense of identity (identification) to include animals, plants, biotic communities, ecosystems, the Earth. The destiny of humankind is seen then, not in the domination and control of nature, but in the special quality of human consciousness, its unique reflectivity and tool-making creativity. Living systems of all kinds are valued intrinsically, in and for themselves—not instrumentally, as resources to be exploited, managed, or conserved.

Human Relationship to Land

<i>Industrial Age</i>	<i>Ecological Age</i>
land use: farming, herding	land ethic: thinking like a mountain
competing for territory	dwelling in place
owning “real estate”	re-inhabiting the bioregion

In relation to the land, the Western industrial-technological worldview is fundamentally based on the notion of property and ownership. Land exists to be used and developed, for farming, herding, building, and so on. Since the beginning of the Kurgan invasions of Europe and the Mediterranean by nomadic pastoralist warrior tribes from Central Asia, about 6000 years ago, the competing tribes have been fighting for territories, and the herds and slaves that went with them. Indigenous cultures such as the Native American have had a very different relationship to the land—more akin to stewardship—with a profound respect for place and the sacredness of certain particular places of power. Similarly, the American ecologist Aldo Leopold spoke of a “land ethic,” that would require us to learn to “think like a mountain.” Today, the bioregional movement advocates a return to an appreciation of the natural (e.g., watershed) boundaries of a given region, optimally with decentralized self-sufficiency. The task of the human is then to “re-inhabit” the place, to really know it and dwell in it.⁴

Human Social Relations

<i>Industrial Age</i>	<i>Ecological Age</i>
sexism, patriarchy	ecofeminism, partnership
racism, ethnocentrism	multiculturalism, diversity
hierarchies of class & caste	social ecology; ecojustice

The value systems governing human social relationships are also changing under the impact of the global transition to ecological worldviews. Feminists and eco-feminists have cogently argued that the domination of nature is inseparable from the domination of women. Under patriarchy, which has come to be the accepted social norm almost worldwide, women were regarded as possessions, along with the children, the herds, and the slaves of conquered peoples. Partnership or “gylany” is the term used by Riane Eisler to indicate the balanced male-female relationship pattern that needs to be re-introduced.⁵ Value divisions based on racial or ethnic differences will increasingly give way to a new planetary global culture that respects and celebrates

qualitative differences and diversity. The beginnings of this can already be seen in the worldwide “fusion” of diverse styles in fashion, music, cuisine, and lifestyle, facilitated by the global media networks. The position of social ecologist Murray Bookchin argues that class domination patterns must be corrected simultaneously with the patterns of our relationship with nature.⁶

Theology and Religion

<i>Industrial Age</i>	<i>Ecological Age</i>
nature as background	animism: everything lives
nature as demonic & frightening	nature as sacred
transcendent divinity	immanent divinity
creation as fallen, corrupt	creation spirituality
monotheism & atheism	polytheism & panentheism

Several religious and theological scholars have pointed out that in the three great monotheistic religions, God (always masculine) is a transcendent creator and law-giver deity. In such religions, there is an inseparable gulf between God and humans, whose only recourse is to obey the law and support the priesthood or Church. In the animistic religious views of primordial peoples, all of nature—animals, plants, mountains, forests, streams, landscapes—is animated by living intelligences (called “spirits”), with which both shamans and ordinary people can be in communication. The monotheistic religions altered this entirely: nature, the world, was the creation of a remote transcendent deity and was inherently corrupt, tainted by original sin, dark, non-sacred, and finally demonic and frightening (which fit with the command to dominate and conquer). By destroying pagan animism and the shamanic traditions preserved in witchcraft, Christianity drastically severed itself from the roots of a regenerative spirituality grounded in the natural world.⁷ Protestantism, which, as Max Weber pointed out, furthered the development of exploitative capitalism by focussing on the value of work in the material world, completed the desacralization of the natural world. In the modern atheistic, materialist worldview, there is no spiritual being anywhere, either in this life or after death, either in nature or above it; but control, use, and exploitation are still the norm.

Although their environmental record is not above reproach, the polytheistic, animistic religions that preceded Judaism and Christianity still had at least a conception of spirituality as immanent within nature.

Pantheism (“everything is divine”) or panentheism (“the divine is in everything”) was the theology of the original Europeans, and of the Jewish and Christian mystics (such as Francis of Assisi and Hildegard von Bingen) as well. The “creation spirituality” concept of theologian Matthew Fox, as well as the work of Teilhard de Chardin and Alfred North Whitehead are modern examples of theology that incorporates the insights of ecology.

Education and Research

<i>Industrial Age</i>	<i>Ecological Age</i>
specialized disciplines	multidisciplinary, integrative
“value-free knowledge” pursued	unconscious values explicated
science-humanities split	unified worldview

In education and research in the modern era, we have come to see the ever narrower specialization of disciplines and an unbridgeable gap between the “two cultures” of science and the humanities. The mechanistic paradigm of classical physics, which has been adopted by the life sciences and the social sciences, assumes that its method attains to “objective” knowledge, to “facts” free of values. Beginning with the work of Thomas Kuhn in the 1960s, historians and philosophers of science have long since established that the pursuit of scientific knowledge is anything but free of values or metaphysical assumptions. In actuality, the underlying value systems presupposed by science are congruent with the domination and exploitation agenda of the patriarchal mind-set. Prediction and control are the stated objectives of research; and the results of research are fed into technology for “man's benefit” (read: profit and capital accumulation) and “security” (read: militarism). In the emerging ecological worldview, with ecology instead of physics as the model discipline, education and the pursuit of knowledge would of necessity be multidisciplinary and integrative. Unconscious values and hidden agendas will need to be brought into the light of critical review. Global citizens of a unified world in catastrophic transition cannot afford to hang on to the fragmented paradigms of European industrial culture.

Political Systems

<i>Industrial Age</i>	<i>Ecological Age</i>
nation state sovereignty	multinational federations
centralized national authority	decentralized bioregions

patriarchal oligarchies	egalitarian democracies
cultural homogeneity	pluralistic societies
national security focus	human & environment focus
militarism	commitment to non-violence

In the political arena, the industrial-technological culture has crystallized around the nation-state. During the modern era, the concept of nation state sovereignty and centralized authority emerged out of the monarchic, feudal, and ecclesiastical forms of the medieval period. Patriarchal power groups, organized to protect patrilineal property and ownership “rights,” imposed a gradually increasing stranglehold of industrial and militaristic cultural uniformity on their subject populations. The propagandistic use of mass-psychological processes of scapegoating and enemy-making culminated in the fascist, genocidal, totalitarian holocausts that European “civilization” inflicted upon the world in the twentieth century. In departing from these suicidal and ecocidal patterns, the kinds of political forms that are emerging are various forms of federations and confederations, a decentralization of the nation state into pluralistic societies of ethnic and national groupings, increased reliance on self-sufficient and self-maintaining bioregions, and a shift of values and priorities away from military to human and environmental concerns.

Economic Systems

<i>Industrial Age</i>	<i>Ecological Age</i>
multinational corporations	community-based economies
assume scarcity	assume interdependence
competition	co-operation & competition
limitless economic growth	limits to growth
economic “development”	steady state, sustainability
no accounting of nature	economics based on ecology

The prevailing economic systems, both capitalist and socialist, are based on the illusion that unlimited material progress can be achieved by further industrialization. Natural capital is relegated to “externalities” in current accounting; and pollution, toxic waste, and adverse health impacts are counted as contributing to “growth” if money is spent on them. Under the impact of an avalanche of feedback that humans are exceeding the carrying capacity (the “limits to

growth”) of the biosphere, while destroying habitats and causing the extinction of countless species of plants and animals whose existence is vital to the regenerative capacity of the biosphere, these assumptions and policies will need to be revised in favour of co-operative, community-based, steady-state, sustainable economies that recognize the prime and ultimate dependence of all human economic activity, as well as all non-human life-forms, on the integrity of the biosphere and the local ecosystems.⁸

Technology

<i>Industrial Age</i>	<i>Ecological Age</i>
addiction to fossil fuels	reliance on renewables
profit-driven technologies	appropriate technologies
waste overload	recycling, re-using
exploitation & consumerism	protect & restore ecosystems

Profit-driven technologies that pollute the global elemental energy cycles and generate catastrophic amounts of toxic and non-recyclable wastes will have to be replaced by appropriate technologies, also called “soft energy paths” by Amory Lovins,⁹ and a massive conversion of the entire industrial infrastructure to re-usable and recyclable materials and products. Technology, instead of being used to feed a runaway cycle of exploitation and consumerism (“more and more goods for more and more people”), will need to be re-directed toward the protection and restoration of damaged ecosystems.

Agriculture

<i>Industrial Age</i>	<i>Ecological Age</i>
mono-culture farming	poly & permaculture
agribusiness, factory farms	community & family farms
chemical fertilizers & pesticides	biological pest control
vulnerable high-yield hybrids	preserve genetic diversity

In agriculture in the industrialized nations, excessive reliance on chemical fertilizers and pesticides, combined with monoculture using artificially produced hybrids has led to disastrous loss of topsoil, genetic erosion, and decreasing yields for increasing populations. The way out of this dilemma, as propounded by the organic farming movement and thinkers such as Wes Jackson and Wendell Berry, is to

return to traditional, small- and medium-scale farming methods that use crop rotation and biological methods of pest control, and achieve thereby a truly sustainable agriculture.¹⁰

In reflecting on the ecological worldview outlined here, it would appear that there is actually a remarkable degree of congruence and agreement, if not consensus, even among people working in quite different areas. The disastrous features of our present policies and practices seem to flow from a few, widely shared basic assumptions and value systems. These assumptions and values have no inherent staying power: they are cultural, not biological givens. The alternative attitudes and values now being advocated in many circles are unconventional, but not unnatural. Indeed, they seem to resonate to the most ancient human longings for exuberant life, freedom to grow, the recognition of spirit, the appreciation of differences, the delight in creativity. The pathways into the ecological age have been, and are being, convincingly articulated by many pioneers. It remains for us to muster the personal and political will to walk these paths.

If a cultural transition to an ecological worldview does take place somewhat as here outlined, it may be that the long-range vision of theologian Thomas Berry is also on target. Looking at an evolutionary time-scale, Berry has proposed that we are coming to the end of the *cenozoic* (the age of mammals and flowering plants), which began 65 million years ago, and moving into an *ecozoic* era.¹¹ According to Berry, we will then realize that we live in a world that is a “communion of subjects,” not just a “collection of objects.” In such a world, humans will be able to find their rightful place, not as rulers, but as participants in the integral interdependent community of all life.

Notes

¹ See *The Subversive Science: Essays Toward an Ecology of Man*. 1967. Edited by Paul Shepard and Daniel McKinley. Boston: Houghton-Mifflin.

² See David Ray Griffin, ed. 1988. *The Reenchantment of Science: Postmodern Proposals*. Albany: SUNY Press, (SUNY Series in Constructive Postmodern Thought); see also Charlene Spretnak, *States of Grace: The Recovery of Meaning in the Postmodern Age*.

³ Willis Harman. 1988. *Global Mind Change*. Indianapolis: IONS and Knowledge Systems.

⁴ See Arne Naess, “Self Realization: An Ecological Approach to Being in the World,” in *Thinking Like a Mountain: Towards a Council of All Beings*, edited by John Seed, et al. 1988. Philadelphia: New Society; Aldo Leopold. 1949. *A Sand County Almanac*.

Oxford: Oxford University Press; see also Van Andruss, et al. 1990. *Home! A Bioregional Reader*. Philadelphia: New Society Publishers. Also in the *Trumpeter* 4 (3)1987.

⁵ Raine, Eisler. 1987. *The Chalice and the Blade: Our History, Our Future*. Cambridge, MA: Harper and Row.

⁶ Murray Bookchin. 1990. *Remaking Society: Pathways to a Green Future*. Boston: South End Press.

⁷ See Mary Evelyn Tucker and John Grim, eds. 1993. *Worldviews and Ecology*. Lewisburg, PA: Bucknell University Press; Thomas Berry. 1988. *The Dream of the Earth*. San Francisco: Sierra Books.

⁸ See William R. Catton. 1980. *Overshoot: The Ecological Basis of Revolutionary Change*. Urbana: University of Illinois Press. Hazel Henderson. 1991. *Paradigms in Progress: Life Beyond Economics*. Indianapolis: Knowledge Systems.

⁹ Amory Lovins. 1977. *Soft Energy Paths*. Cambridge, MA: Ballinger.

¹⁰ See Wes Jackson. 1967. *Altars of Unhewn Stone*. Berkeley: North Point Press; Wendell Berry. 1970. *A Continuous Harmony: Essays Cultural and Agricultural*. San Diego: Harcourt, Brace and Jovanovich.

¹¹ Brian Swimme and Thomas Berry. 1993. *The Universe Story: From the Primordial Flaring Forth to the Ecozoic Era*. San Francisco: Harper Books.