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Moral Ambiguities in the Politics of Climate Change

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Historically, the discourse of environmental ethics rested on the biocentric/anthropocentric distinction: an environmental ethic was one that extended moral significance beyond the sphere of merely human interests to the interests of life at large. However, in the context of climate change, this biocentric/anthropocentric distinction is becoming blurred, since efforts to mitigate climate change in the interests of human survival also generally serve the interests of the larger biosphere. In the context of climate change, in other words, environmentalism is undergoing globalization: its object is now the biosphere as a whole rather than particular ecosystems or species. However, there are different ways the biosphere as a whole may be conceptualized, and from these different conceptualizations, very different mitigation strategies, with very different consequences for other-than-human life, flow. It is important then, in the interests of environmental ethics in its original sense, as an ethic inclusive of other-than-human forms and systems of life, to distinguish these different conceptions of the biosphere and track their ethical implications.

Environmental Ethics and Anthropocentrism vs. Biocentrism

I happened to attend one of the very first screenings of *An Inconvenient Truth* in Australia. There was little advance notice of what we, the audience, could expect. When, in the stunned aftermath of the screening I walked out of the cinema, I remember thinking, "everything has changed." And it had. The year 2006 was the year the world woke up to climate change. This was not only because of Al Gore's film, of course; but the film certainly helped to precipitate the exact historical moment of awakening.

Although it was exhilarating to witness the moment of awakening, it was also, for me, touched with personal ambivalence. Ecological philosophy had been my life's work up to that point, and ecological philosophy had been, at its heart, a moral wake-up call. It had been essentially an argument for the moral significance of nature in its own right, over and above its utility for human purposes. It had, in other words, been an argument for some form of *biocentrism*, or *bio-inclusiveness*, in our moral thinking, or for a specifically *environmental* ethic, an ethic of nature.[1] Of course, there had been those who had argued that moral protection for the environment could be derived from the purely human-regarding ethical systems that had hitherto characterized the Western tradition, and that a new biocentric departure was neither required nor justified.[2] But insofar as ecological philosophy embraced the biocentric perspective and insisted on the intrinsic moral significance of nature, it did indeed inaugurate a new phase in the philosophical thinking of the West. The argument for this intrinsic moral significance of nature took many different forms, and solidified into many different positions, which were often at loggerheads with one another, but they were nevertheless basically all lined up against the blindness of Western civilization to the moral consideration of other-than-human forms and systems of life. The argument of ecological philosophy was, in other words, basically pitched against an anthropocentrism deeply entrenched in Western thinking since its inception.[3] The anti-anthropocentrism of the new environmental ethic, so counter to the basic Western mind set, articulated a sentiment that was core to environmentalism. Not all environmentalists shared it, but it was the main moral wellspring of the movement, and gave to the movement its distinctive moral passion.

The argument for the intrinsic moral significance of nature hinged on the question of what it is that entitles an entity to moral consideration. For many, though by no means all, ecological philosophers, an entity was entitled to moral consideration if it possessed an attribute of the kind that could broadly be described as mind-like. Although philosophers differed in their exact characterization of this attribute, most, though again by no means all, shared a tacit assumption that the concept of nature had in the West been constructed in opposition to the concept of humanity, and that this dualistic construction had reserved mind for us and had drained all mental-type qualities out of nature, leaving nature with only the matter-qualities accorded it by a strictly materialist science. By mental-type qualities, I mean here not only consciousness as it is found in the human instance, but larger possibilities of intelligence,

subjectivity, sentience, agency, intentionality, telos, or conativity, such as might belong to a wider range of organisms, and perhaps even to all of life.[4] In any case, it is manifestly such mentalistic qualities, in this larger sense, that imbue an entity with a degree of self-meaning, a degree of mattering to itself. And an entity which matters to itself is categorically different, from a moral point of view, from one which does not: destroying an entity that matters to itself is, at least prima facie, a different proposition, morally speaking, from destroying one which does not matter to itself. There is, in other words, a fundamental relationship between morality and mattering, and while it may indeed be that entities can only have moral significance if they matter to someone, that someone can, in the case of entities with mental attributes, be themselves. In order to show that nonhuman as well as human entities are morally considerable then, ecological philosophers often argued, contra mind-matter dualism, that nonhuman existence, like human existence, is permeated with mind-like attributes.

Restoring mental attributes to nature in this way and accordingly extending moral consideration beyond the circle of human interests represented, as I have remarked, a radical challenge to the metaphysical and moral premises of Western civilization, with its foundational commitment to a materialist science and an instrumentalist economism. It was for this reason that the discourse of ecological philosophy, with its advocacy of a specifically environmental ethic, or ethic of nature, had a dissident status, and to the extent that this discourse informed environmentalism, lent the movement a counter-cultural flavor.

Precisely because the roots of anthropocentrism lay so deep in Western thought, few of us ecological philosophers or environmentalists were, I think when I look back, really surprised that our call for a new environmental ethic was largely ignored by mainstream society. We understood that such an environmental ethic was morally revolutionary in its implications for the West, and was hence at best a long term goal. So some of us were a tad unprepared when suddenly, in 2006, the great wake-up seemed to be upon us! After decades of denial, society was suddenly facing up to the frightening urgency and gravity of the climate crisis. And the climate crisis was so huge in its environmental implications it seemed to swallow up other environmental issues—environmentalism itself seemed to morph, in the public imagination, into response to climate change.

Welcome as this sudden green awakening was, I personally was left, as I have remarked, wondering what further role, if any, there would

be for ecological philosophy. Now that it had been widely acknowledged that we were in the midst of an unprecedented environmental crisis, the ball was, it seemed, in the court of economists, scientists, and designers: their task was to work out, in practice, how to re-design the production regimes of modern societies to bring them in line with sustainability requirements. Moral musings seemed, in the new Titanic context, superfluous. However, I held my peace, and waited to see how the dust would settle. I did notice that, at my own university, nobody beat a path to my door and said, "Oh, you ecological philosophers were right after all!" Nobody apologized for the marginalization that ecological philosophy had always endured within the academy. I noticed too that despite the fact that debate on climate change was dominating the airwaves, the new "experts" were not the old environmentalists and greenies, but the same economists, managers, industry leaders, and politicians who had but a few years earlier scoffed at the very idea of an environmental crisis. They seemed to be taking the newly acknowledged crisis more or less in stride, a new variable to be factored into the old equations. I fully acknowledged that practical solutions were indeed what we needed now, and that practical solutions would emanate from economists, scientists, business leaders, lawyers and the like. But nevertheless, something seemed to be missing in the new debate.

Having accepted that environmental problems were extremely urgent and serious after all, mainstream commentators and leaders seemed to imply, in their behavior, that such problems could certainly not be entrusted to those pipe-dreaming counter-culturalists, the greens. The time had come, it appeared, for proper hard-headed solutions to be brought forward. This was code for more of the same thinking that had produced the crisis. In other words, the value system seemed not to have changed. It was as anthropocentric as ever. The whole "awakening" to the environmental crisis in the shape of climate change had in fact pretty much by-passed the moral question. Yet the climate change debate was clothed in the moral rhetoric of environmentalism, and for this reason environmentalists appeared to accept its legitimacy.

Nature of Climate Change and Moral Distinction between Anthropocentrism and Biocentrism

But why did environmentalists, or those of them committed to an environmental ethic, not see through this? Why did they seemingly, by and large, accept the terms of the climate change debate, and welcome

it? One reason, I think, lies in the way in which the nature of climate change itself *masks* the moral distinction—between anthropocentrism and biocentrism—on which an environmental ethic rests. Climate change introduces moral *ambiguity* into environmental debate. Or that, at any rate, is the proposition I wish to explore here.

I shall consider two main ways in which climate change introduces such ambiguity. First, there is the matter of *scale*. The scale of the climate problem is so great as to simply, potentially, overwhelm environmental ethics: when the habitability of the planet per se is at stake, efforts to maintain its habitability for humans will *ipso facto* help to keep it habitable for all life systems. In past environmental struggles, human interests and the interests of the other-than-human world have often been locked in conflict; the moral issue in these cases has been whether we are justified in appropriating or destroying nonhuman beings or systems in pursuit of our own self-interest. In the current climate change crisis however, human interests and the interests of other-than-human entities and systems seem to be thrown together into the same life boat: in order to protect itself, humanity has to secure the physical conditions for life per se, and in doing so, it will incidentally be helping to save the rest of nature. The old biocentric/anthropocentric distinction thus appears in this context to no longer be useful.

Although there is some truth to this claim—that in the climate change context our efforts on our own behalf will also, incidentally, benefit the rest of nature—our choice of actual mitigation strategies will be profoundly influenced by our moral presuppositions. If these presuppositions are anthropocentric, our goal is likely to be to perpetuate industrial civilization in basically its present form by relying on a purely instrumental scientism for our solutions. This will involve devising large-scale mechanistic or engineering remedies that are conceived with little regard for their consequences for the rest of life. Opting for nuclear power as an alternative to fossil fuels is an example of this approach. So too are the various large-scale engineering strategies that have been proposed to mitigate global warming. These include the use of giant reflectors in space to regulate atmospheric temperature or the pumping of sulfur into the atmosphere to achieve solar dimming and thereby, again, reduce global temperature. Other such suggestions include firing particles into the stratosphere to replicate the effect of "volcanic winters" and pouring chemicals into the oceans to encourage the growth of algae that will then gobble up CO_2 from the atmosphere. The rush to cut into the last of the earth's forests and shrublands for bio-fuel production follows a

similar anthropocentric trajectory, advocating use of the last remaining biological resources of the planet to prop up our present industrial and transport regimes.

In all these cases, a science which treats nature as pure mechanism is brought to bear on the problem of thermal instability, and narrowly-conceived solutions which serve industrial civilization are proposed with little or no regard for their consequences for planetary life-systems. In other words, without a conscious commitment to biocentrism, Western approaches to climate change are likely to substitute technical systems for natural ones and to select mechanistic strategies that impact negatively on natural systems. Even if these strategies succeeded in securing the physical conditions required for climate stability—and it is doubtful that they would do so—their own consequences may turn out to be as harmful to other-than-human life systems as climate change would have been.

While we might then concede that *scale* alone does not collapse the moral distinction between an anthropocentric and a biocentric course of action in the context of climate change, there is a *second* factor arising out of this context that also generates moral ambiguity. This is the factor of *globalism*. Since climate change is inherently and irreducibly a global phenomenon, it forces us to re-cast environmentalism in global terms. Insofar as the moral object of environmental ethics has traditionally been "nature," climate change forces us to think about nature not in terms of particular ecosystems or organisms or even species—this forest, that wetland, this endangered butterfly, that significant habitat—but rather in terms of the biosphere as a whole. Nature, in other words, is understood holistically rather than as a mere aggregate of living things: it is the planetary system as a whole that generates climatic phenomena. But how exactly is this whole to be conceptualized?

I would like to propose two ways—both holistic, but differently so—in which "nature" under its global aspect might be conceived. The first such way in which nature might be conceived is as a self-realizing or autopoietic system, defined not in terms of the elements that contingently constitute it, but in terms of its ends as an entity in its own right, which is to say, in terms of its status as an end-for-itself, and its disposition to navigate circumstances in such a way as to preserve its own identity as a living system through time and change.

The second way in which nature under its global aspect might be (holistically) conceived is as a self-realizing or autopoietic system, yes, but one which is defined not merely in terms of its ends—the end of self-

preservation—but also in terms of its specific pattern of organization, its pattern of self-structuration. The moral significance of nature under its global aspect, from this point of view, lies as much in this pattern of self-structuration as in its status as an end-for-itself. In protecting it, we would not only preserve its physical continuity through time and change, but its particular organizational integrity as well.

For a fuller appreciation of the distinction between these two interpretations of global nature, let us examine each of them in turn.

If, in speaking of the biosphere as a whole, we intend to indicate a Gaian-type self-regulating or autopoietic system which seeks actively to preserve and promote the physical conditions necessary for its own self-perpetuation, then it might seem natural to assume that in protecting that system we will also be protecting the particular ecosystems—the forests, wetlands, species, habitats, and individual organisms—that make it up. We might assume, in other words, that our efforts on its behalf will have outcomes consistent with biocentrism. But is this necessarily the case? Consider an analogy. An organism, let us call it O, might evolve a capacity to replace the organs in its body with crafted structures that reproduce the functional effects of the original organs. O might undergo a quite extensive internal conversion of biological organs to replacement devices that nevertheless ensure O's perpetuation just as effectively as the original organs did. O's own substitution of devices for organs might well then be consistent with its original autopoietic ends—this substitution would not necessarily detract from O's status as an end-for-itself and as a self-realizing system, though the "self" that it preserves and realizes is not the original community of organs but a hybrid of organs together with devices of its own making. We ourselves are, after all, such an organism, capable of substituting technological devices for some, maybe one day many, of our organs, yet remaining dedicated to our own self-realization and in this sense retaining our commitment to our original autopoietic ends.

If nature under its global aspect is defined purely in terms of its autopoietic ends, there seems no reason, morally speaking, why we should not substitute technology for ecology as the internal mechanism for the self-preservation of the biosphere. "Biosphere" here signifies a system that reproduces the conditions for life, where "life" is understood in generic rather than specific terms, as a physiological process rather than as any particular pattern of species composition. That we ourselves ended up more or less exclusively occupying the resultant space for life would no more count against the autopoietic status of the planetary system, from

this point of view, than multiple organ replacements would count against the autopoietic identity and continuity of the human patient.

In other words, if nature under its global aspect is defined purely in autopoietic terms, then "nature" might well be "saved" by our substituting technological systems for many or most ecological ones. There is no telling, a priori, that this is not possible—that we might not be able to engineer the planet so that it remains hospitable to "life"—in the shape of ourselves—even though most natural ecosystems have ceased to exist. To put this in Gaian terms, as products of Gaia's self-activity, our activities, including their technological expressions, might be seen as just as integral to Gaia's autopoietic agency as are the activities of biotic systems. If Gaia's moral significance lies in its status as an autopoietic system, then can't we humans see ourselves as agents of Gaia's moral purpose? But saving "nature" by substituting technology for ecology is hardly the kind of outcome intended by proponents of a bioinclusive environmental ethic.

Now let us consider the position that what is morally significant about the biosphere under its global aspect is not merely that it is a living system in the autopoietic sense—though we may be agreed that it is indeed a living system in this sense—but that it is a living system in a further sense, namely inasmuch as its internal organization conforms to certain definitive principles. In other words, what makes the biosphere as a whole morally considerable, according to this position, is not just that it is an end-for-itself and is self-active in pursuing its own continued existence, but that its way of pursuing its existence—the strategies and principles of organization it follows in doing so—represent the embodiment of what might be called a special *genius* that is the peculiar province and merit of living things. This genius is characterized by the economy of means that living things employ to achieve their ends—their ability to convert wastes from other organisms into resources for themselves and to make of their own costs opportunities for others, and vice versa. In other words, living things realize themselves by availing themselves of the resources provided gratis by others, where this has the consequence that their possibilities of self-realization are tightly shaped by one another. Such an economy of means is, as the turning of costs into opportunities for others demonstrates, logically tied up with a functional interdependence so intricate as to make such systems effectively mutually inextricable.

This relational inter-functionality, integral to the peculiar genius of living systems, gives such genius a distinctively moral texture, a texture of accommodation of self to others, that confers on living systems a moral

status additional to the moral status that accrues to them simply on account of being ends-for-themselves. The genius of life is then a genius of adaptation of self to other, which is at once a genius of intelligence, insofar as it conserves effort and thereby increases fitness, and a moral genius, indeed the very prototype of morality. Since the biosphere as a whole is a system internally organized in accordance with this principle of accommodation of self to other, and moreover constitutes the condition for the like organization of its component systems, it is the pre-eminent locus of this peculiar genius and of the merit associated with it, and for this reason may deserve our moral consideration.

If the biosphere, viewed as a locus of such genius, is the object of our moral concern, then our own interventions on its behalf have to conform to its distinctive pattern of organization. It would not suffice, in this instance, merely to secure the physical conditions necessary for life, in a generic sense, on the planet. We would have to secure those conditions by the same kind of means that nature does, for otherwise our interventions would destroy the very thing—the pattern of organization—we seek to preserve. This way of interpreting nature indicates the path of biomimicry, biomimicry being a philosophy which takes nature as the model for design and organization in human praxis. As biomimicry advocate, Janine Benyus, explains, biomimicry "is a new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems" (Benyus 1997, xi). Biomimicry points more generally to the idea of a "circular economy," a closed-loop system that converts all "waste" incurred in (agricultural or industrial) production into resources for further production. ("Circular economy" is the term adopted in China for industrial ecology, or the organization of industrial production in accordance with the principles that structure ecosystems in nature. It is defined in opposition to a "linear economy," which rests on the assumption that resources can be secured in endless supply at one end, and allowed to build up in the environment as waste at the other end.[5])

However, although biomimicry is undoubtedly a key concept in addressing climate change, and the circular economy is a key development in sustainability theory, neither of these will necessarily, of themselves, lead to bio-inclusive outcomes. For suppose it turns out that we can indeed re-design industries and transport-systems and built-environments along strictly biomimetic lines. We might discover how to construct "living buildings," for instance, which, in the process of serving the needs of their occupants, capture solar energy, precipitate and circulate

water, extract oxygen from carbon dioxide, and regulate their own temperature purely via physical design.[6] We might design industrial plants that purify and recycle water as they consume it and filter and regulate atmospheric gases, while at the same time, with their waste streams, create resources for further manufacturing and for food production.[7] We might eventually become so adept at designing cities and industries and transport systems that functionally equate with ecological systems that the need for ecological systems as mechanisms of planetary self-regulation will be obviated. Solar cities that photosynthesize may take the place of forests, and industrial "plants" that purify and reticulate water may take the place of wetlands. Manufacturing processes that include food in their outputs and confine production inside closed resource loops may replace traditional agriculture and bypass the need for resource extraction and waste disposal. The physical conditions for life may, in other words, ultimately be maintained by biomimetic technical systems that render superfluous the biological systems they imitate, with the result that the "planetary life" which these conditions safeguard becomes vested exclusively in us.

The Need to Protect the Biosphere as a Whole

In relation to both interpretations of global nature, it may be argued that seeking to protect nature under its global aspect subtly tends to prioritize the interests of the system as a whole over the interests of its component parts. Whether this system is identified in terms of its autopoietic ends, as in the first, or its distinctive pattern of organization, as in the second, we could protect it—its ends or its pattern of organization—while sacrificing its actual living components, the forests, wetlands, species, habitats, and individual organisms that are the objects of a biocentric ethic. In other words, the apparently biocentric goal of "protecting nature," in the global context of climate change, could quite conceivably lead to outcomes which were anthropocentric.

So the issue of climate change is fraught with moral ambiguity for environmentalists. I would suggest that the way forward is to maintain our traditional environmental commitment to local ecosystems as moral ends-in-themselves, and not allow this commitment to be subsumed under the new global perspective emanating from climate change. In other words, concern for the biosphere as a whole needs to be balanced with concern for its component parts if we wish to retain a biocentric orientation. As long as earth is valued exclusively as a global system, its parts may be sacrificed for the sake of the whole. In making this

point I am re-playing earlier debates in environmental ethics regarding the rights of ecosystems versus those of individual organisms.[8] However, the moral ambiguities that vex questions of part-whole relations do arise again in the context of climate change, and it is important to be alert to them if we wish to avoid conflating biocentric and anthropocentric objectives.

That said, it is at the same time self-evident that environmentalists committed to bio-inclusive outcomes also need to address the problem of climate change, since stable climatic conditions are as necessary for nonhuman life as they are for human life. So how can environmentalists of a biocentric persuasion maintain their moral commitment to particular ecosystems while still taking into account the global requirements of climate stability?

Bio-Synergy Will Protect the Biosphere and Address the Climate Change Problem

I would suggest that we rely on these ecosystems themselves as our main means of climate change mitigation and as our main avenue to sustainability in production. I am suggesting, in other words, that we maintain our traditional commitment to natural ecosystems while also discovering how to make these systems work for us, as never before. This means entering into a partnership with ecosystems, being prepared not merely to conserve them in their present form, but to act as agents of their evolution, adapting and changing them, but in directions that are consistent with their own biotic integrity and conative trajectory. I call this kind of partnership *synergy*.

Since conativity and synergy are salient categories here, let me take a moment to explain them. By the term *conativity*, I mean the innate impulse of living things to maintain and increase their own existence, each in their own particular mode or style.[9] By *synergy*, I understand a form of relationship between two or more conative parties who engage with each other in such a way that something new and larger than either of them, but true to the conative tendency of each, is born. Synergy is a modality which brings novelty and change into the world but in a way that is consistent with the conative grain of things at any given moment in the self-unfolding of nature.[10]

To engage synergistically with natural ecosystems then, in the interests of both climate change mitigation and sustainable production, would mean harnessing their energies while yet ensuring that our interactions with them did not revert to the one-way instrumentalism of anthropo-

centric regimes. For this to be feasible, we would need to possess vastly expanded insight into the nature of these systems, and to be prepared to adapt our productive requirements, and hence our own self-expressiveness, to the conative contours of biological systems. Let us look at the implications of these two conditions.

To understand biological systems to the degree necessary for making them our principal means of both climate change mitigation and sustainable production would mean a significant expansion of traditional biological and ecological sciences, and the addition of new kinds and methods of "science" that would offer insight into the conative tendencies of organisms and living systems.

In order to explain, let me offer an example of the kind of expansion of traditional biological science needed to appreciate the role of ecosystems in climate change. It is already well known how forests, for example, function as carbon sinks, absorbing carbon from the atmosphere and storing it in forest soils (Garnaut 2008, 35-36; Mackey, Keith, Berry and Lindenmayer 2008). But new work is pointing to how little we have in fact to date understood the biospherical functionality of forests, and hence how ill-equipped we have been to take informed biological action in response to the climate crisis. The work in question emanates from a small group of scientists in Australia, the Sustainability Science Team of the Nature and Society Forum in Canberra, led by Walter Jehne. They offer a somewhat heretical analysis of the causes of climate change (Jehne 2007). Not being a scientist myself, I cannot vouch for their claims. I am introducing these claims here rather to illustrate, in a small way, just how under-developed current science may be in its account of the contribution of biology to climate stability.

In his analysis of climate change, Jehne points out that though the ice core data reveal an association between increased levels of atmospheric carbon and elevated temperatures over the past 600,000 years, the increase in carbon often precedes the increase of temperature by thousands of years. This suggests that carbon is not in fact causing temperature increase, but rather that carbon increase and temperature increase are effects of a common cause. In any case, Jehne explains, carbon is a relatively small player in the thermal regulation of the atmosphere: the main player is water. It is the amount of H_2O in the atmosphere that accounts for 95 percent of thermal flux, while other gases account for only 5 percent.[11] Jehne then hypothesizes that the past variations in atmospheric temperature and CO_2 evident in the ice core data are common effects of changes in the hydrological cycle of the planet. Optimal H_2O in the

atmosphere produces optimal thermal conditions for life by ensuring cloud cover with the right albedo (capacity to reflect solar radiation). Optimal H_2O in the atmosphere is maintained by vegetation—by the native forests and shrublands and grasslands that emit vast quantities (over a billion tons annually) of microbial life into the atmosphere. The microbes act as microscopic aerosols that afford condensation surfaces and nucleate water vapor into micro-droplets that play a major role in cloud formation. When land is cleared, and native vegetation with its cloud-forming function destroyed, cloud cover is diminished, and the amount of solar radiation reaching the surface of the earth increases.[12] Atmospheric CO_2, of course, also increases as a result of the drop in bio-sequestration of carbon that accompanies land clearing.

Jehne hypothesizes that the observed current increase in both atmospheric temperature and atmospheric CO_2 is the result of the vast scale of land clearing that has occurred since the beginning of industrialization two hundred and fifty years ago, rather than of the industrial carbon emissions of the last thirty years. (He reminds us that the thermal effects of these latter emissions are actually yet to be seen, as carbon from emissions is absorbed by the oceans for about fifty years before it finally finds its way back into the atmosphere.) Of course, there is nothing heretical about including land clearing as a source of carbon emissions in climate change computations. The difference in the approach of the Sustainability Science Team is that land clearing is seen as significant not so much for the carbon emissions it produces as it is for its effects on the hydrological cycle. Their argument is, as I have indicated, that it is primarily alterations in the hydrological cycle rather than in the carbon cycle that are currently driving climate change. They assert that "a 1% increase in mean solar reflectance through increased cloud albedos may have an equivalent effect in cooling the earth's surface climate to that of reducing current CO_2 levels back to preindustrial levels" (Jehne 2007, 5).

If the destruction of forests and other native vegetation systems on a planetary scale is the major cause of global warming and climate destabilization, then the "solution" may simply be to allow those forests and other vegetation systems to recover. All that is required of us in the present situation of crisis then is to allow forests and other ecosystems to follow their own conative trajectory and regenerate. Reduction of greenhouse gas emissions of course remains important, but the principal task is regeneration. As the hydrological cycle is readjusted by such regeneration and the climate problem thereby ameliorated, carbon will

also be sequestered, soil loss will be reversed, soil structure improved, salination and desertification redressed, rivers revived, water supplies replenished and purified, and biodiversity boosted as habitat is restored across the planet.

This, then, is a biological solution to climate change, and it requires very little of us, not even synergy. It requires only that we give full rein to the conative tendencies of planetary vegetation systems, just as a biocentric ethic dictates that we should. Of course, for us to allow forests and other vegetation systems to get on with the job in this way does entail major readjustments of our own economic praxis, for it involves giving back to nature, so to speak, land and resources that have been used by us for extractive, manufacturing, agricultural, and other intensive, biodestructive purposes. We will accordingly have to meet our productive needs in other ways, ways that are consistent with nature meeting its needs. I shall take up this point shortly.

For the moment, let me return to the second way in which science has to be expanded if we are to balance the moral claims of the biosphere as a whole with the moral claims of its component parts, as required by a biocentric ethic. I suggested that such a balance could be achieved if we were able to rely on these component biological systems as our means of both climate change mitigation and sustainable production. We have already seen how climate change mitigation could be achieved simply by allowing biological systems to recover. Affording the conditions for such recovery, once we have understood through an expanded science why this is necessary, requires little in the way of synergy and a minimum of insight into the details of the conativity of these systems. To effect wholesale mobilization of biological systems in the service of sustainable production, however, is a different matter. It would require complex synergies with these systems and accordingly detailed knowledge of their conative tendencies. Only with such detailed knowledge could we be sure that our interactions with them were genuinely synergistic, which is to say, consistent with their own inherent tendencies, rather than purely instrumental, and hence anthropocentric.

But how can we attain such knowledge of the inherent tendencies of living entities? We can appreciate that the basic conative tendency of each living thing is to maintain its integrity and repair or regenerate itself when damaged. But how can we discover the distinctive *style* of self-realization that constitutes the conative essence of any particular entity, and thereby circumscribe the transformations that are consistent with its integrity? To discover this distinctive style of self-realization is

of course critical to attaining synergy, since synergy is defined in terms of it. But traditional science offers little or no insight into styles of self-realization, since such phenomena are not reducible to the analytical terms of traditional science. This is because a living thing's style of self-realization emanates from the inner unity of meaning that a thing has for itself rather than from the underlying laws of physics. This inner unity of meaning, which constitutes the living thing's own sense of itself, is expressed in the patterns whereby it seeks to actualize itself, patterns that are selected out from the unlimited possibilities arising from mere physical causation by the inner meaning these patterns hold for the thing in question (Mathews 2008). To discover such underlying patterns of meaning does indeed require empirical methods, but empirical methods that lie well outside the repertoire of traditional science.

One method that might serve this purpose is the method of Goethean science. Goethe, the eighteenth century poet and naturalist, outlined a four-step procedure (exact sense perception, exact sensorial imagination, seeing-in-beholding, and being one with the object) that started with contemplative observation of an entity, but opened out into a form of communicative engagement with it that involved the exercise of carefully disciplined faculties of intuition and imagination as well as perception in order to discover the distinctive "gesture" of the entity that was expressed, but never entirely articulated, in the appearances it presented to observers (Brook 2009, Bortoft 1996). It would take me too far afield to explain this procedure in more detail here. Suffice it to say that if synergy with living systems is to be the basic modality of a new civilization indicated by a biocentric ethic in the era of climate change, new forms of cognition or epistemic protocols in addition to those countenanced by traditional science will need to be developed.

Now, finally, let us consider the proposition that biological systems should provide our principal means of production as well as our principal means of climate change mitigation. This proposition was put forward in response to the biocentric requirement that we achieve climate stability without compromising the integrity of the component entities or systems that make up the biosphere. To satisfy the proposition, I suggested, would involve harnessing natural ecosystems for the purposes of production without reducing them, instrumentally, to mere means of ours. This could be achieved by synergy, by allowing natural systems to serve our ends, but only to the extent that their doing so was compatible with the pursuit of their own ends. Where the ends of ours contradicted

the conative tendencies of natural systems, those systems could not be conscripted by us. Instead our ends would have to be adapted to the conative contours of the systems.

Let us describe an economy based on this kind of relationship with biological systems as a *bio-synergistic* one.[13] Bio-synergy is clearly distinct from biomimesis in that in a biomimetic economy technology is designed in accordance with biological principles of organization, whereas a bio-synergistic economy operates in actual partnership with existing biological systems. Bio-synergy will undoubtedly overlap in practice with biomimesis, but the two are conceptually distinct in important ways. The main difference in their perspectives is that for bio-synergy, sustainability is a matter of meeting human needs while assuring the viability of existing life systems, whereas biomimesis aims to reproduce, in the processes of production, the conditions for life in a generic sense, without pre-specifying the ultimate membership of the life community.

A bio-synergistic economy brings aspects of a forager economy into the twenty-first century in that it relies on provisions from the bio-energy systems that are already available in the biosphere rather than replacing these systems with agricultural and manufacturing systems of its own. Any such bio-synergistic economy, understood here merely as an ideal type rather than as a presently feasible alternative, will include certain cardinal aspects.

Such an economy will be, first and foremost, a solar economy, since solar energy animates the entire fabric of natural biological systems and can be gathered without cost to those systems.

Bio-synergy will, secondly, involve adjusting human demand to ecological carrying capacity, where ecological carrying capacity is understood to mean the capacity of ecological systems to support human populations without compromising other-than-human constituencies. Biosynergy in this respect is patently incompatible with current levels of human population and therefore prescribes human population decline.

Thirdly, bio-synergy indicates that instead of practicing traditional agriculture, we should allow indigenous ecosystems to serve as our primary producers. "Bush foods" (or, in the Australian context, "bush tucker") will in this sense constitute staples in a bio-synergistic economy, though it is imperative to qualify this statement with the condition that bush foods will only be harvested to the degree required for the regulation of ecosystems. In other words, the role of human consumers in the ecosystem will replicate that of other predators, routinely reducing

populations of consumed plant and animal species to ecologically optimal levels. (It is paramount to state this qualifier since the commercial harvesting of "bush meat" in economies in which nature is already under attack is often the last nail in the ecological coffin.)[14] In countries like Australia where feral species—plant and animal alike—pose major threats to indigenous biological systems, ferals will be the first targets of the new biosynergistic regimes of organized foraging. Bypassing such species as objects of consumption is one of the most striking anomalies of present bio-antagonistic economies. Australia, for instance, is host to vast populations of invasive feral animals, such as rabbits, goats, pigs, and camels, yet these animals almost never appear on the national table. Further ecological damage is incurred, on an even vaster scale, to deliver traditional farmed animals—sheep, chickens, and cattle, for instance—to the table instead. Readiness on the part of consumers to switch from traditional meats to feral meats and ultimately to indigenous meats, in reduced quantities, provides an example of the kind of adaptability required of consumers in a biosynergistic economy, in which two-way accommodation of ends is expected. It must be remembered, in other words, that bio-synergy is a two-way street—it allows us to act on nature, but it also permits nature to act on us, trimming our ends, and with them our self-expressiveness, to the conative contours of ecosystems.

Insofar as we rely for provisions on the bio-energy systems that are already available in the biosphere rather than replacing those systems with agricultural and manufacturing systems of our own, we are exemplifying the forager aspects of bio-synergistic economies. However, biosynergy is not exclusively a forager modality. It allows us not only to gather produce from pre-existing biological systems, but also to proactively modify those systems, at least to the extent that such modifications represent a further self-unfolding of those systems rather than their thwarting. So, for instance, we might vary the physical conditions that define the parameters of particular ecosystems, thereby changing those systems, but in a direction we judge to be consistent with their conative tendency. We might, for example, increase the number of water holes in an arid region, thereby increasing the density of wildlife there. Such an action would need to be offset by other actions, since increasing the density of wildlife in a fragile arid ecosystem might well incur degradation of the vegetation. But a judicious selection of actions might result in the "evolution" of the original ecosystem into one with higher biomass and higher biodiversity than the original system. If we judge the cona-

tive tendency of living things to include the impulse not only towards self-maintenance but also towards self-increase, it is arguable that such a change in an ecosystem—in the direction of greater vitality and diversity—would qualify as consistent with the system's own conativity. In this sense, it may be possible for us to intervene in biological systems to increase their "productivity" without violating their integrity. Clearly such complex and delicate interventions, which at the same time serve our own interests and the interests of the systems themselves, would only be possible to the extent that we fully understand the physical and conative capacities of systems.

Primary production in a bio-synergistic economy then might be figured as a sophisticated and proactive custody of indigenous ecological systems. In areas already laid waste by traditional farming, such systems could be re-introduced. More intensive forms of boutique food production, featuring the full range of available food species, could also be integrated into industrial and urban design, thereby taking pressure off natural systems. But industrial production in a bio-synergistic mode is more difficult to envisage. Certainly manufacture can take advantage, biomimetically, of natural materials and energy sources; transport systems can piggyback on natural carriers, such as rivers, oceans, and wind flows. Architecture can exploit topography and siting to minimize the impact of buildings on landscapes. But the kinds of strategies available to manufacture are primarily biomimetic rather than biosynergistic: it is hard to see how natural biological systems could, even in synergy with us, produce cars and kettles, let alone airplanes and computers. For the time being then, biomimesis, together with the progressive tailoring of our desires to the capacities of natural systems, might have to suffice: we might have to be content with a manufacturing system that functions biomimetically, without further waste or extraction, on a material resource base already carved out by industry, rather than looking to the agency of actual biological systems to take the place of industry. In the future, however, we might indeed achieve the purposes currently served by articles such as cars and kettles by harnessing the agency of natural systems more immediately and processually, without the need for clunky permanent articles of this kind. From the vantage point of such a biologically sophisticated future, we might look back on our present era of manufacturing as a kind of Dark Ages, an age of obtuse unnecessary clutter, blocking, short-circuiting, and destroying the elegant pathways of agency and efficacy already available in the shape of natural biological processes and systems.

Conclusion

In conclusion, I have argued that the way forward for bio-inclusive environmentalism in the era of climate change is not merely *biophysical*, in the Gaian-type sense, involving the engineering of the physical conditions requisite for life on the planet; nor merely *biomimetic*, in the sense of replicating, in our technologies, the patterns of organization characteristic of life; but *bio-synergistic*, in the sense of entering into active partnership with actual ecosystems to ensure both the regulation of the climate system and the sustainable provision of our own needs.

I am under no illusions that, as a political goal, bio-synergy is achievable at the present time; but I think it is our responsibility, as ecological philosophers and thinkers, now as before, or now more than ever before, to keep this goal visible in the public debate.

Notes

1. Early architects of this specifically environmental ethic, or ethic of nature in its own right, included Routley, 1973: 205-10; Routley and Routley, 1980, 96-189; Arne Naess, 1973, 95100; Rolston III 1975, 93-109; J. Baird Callicott, 1979, 71-81.
2. This was argued most famously, in the early days, by Passmore 1974.
3. Feminists, particularly ecofeminists, provided particularly telling analyses of the way Western thought was organized around a category of nature dualistically opposed, and inferior, to all that went to make up our concept of humanness. Out of such a dualistic system of thought, anthropocentrism emerged as our natural and legitimate standpoint vis-à-vis nature. Early analyses of this kind included Griffin 1978; Daly 1978; Ruether 1975. Later, less essentializing, more critical treatments of this theme included Lloyd 1984; King 1990, 106-121; Plumwood1993.
4. For classic discussions of criteria of moral considerability, see Rodman 1983, 82-92; Goodpaster 1978, 308-325; Taylor 1981, 197-218.
5. John Mathews, Professor of Management, Macquarie University, personal correspondence. China adopted the circular economy as its official development model in August 2008, and is the first country to have done so. (The *Circular Economy Promotion Law* was adopted by the fourth session of the 11th People's Congress in Beijing in August 2008, as reported by the *ChinaDaily* in September.)
6. See, for example, Berkebile and McLennan, who discuss buildings designed to "generate a significant portion of [their] power without pollution, clean all [their] own wastes on site, and respond actively to temperature changes to maintain a comfortable indoor environment" (Berkebile and McLennan). Another example of thermal self-regulation in architecture is the Eastgate Building in Harare, Zimbabwe, an award-winning office complex designed according to the same thermodynamic principles as a termite mound. See *www.asknature.org*, the Web site for the Biomimicry Institute, founded by Janine Benyus. [7]See, for example, the brewery near Tsumeb in Namibia that has been designed for zero emissions. The brewery produces mushrooms, earthworms, chickens, spirulina algae, and fish in addition to beer. It generates fuel for its own operations and recycles all the water it uses (Mshigeni 2001; Saunders 2000).

8. This debate was famously played out between advocates of animal ethics and advocates of ecological ethics, the animal advocates emphasizing the rights of individual organisms and the ecological advocates emphasizing the over-riding ethical claims of ecosystems. See, for instance, Callicott 1980: 311-328; Callicott 1989: 49-59; Mark Sagoff 1984: 297-307.
9. I derive the term from Spinoza, who defines *conatus* as that endeavour whereby things strive to maintain and increase their own existence. See Prop VI, Part III of the *Ethics*, any edition.
10. I am using the term *synergy* here in a way that contrasts, to some extent, with its definition by comparable theorists. Peter Corning, for instance, uses the term to refer to "the combined, or cooperative, effects produced by the relationships among various forces, particles, elements, parts or individuals in a given context." (Corning 2003, 2) For Corning, the bricks in a wall and the atoms in a molecule are engaged in synergy, whereas in my sense, synergy implies a certain transformation in the participating parties, a transformation that represents a further elicitation of potentials inherent in their respective conativities. Synergy in this sense is not merely a cooperative way for agents to achieve their respective pre-elected ends but rather an interaction that transforms those ends, or redirects the agency of the parties, though in a way that enhances their self-realization. For a discussion of synergy in this sense, see Mathews 2006, 85-114; for a more metaphysical treatment, see Mathews 2003.
11. John Schooneveldt, a member of the Sustainability Science Team; private communication.
12. Although I cannot in any way vouch for the validity of Jehne's approach to the causes of climate change, it is worth noting that the Garnaut Report acknowledges the lack of understanding of the role of water vapor in thermal regulation: "[T]he lack of understanding of the way water vapour will respond to climate change, specifically its role in cloud formation, is a key factor in the uncertainty surrounding the response of the climate to increased temperatures" (Garnaut 2008, 34).
13. I am using the term *bio-synergy* here as a special instance of synergy, namely the kind of instance that occurs when humans engage synergistically with biological systems with specifically instrumental—though still synergistic—intent. A quick google of the term *biosynergy* threw up at least one author who was using the term in a cognate, but not quite identical, way. Anthony L. Rose of the Biosynergy Institute defines bio-synergy as "the fundamental and overarching process that sustains life on Earth. Its seed and its spark have been born and imbedded in every living cell, organism, and ecosystem since the beginning of time. Biosynergy is the inner force that compels each and every individual being to collaborate with others for the greater good" (Rose 2007).
14. For an account of the bush meat crisis—the large-scale commercial butchering of wildlife, including gorillas, chimpanzees, bonobos, and elephants, for domestic and export markets—see the Canadian Ape Alliance Web site as well as Anthony Rose's Web site, <bushmeat.net>.

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