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Towards an Ecological Civilization

Arran Gare

The Austro-French eco-Marxist, André Gorz began the first chapter of his book *Paths to Paradise* by noting:

> Times of crisis are also times of great freedom. Our world is out of joint; societies are disintegrating, our lifelong hopes and values are crumbling. The future ceases to be a continuation of past trends. The meaning of present development is confused; the meaning of history suspended. Because the curtain has fallen on the old order and no other order waits in the wing, we must improvise the futures as never before.¹

This was written in 1983, during an earlier economic crisis, when people were just becoming aware that the global ecological crisis was threatening the very existence of humanity. Gorz’s proclamation was not heeded. The subsequent path taken was of intensified exploitation of nature, farmers and workers, driven by the quest for profits, with almost no regard for ecological constraints. At the same time, the command economies of Eastern Europe collapsed, being totally discredited as alternatives to market based economies. While enriching some to a fantastic degree, this profit driven economic growth impoverished vast numbers of people, brought us to the greatest economic crisis since the Great Depression and to the brink of ecological disaster. This situation makes Gorz’s call for radically new thinking more apposite than ever. The current economic crisis should be seen as an opportunity to chart a new course for humanity, to begin creating an ecological civilization.

To begin with, however, it is first necessary to clarify the seriousness of the situation confronting us. A recent edition of *New Scientist* attempted to portray what the Earth would look like if the world were 4°C warmer.² A map showed most of the presently populated world, including almost all of China, USA, Africa, South America and Australia, to be uninhabitable desert or uninhabitable due to drought, floods or extreme weather. James Lovelock, reflecting on what happened in the Eocene ecological collapse of 55 million years ago, suggested that our inability to address this crisis will leave as few as two hundred million people alive at the end of the century, living close to the North Pole.³ The collapse of civilization is the destiny of humanity unless there is radical change.⁴

Diverse proposals have been put forward to deal with this. For instance, James Hansen (the eminent climate scientist from NASA) and his wife, in an open letter to President Obama and his wife, characterized policies such as the Kyoto Protocol, as ‘ineffecitual and not commensurate with the climate threat’. They continued:

There is a profound disconnect between actions that policy circles are considering and what the science demands for the preservation of the planet. … Science and policy cannot be divorced. It is still feasible to avert climate disasters, but only if policies are consistent with what science indicates to be required.\(^5\)

They argued for a moratorium and phase-out of coal plants that do not capture and store CO\(_2\), raising the cost of carbon emissions via a greatly increased carbon tax and called for urgent R&D on 4\(^{th}\) generation nuclear power with international cooperation. Vandana Shiva is equally concerned about the inadequacy of current government policies, but does not see the solution in nuclear power - which she regards as the dirtiest of all the ‘new clean fuel’ options.\(^6\) Promoting ‘Earth Democracy’ she is calling for local control of food production, nutrition and soil health, defending and recreating traditional forms of farming and ways of life. These are the ways of farming which are sustainable, she argues. They preserve diverse forms of life, including forests, and do not use up resources or generate massive greenhouse gas emissions. Lovelock is even more radical. He calls for a mobilization of humanity equivalent to preparation for war, radically changing the way we live. We must create a civilization that augments the life of Gaia, the global ecosystem. In the immediate future this will involve taking on the massive task of not merely ending greenhouse gas emissions but also ‘geoengineering.’ He has defended the use of nuclear power, but now sees this as hopelessly inadequate. Our last hope is to bury vast amounts of charcoal produced from farm waste to remove carbon from the atmosphere.\(^7\)

These responses exemplify the major orientations to the ecological crisis. Hansen, as one would expect of a scientist working with NASA, puts his faith in market manipulation and technological fixes. He is particularly concerned to promote further research into these. He typifies the attitude of those who accept industrial civilization and seek for answers which build on and extend its achievements. Shiva, who began her career as a physicist, is an exemplary case of someone who has lost faith in industrial civilization and is concerned to expose most of its apparent achievements as illusions, and to show the superiority of earlier social forms. Effectively she is a defender of the agricultural civilization that industrial civilization is destroying. Lovelock, originator of the ‘Gaia hypothesis’ according to which the Earth is a living organism is more complex. He is struggling to chart a path which incorporates the best of past social forms but goes beyond these to something new. Embracing and advancing ecology in radically new directions he is the harbinger of a new, ecological civilization.


\(^7\) Gaia Vince, ‘We’re doomed, but it’s not all bad’, *New Scientist*, 2692, 23 January, 2009, p.30.
How can we evaluate these proposals? It would seem difficult to deny that technological advances generated by industrial civilization have solved one problem after another; however, Shiva is surely right to point out the problems that it has engendered, and that modernist forms of technology, particularly as applied to agriculture, have concentrated economic power, excluding and impoverishing the vast majority of humankind. It is precisely this which has damaged local and global ecosystems. More broadly, she is right to see recent drives for modernization based on neo-liberal ideology as a new phase of imperialism, which has been inseparable from industrial civilization. The success of her movement in preserving and reviving traditional Indian forms of agriculture is a powerful challenge to the assumptions of modernists. However, is the hostility to industrial civilization entirely justified? The far higher life expectancy of people in industrial civilization compared to agricultural civilizations suggests some real successes, and as Lovelock argued, the replacement of coal fired power generators by nuclear reactors could give us the time necessary to avoid disaster, even if it is not enough by itself.

It is in this context that the idea of an ecological civilization, conceived as the successor to agrarian and industrial civilization, suggests a vision large enough to overcome such limitations and face up to the magnitude of ecological problems. At the same time, however, it is evident that this will have to build upon the achievements of all past civilizations. What could it mean to create an ecological civilization as the successor to agricultural and industrial civilizations? To answer this question, I think it is necessary to look at the development of the science of ecology as a fundamental challenge not only to the core assumptions of modern science, but of industrial civilization. By modern science I mean the form science took with the emergence of industrial civilization, a form of reductionist materialism that denied any purpose to human existence, rendered sentient life unintelligible, created a dualism between body and mind and divided science from and opposed it to the humanities. Its most potent ideological interventions have been through Social Darwinism and neo-classical economic theory. Recent developments in ecology provide the basis not only for making teleology intelligible, making sentience comprehensible, overcoming the dualism between body and mind and science and the humanities. By situating humanity as an emergent complex of processes within nature, ecology provides the basis for comprehending the achievements and limitations of both industrial and pre-industrial social forms. In doing so, it is developing the forms of thinking required to rethink the relationship between humanity and nature and between individuals and their communities, and thereby the nature of culture and civilization. This then provides the basis for a different kind of ethics and political philosophy to those that have dominated modernity. That is, ecology is developing the forms of thinking required to create an ecological civilization. What are these forms of thinking?

Ecology and the Global Ecosystem

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8 For further arguments along these lines, see Alf Hornborg, *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment*, (Walnut Creek: AltaMera Press, 2001).

In pondering the present state of ecology, Robert Ulanowicz, a leading theoretical ecologist, claimed that ecology brings into focus what are now coming to be seen as the core problems that have to be addressed to advance science in all fields. Reductionist materialism cannot account for organized complexity or its emergence, and ecology is the field in which such emergence can be studied. As he put it in his book *Ecology, The Ascendent Perspective*:

Ecology occupies the propitious middle ground. ... Indeed ecology may well provide a preferred theatre in which to search for principles that might offer very broad implications for science in general. If we loosen the grip of our prejudice in favour of mechanism as the general principle, we see in this thought the first inkling that ecology, the sick discipline, could in fact become the key to a radical leap in scientific thought. A new perspective on how things happen in the ecological world might conceivably break the conceptual logjams that currently hinder progress in understanding evolutionary phenomena, development biology. The rest of the life sciences, and, conceivably, even physics.10

There are a number of elements to recent developments in theoretical ecology. The most important of these are recent developments in thermodynamics, hierarchy theory, and biosemiotics. Such developments involve a new ways of understanding the nature of life, and justify Lovelock’s Gaia hypothesis, the claim that the Earth itself is alive. These ideas have then provided the basis for new developments in human ecology, characterizing humanity as an emergent complex of processes and structures within the global ecosystem and providing new insights into why civilizations collapse, and what is required to avoid such collapse.

To begin with, far from equilibrium thermodynamics, focusing on open systems, is given a central place. Open systems, or as Ilya Prigogine characterized them, ‘dissipative structures’, are to some extent self-organizing, generating states and trajectories that are to some extent independent of their environmental. Their emergence involves a form of creative causation. Appreciating this requires a radical rethinking about the very nature of physical existence. As Prigogine and Isabelle Stengers argued, it requires the acceptance of process philosophy of Henri Bergson and Alfred North Whitehead in place of the reductionism of mainstream physics, whether in the form of atomism or unified field theory.11

Far from equilibrium thermodynamics entails embracing complexity theory, the science concerned with organized complexity. A variety of theories have been developed under this banner, ranging from essentially reductionist approaches focusing on the patterns which emerge in the computer modeling of interactions between large numbers of components, to theories radically opposed to all forms of reductionism. It is the latter that are more important for ecology.


One of the most important of these is hierarchy theory. Through this, scientists have been able to account for the emergence in nature of final causation, that is, teleology. For hierarchy theorists, the very being of any system involves self-constraining, and such self-constraining is the basis of their freedom. As Howard Pattee pointed out:

The constraints of the genetic code on ordinary chemistry make possible the diversity of living forms. At the next level, the additional constraints of genetic suppressors make possible the integrated development of functional organs and multi-cellular individuals. At the highest levels of control we know that legal constraints are necessary to establish a free society, and constraints of spelling and syntax are prerequisites for free expression of thought.

To identify these hierarchies of constraints it is necessary to identify different process rates. Emergence of new systems involves the interpolation of new constraints characterized by specific tempos between systems characterized by longer and shorter tempos. Behaviour corresponding to higher levels operates at slower rates, while lower levels are characterized by relatively fast rates, and understanding the relationships between processes characterized by different rates allows us to understand teleology. As Stanley Salthe put it: ‘constraints from the higher level not only help to select the lower level-trajectory but also pull it into its future at the same time. Top-down causality is a form of final causality.’

In developing hierarchy theory, Pattee was particularly concerned to provide a physical account of ‘semiosis’, that is, of how physical processes generate and interpret signs. Through signs, systems can respond not only to their immediate situation but can anticipate what situations they will encounter in the future. It was soon realized (by Salthe) that Pattee’s ideas accorded with the more radical work of the philosopher C.S. Peirce who had attempted to develop a general theory of signs, to account for their possibility, and to reveal the extent to which the production and interpretation of signs pervades nature. The most general definition of a sign offered by Peirce is that it is that which ‘mediates between an object and an interpretant; since it is both determined by the object relatively to the interpretant, and determines the interpretant in reference to the object, in such wise as to cause the interpretant to be determined by the object through the mediation of the “sign”’. It is important to emphasize here ‘this tri-relative

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influence’ is not ‘in any way resolvable into actions between pairs.’ Interpretants can themselves become signs, generating new interpretants, and this process can continue indefinitely. Such semiosis involves limiting of possibilities or determining, in this case of the interpretant by the object through the sign, but this is what facilitates greater control by a system of its own dynamics.

When people talk of the production and interpretation of signs they are prone to think of this as first and foremost as something ‘mental’, as in language where an utterance is made by someone and interpreted by someone else. However, far more commonly in nature, interpretants, which in turn become signs for further interpretation, are actions. This is true not only with almost all animals, but with human semiotic activity. Interpretation is an aspect of an action, and actions are signs for other actors. Even more fundamentally, interpretation is growth of form, of ‘morphogenesis’. Morphogenesis is the process by which embryos grow into organisms, plant germs grow into plants and colonies of organisms grow to form larger structures such as moss, corals or forests. DNA is really a system of signs bequeathed by organisms to their progeny interpreting the environment they will grow within. It is by virtue of this that plants grow down to water and up towards light, utilizing gravity as a directional sign, and develop their characteristic forms. This is ‘vegetative semiosis.’ Such generation of form, utilizing the potentialities of physical structures, is central to all life. As Kalevi Kull argued, ‘vegetative semiosis’ is the most primordial form of semiosis. It is presupposed by ‘animal semiosis’ or action, which in turn is presupposed by ‘intellectual semiosis’. Semiosis can involve all three levels. For instance, the growth of flowers and their opening is a sign to bees, which is interpreted in their activities of collecting nectar, but also in bee dances in their hives by which they indicate to other bees where flowers can be found. Such semiosis is central to all and the condition for all life on Earth. Jesper Hoffmeyer has suggested that the emergence of the global ecosystem has created what he calls the ‘semiosphere’, a sphere central to the auto-regulation of life and the global ecosystem.

So far I have been discussing ecosystems, referring to organisms only as components of ecosystems. Where do organisms fit within this scheme? Organisms can best be understood as highly integrated ecosystems, that is, as systems of ‘homes’ (the literal meaning of ‘ecosystem’) for smaller systems such that their activities are coordinated to serve the common good. That is, organisms are systems of systems in synergetic relation to each other. This is most clearly the case with multi-celled organisms where the whole provides the home for the individual cells, coordinating their activities to serve the common good of all these cells. However, Lynn Margulis has shown that eukaryotic cells, that is, cells with a sharply defined nucleus, consist of components that evolved independently of each other and then entered into symbiotic relation. As Margulis put it, we are all symbionts.

What then is ‘life’? Life can then best be understood as ecosystems, that is, as communities of processes in symbiotic relation, able to constrain each other directly or through the mediation of signs to coordinate their activities to serve the common good, reproducing or facilitating the reproduction of the members of these communities, and thereby maintaining themselves in existence as communities. All ecosystems, including organisms, are communities, or more commonly, communities of communities, that create and provide niches or homes for their components. They can be healthy or unhealthy. ‘Health’ is characterized by mutual augmenting of the whole community and the component communities at multiple levels. Characteristically, it is associated with the generation of forms consisting of mutually augmenting centres at multiple scales. The breakdown of health can have many causes, but it is characterized by loss of coordination, corruption of semiosis, loss of balance and destruction of the conditions for continued existence. These can be generated outside the ecosystem, but can also be endogenous. This is often associated with the breakdown of constraints on component communities as occurs for instance in cancer, where cell reproduction produces tumours which, if they do not destroy vital organs, absorb all nutrients and starve the rest of the organism. ‘Death’ is the final breakdown of such coordination and thereby the destruction of the homes conducive to the flourishing of component systems. We should think of all ecological communities, ranging from single cells to multi-celled organisms to local ecosystems and the global ecosystem as being alive. This justifies Lovelock’s claim that the global ecosystem is a living being, Gaia, under adverse circumstances, could lose its capacity to coordinate its components for the common good of their components, and die.

From Ecology to Human Ecology: Humanity as a Component of the Gaia

While traditional Darwinian mechanism of evolution as variation and selection in the struggle for survival is not entirely wrong, it misrepresents what is most important in variation and in survival. Variation includes the emergence of new kinds of organism based on new kinds and levels of cooperation, while one of the most important determinants of survival is their effects on their environmental conditions or ‘homes’. Orthodox Darwinians tend to be blind to this. They are also blind to teleology. New kinds of organisms can be regarded as experiments by ecosystems. They come into existence with their autonomous dynamics, and if they augment their ecosystems (which can be through limiting the excessive proliferation of other organisms) they are preserved. On the other hand, ecosystems, and this includes the global ecosystem or Gaia, effectively remove those organisms that destroy their environments. Cancerous tumours are good examples of such organisms, which are either eliminated by the organism in which they emerge, or are eliminated through the elimination of the organism that was their home. Whole species of organisms destroy their environments in this way, and be eliminated.

From this perspective, humanity can be regarded as a very complex experiment by the global ecosystem. It is complex because it involves a multiplicity of new kinds of organization and cooperation, from local communities to global civilization. However, all

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24 This claim has been contested, particularly by Mark Sagoff, but it has been defended, notably by Ernest Partridge and Robert E. Ulanowicz. On this debate, see Ecological Integrity: Integrating Environment, Conservation, and Health, David Pimentel et. al. (eds), (Washington: Island Press, 2000).
this complexity is made possible by the unique kind of semiosis characteristic of humans which makes them more essentially cultural beings than any other animal. The most obvious manifestation of this semiosis is human language which drives the quest to represent the world more adequately. However, while language is extremely important, there are two other dimensions or ‘dialectics’ of culture which are irreducible to language. The second dialectic, the dialectic of labour, derives from the capacity of humans to recognize objects as signs of functions and thereby use and make ‘tools’, that is, shared instruments to augment control of the world, including weapons, machines, houses, roads, electronic media and so on. It is by virtue of this dimension that humans are major contributors to the morphogenesis of nature. The third dialectic is the capacity of people to recognize others as other subjects, and through others, themselves, as free social agents sharing a common world. Each of these dialectics of culture is a component of the other, yet irreducible to it.

As noted above, all emergent order involves new constraints, and this is also true of the dialectics of culture, including the dialectic of recognition. Proper recognition of others carries with it self-constraint, which is a condition for establishing a proper sense of one’s own self as a free agent and constraining one’s own activities accordingly. It is this dialectic that is most important for creating institutions and complex forms of organization with stable role relationships which are sustained over generations, and self-conscious identities able to challenge and change existing institutions. The dialectic of recognition engenders a drive for justice as the proper recognition of others and oneself. As such, it has enormous potential for achieving an harmonious social order based on justice, which can be extended from humans to the rest of nature.

However, recognition of a kind can also be achieved by people defining themselves against a diversity of others. Most agricultural civilizations engendered social forms characterized by groups unifying themselves into elite classes in opposition to other members of their society and to others of neighboring societies, exploiting the subordinated classes to produce prestige goods to define their superiority and develop the military means to combat the ruling classes of other societies. The result was usually imperialism. Such elite classes have been forms of cancer within their ecosystems. Intensifying exploitation of peasants and through them, the land and forests, they destroyed their ecosystems, leading to collapse of their civilizations, a collapse of their populations and then to ‘dark ages.’ This trajectory was followed by the Maya civilization which began its collapse in the ninth century A.D. and has been intensively studied, but it is also the trajectory followed by the bronze age civilizations (Mesopotamia, Harappa, Mycenae and Egypt) over three thousand years ago, various civilizations in the Americas, the Western Roman Empire, Islamic Mesopotamian civilization in the late ninth century AD, and Byzantine civilization.

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Industrial civilization has continued on the same trajectory. Originating in Britain and then spreading first to Europe and then around the world, either associated with European colonization or in response to the threat of subjugation by industrialized societies, industrial civilization has been characterized by imperialism and warfare on a massive scale. It has been associated with elite classes committed to domination of members of their own societies, workers as well as peasants, and domination of other societies, and to the production of prestige goods and weapons on a scale unimaginable to the ruling classes of agricultural civilizations. The result has been massive global ecological degradation. However, up until now the consequences for the elites have been avoided partly through the range and extent of countries they have been able to exploit, but also by the exploitation of fossil fuels and by the development of new technologies which have extended the possibilities of exploitation. This civilization has been able to both advance itself while blinding itself to its destructive effects through the world-view of scientific materialism. Scientific materialism has provided the knowledge to develop most of the technology of industrial civilization, but has also underpinned economic theory, Darwinism and Social Darwinism through which the reduction of nature and lower classes to mere instruments has been justified, and the destruction of ecosystems, societies and civilizations legitimated as the inevitable byproduct of economic and evolutionary progress. This world-view has largely neutralized the quest for justice which is incomprehensible from the perspective of reductionist materialism. Progress has been defined as the total reduction of nature and people to instruments for the maximization of disposable income.

The impending global ecological catastrophe has undermined the legitimacy of all of this. And the global financial crisis has further exposed the illusions cultivated by the elite classes that their massive accumulation of wealth and power and their obscene levels of conspicuous consumption benefit ‘economic growth’ and thereby humanity. But for the global ecological catastrophe to have been recognized as a threat is testament to the advance of the dialectic of representation, and along with this, the dialectic of recognition, in opposition to reductionist materialism. Through the advance of science beyond reductionist materialism, humanity has come to understand that it has a potential function in nature, and that function is to augment the life of the global ecosystem, and that if it does not embrace this function, it faces extinction. Appreciating this is appreciating the contribution of human culture to the semiosphere; it is the advance of Life’s semiosis to the stage where, through humans, Gaia has become conscious of itself and its significance, and the problems confronting it, the most important of which is the current trajectory of human civilization. At the same time this semiosis has revealed the quest for justice, the proper recognition by components organisms of the dynamics and significance of ecosystems, is integral to healthy ecosystems. The advance of the dialectic or recognition whereby people constrain themselves according to their growing appreciation of the significance of ‘others’, both human and non-human, or more generally, ecosystems, are the constraints required to return local and the global ecosystem to health. The science that integrates all this, and thereby transcends the opposition between science and the humanities, is ecology.

With the perspective provided by ecology, including human ecology, we can now re-examine the proposals to deal with global warming. Vandana Shiva is certainly justified in calling for proper recognition of the local knowledge and forms of life of
peasants who have developed sustainable forms of agriculture, but this is not enough. It is in the state of Kerala (the Sweden of India), with its strong commitment to providing education, health services and to strong democracy through which local populations have been empowered, that ‘Earth Democracy’ has been pursued most successfully. This shows the way ahead. It was almost inevitable that until a global civilization had formed that more brutal and more ecologically destructive societies would subjugate less aggressive societies, but these brutal societies have generated the technological, cultural and institutional means to transcend such brutality and to provide the conditions where healthy communities, such as those in Kerala, can flourish.

Jim Hansen’s call for nuclear power looks suspicious. Nuclear power plants in the past have been large scale affairs associated with the concentration of economic and political power, but some of the proposed fourth generation nuclear reactors could be small affairs, generating power for towns or villages for centuries without generating wastes or materials that could be used to manufacture nuclear weapons. Such nuclear reactors are on the drawing board, however, and it often takes forty years to move from this stage to full implementation. This is too long. Of the proposals considered by James Lovelock, the most promising is the burying of charcoal. To work properly this should be based on small scale units, using relatively small scale technology which should be easy to develop to turn agricultural waste such as rice or wheat stalks into charcoal, and then bury it. An important feature of this is that while it can double yields, charcoal does not function as a fertilizer. It builds up the structure and eco-dynamics of the soil, generating soil ecosystems which enable plants to utilize the nutrients in rain while retaining moisture, thereby allowing crops to be grown with much less fertilizer and less water. It is a strategy based on augmenting our ecosystems, constraining the dynamics of life to improve the health of the global ecosystem.

It is important to think about more than technological solutions, however. To avoid the kind of destructive exploitation that has characterized past civilizations it is necessary to create a global civilization that not only empowers people to augment their ecological communities but inspires them to do so. In place of a social order that concentrates power, subjugates workers and promotes consumerism, it is necessary to create a civilization in which people define themselves and gain fulfillment and meaning in their lives through their work and through participation in the governance of their communities. The most promising path to achieve this is the development of a multi-leveled hierarchy of communities characterized by organized decentralization (with perhaps Switzerland and Kerala providing models for this). Broader communities, united by working for the broader common good, should constrain more local communities to prevent conflict and exploitation and align their activities with the common good, while empowering these local communities to constrain the broader communities to ensure they fulfil this function. Ecology provides the thinking required to achieve this. Ecologists have found that it is precisely such organized decentralization, whereby components have the freedom within broad limits to develop in their own way, which characterizes healthy

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ecosystems.\textsuperscript{30} We need a world civilization structured as communities of communities at multiple scales, with human communities recognizing themselves as participants in ecological communities, ultimately participating in the life of Gaia. To achieve such a social order it is necessary to educate people to embrace such an ecological world-view to enable them to develop their own unique potentialities to contribute to this complex of communities and to see the significance and meaning of their own lives, and the lives of the local and broader communities, accordingly. Creating such an ecological civilization is the challenge we face, and the current economic crisis provides an opportunity to accelerate this process. If we fail, our current civilization will be destroyed, and this process will continue over perhaps millennia until humans get it right or are finally eliminated. It would be better to succeed on the first try.