Sinners in the Hands of an Angry Metaphor: James Lovelock's *Revenge of Gaia*

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The Revenge of Gaia is the latest work by scientist and futurologist James Lovelock (with a foreword by his colleague, environmentalist and diplomat Sir Crispin Tickell). The book is the culmination of the life's work of Lovelock, who is celebrated as the originator of the Gaia Hypothesis. The plot of this treatise on eco-catastrophism and nuclear salvation is in some ways reminiscent of a bad Victorian science fiction novel:

> The world is a *Giant Woman*, and she's out to get us!" exclaimed Dr. J. Ephraim Lovelock. "Quite right, Lovelock," cried his trusty assistant, Sir Crispin Tickle, "Let's unleash the *Atomic Energy*!"

Yet the work has been greeted by many as a kind of final revelation by the great eco-prophet of our age. The *Daily Telegraph* called it "probably the most important book for decades." Anti-progressivist gadfly John Gray pronounced it "the most important book ever to be published on the environmental crisis." And, needless to say, organs of the nuclear energy industry have waxed enthusiastic about its nuclear politics, though they often seem baffled by the intricacies of what Lovelock now calls "Gaia Theory."

Gaia's Will be Done

What is this "Gaia Hypothesis" that has now been raised to the dignity of Theory? Lovelock defines Gaia as the "thin spherical shell of matter that surrounds the incandescent interior" of the planet. It extends from "where the crustal rocks meet the magma of the Earth's hot interior" to "the even hotter thermosphere at the edge of space." It may be a mere shell, but the hard kernel of its Gaianism is that it is "a dynamic physiological system that has kept our planet fit for life for over three billion years." In Lovelock's view, this shows that Gaia has "the unconscious goal of regulating the climate and the chemistry at a comfortable state for life." [p. 15.] Lovelock thus takes on the role of planetary analyst, ready to reveal to us the secrets of the Gaian unconscious.

In view of the nature of this project, it is understandable that Lovelock tries to shield himself from charges of personifying or anthropomorphizing nature, and indeed he claims that he does not even invalidly animate it. He protests that he is not "thinking of the Earth as alive in a sentient way or even alive like an animal or a bacterium. . . . [Gaia] has never been more than metaphor—an *aide pensée*, no more serious than the thoughts of a sailor who refers to his ship as 'she.'" [p. 16.] Let's call this the "Lovelockean Proviso": that whatever Lovelock says about Gaia can be translated into non-metaphorical, non-anthropomorphizing, non-animistic statements about reality.

Contrary to this Proviso, Lovelock often slips into exactly the kind of thinking that he disclaims. For example, in an article announcing the appearance of his book, he says: "My Gaia theory sees the Earth behaving as if it were alive, and clearly anything alive can enjoy good health, or suffer disease." Lovelock not only depicts Gaia as a living being, but when he goes on to describe its efforts to maintain its health and well-being, he attributes to it a strongly teleological and even intentional dimension that cannot be glibly dismissed as mere metaphor.

This Lovelockean Gaianalysis leads to a variety of incoherences and contradictions. For example, he looks into the mind of the metaphor and divines that "from Gaia's viewpoint" ice-age glaciation "was a desirable state," because "there was more life on the colder earth." He concludes that "if the Earth system, Gaia, could express a preference it would be for the cold of an ice age, not for today's comparative warmth." [p. 31.]

There are several conceivable interpretations of such statements. One is that Lovelock has somehow actually discovered how to read the mind of Gaia. But we can exclude this possibility immediately, for if, as he emphasizes, Gaia is a mere metaphor, Gaia can really have no mind, will, desires or preferences, and the question of how much or what kind of life Gaia literally "prefers" is meaningless. The second possibility is that the concept of "Gaia" should, as Lovelock urges, be taken strictly as metaphor, in which case the statement "Gaia prefers more life" will mean merely that "there has been a tendency for more life to appear on the planet." This approach would be in accord with the Lovelockean Proviso, but it would also completely demolish Lovelock's position.

It would follow from such an interpretation that when there is a tendency in the "Earth system" to produce *less* rather than more life, this would translate metaphorically into "Gaia prefers less life." It would also follow that there could be no basis for any "Revenge of Gaia" in retaliation for the destruction of life, and in fact all the implicit normative aspects of Lovelock's position would collapse. The third and final possibility is that the statement could be interpreted as a mere projection of Lovelock's own uncritical preferences into the unconscious (and indeed non-existent) mind of the metaphorical Gaia. This is, in fact, what Lovelock does, though from the standpoint of his incoherent Gaian ideology, he is unable to recognize it.

Though Lovelock would have us believe that in some mysterious sense Gaia "prefers" the existence of quantitatively more life on earth, neither Lovelock nor Gaia is particularly fond of the *diversity* of life. He asserts that "rich biodiversity is not necessarily something highly desirable and to be preserved at all costs," and may merely be "the Earth's response to the heat of the present interglacial." [p. 42.] Indeed, it *may* be—but then again, it may *not* be. The crucial question is how one might determine this. Lovelock evidently thinks that because Gaia has produced a greater quantity of life over a long period of time, greater quantity of life is therefore "desirable," and that because Gaia has produced a certain degree of diversity of life over a shorter period of time, this degree of diversity is not nearly so desirable. In other words, "is implies ought."

Unfortunately for Lovelock, if this line of reasoning is generalized, we may conclude that if life were to die out on the planet and remain in this condition of non-existence for a very long time (e.g., forever), this would be the most desirable state imaginable for life on earth. Lovelock has fallen victim to that that plague of amateur ethicists, the fact-value dichotomy. Though biodiversity may be positively or negatively correlated with certain climatic conditions, this correlation does not answer the question of its value ("desirability") or lack of value. The jump to the normative needs some kind of justification.

It could, for example, be argued that if greater biodiversity produces greater and more intense *value-experiences* among beings on the planet, then there is reason to say that it is *of value*. This would link the normative conclusion to an observation of facts that also have a normative dimension. Lovelock himself comes to the opposite normative conclusion but fails to give his judgment any grounding in any realities with a normative dimension. Even worse for Lovelock's position, if we take his own approach and look merely at *what is* as the basis for judging what ought to be, this still does not support his conclusions. For in fact, even though the present level of biodiversity has existed for a relatively limited time over the history of the planet,

there has been a general tendency toward greater diversity over that history. We therefore might well conclude even on the basis of Lovelock's own presuppositions that Gaia "prefers" such diversity, contrary to his claim. And finally, as is no doubt becoming clear at this point, if we adopt his "what is implies what ought to be" approach, his "Revenge of Gaia" thesis will again collapse. For in view of the direction that the ecological crisis is taking, why should we not conclude that Gaia has gotten tired of "regulating the climate and the chemistry at a comfortable state for life" and is using humanity to help itself reach its new goal of reducing life both quantitatively and qualitatively?

The pros and cons of Lovelock's basic Gaia Hypothesis itself have been extensively debated, and numerous issues have been raised about its meaning and validity. It would be tempting to explore some of these questions further. However, those who wish to do so can look, for example, to the collection *Scientists Debate Gaia,* in which no less than 53 views of Gaia, including some that pose embarrassing questions for Lovelock, can be found. The focus here will be primarily on further implications of Lovelock's new idea of the "Revenge of Gaia," or what might we might call his "Gaia is Pissed" Hypothesis.

The "Gaia is Pissed" Hypothesis

Lovelock's colleague Lynn Margulis has stated notoriously that "Gaia is a tough bitch." Lovelock seems intent on convincing us of just how tough she is. She doesn't hesitate to slap humans around a bit, and she's in the process of making them an offer they can't refuse. Central to Lovelock's ecological imaginary is his image of catastrophic social and ecological collapse as the punishment with which Gaia threatens humans for abusing her. And this penalty is a very Draconian one, for collapse, as Lovelock envisions it, encompasses not only the destruction of most of civilization, but also the death of the vast majority of all human beings. What will be left of humanity after Gaia strikes back is only some "breeding pairs" that manage to survive in the Arctic, [p. 10] assuring some minor human presence in the hellish world that remains after the catastrophe.

There is reason to wonder why Lovelock even bothers to warn humanity about Gaia's plan, for if it were true that Gaia prefers quantity of life to quality of life, then the best thing might be for humanity to respond to the coming ecological catastrophe by destroying itself and taking with it as many as possible of the large species whose habitat takes up so much room on the planet. Jonathan Schell warned in *The Fate of the Earth* that nuclear holocaust might result in a "Republic of Insects and Grass." From Lovelock's Gaian perspective, this might be a much-improved polity, but not nearly as good as a biocentrically egalitarian Republic of Bacteria and Plankton.

Underlying Lovelock's vision of a vindictive Gaia punishing a wayward humanity is a very dismal view of human nature. It is a view founded not on any actual study of the diversity of human cultures, institutions and practices, but on Lovelock's ungrounded speculation about what humanity has been and is capable of being. He is appalled at the specter of "over six billion hungry and greedy individuals" [p. 7] overrunning the planet. As the phrase indicates, these depraved creatures have at least three failings. First, they are hungry. Though Lovelock refers rhetorically to the world's hungry multitudes, the actual problem of world hunger doesn't show up on Lovelock's imaginary radar. For him, the problem posed by "hunger" is simply that these creatures have a need to eat. Enough said. Second, humans are greedy. The last thing on Lovelock's agenda is an actual inquiry into the nature of greed. He simply takes it as a given, just another dimension of humanity's original sinful nature. So the only possible solution to the problem, short of species extinction, is to minimize

the impact of this inevitable human greed. This points to the third and most unforgivable failing of human beings: that they are far too numerous.

Lovelock perpetuates the cliché, so common among Western environmentalists, that "the root of our problem with the environment comes from a lack of constraint on the growth of population." [p. 140.] Fortunately, this still widespread view of population as the root of all ecological evil has been losing credibility. This is evidenced most strikingly by Paul Ehrlich's move from an extreme population-centered position to his well-known I=PAT equation. In that formulation, the ecological impact of human activity is seen as a function of population, "affluence," or level of production and consumption, and the nature of the technology that is used in production. There is no one "root" of ecological evil.

Lovelock fails to take even this kind of modest step toward recognizing the complexity of ecological problems, much less touch on the deeper ways in which the global capitalist economy, the nation-state system, patriarchal values, and the megamachine are implicated in the various crises we now face. Instead, he takes a classic ideological approach in which inherent human tendencies toward over-breeding and greed are seen as the basic problem, and controls on individual behavior and high-tech fixes are the solution. The secret of Gaian ideology is that it is a highly mystified form of familiar capitalist class ideology.

This ideology essentializes not only human tendencies toward excessive reproduction and avarice, but, more generally, what Lovelock calls our "tribal" nature. He sees this inherent tribalism as the source of a multitude of evils, including, for example, terrorism and genocide, which he thinks are "surely written in the language of our genetic code." [p. 9.] It should be noted that Lovelock's vague, confused usage of the term "tribal" has nothing to do with the way that most tribal people have actually lived. It's more the B movie "The natives are restless" kind of tribalism. For Gaian ideology, it is irrelevant that large–scale terrorism and genocide arose with the decline of tribal society and the emergence of the state and civilization, or that most of human history took place in the absence of these supposedly genetically-based phenomena.

For anyone who considers this actual human history to be somehow relevant to our view of humanity, the most reasonable conclusion would be that human beings have great potential for terrorism, genocide, obsessive greed, etc., but that the actualization of this potential is linked to certain social institutions that have not usually been present in human society. However, in Gaian ideology, the effects of historically contingent phenomena are transformed into transhistorical necessities rooted in humanity's inherently debased nature.

Lovelockean Techno-pastoralism

The synthesis of Lovelock's ecological imaginary and his Gaian ideology results in a strange kind of techno-pastoralism. On the one hand, he labors under the illusion that as a country dweller, he is close to nature and somehow sheltered from an urban world that he sees as alienated from the reality of nature. He contrasts the impoverished conception of nature of urbanites and suburbanites to the more ecologically sensitive outlook of those in the countryside (for instance, Lovelock and his wife, who "often walk on the few remaining wild areas" of southwest England), for whom the "natural world of Gaia" is less "foreign." [pp. 106-107.] Lovelock values "good countryside," by which he means "farming land and communities that live well with the Earth and represent an ecosystem which, although dominated by people [sic—dominated by people, not by Gaia], has ample room left for woodlands, hedgerows and meadows." [p. 151.] In his

imaginary world, even though such areas are human dominated—even though it is humans who manage the woodlands, plant the hedgerows, and clear the meadows—these areas are somehow less artificial than cities.

Ironically, despite Lovelock's supposed closeness to nature and to what he fantasizes to be the primordial wilderness of contemporary England, his Gaian ideology allows him to reject forms of technology that have been adapted over millennia to life in close relationship with the natural world (wind, water, geothermal and solar power go back to the ancient world). Instead, he sides with radically disruptive technologies that are, he conveniently forgets, very much the product of the modern "urban" elites that he holds in contempt and attacks as hopelessly alienated from Gaia.

Lovelock's harsh denunciation of urban society is reminiscent of Rousseau's condemnation of large cities as breeding grounds of vice and all that is contrary to nature. We might call this aspect of the Gaian ideology "On the (Environmental) Idiocy of Urban Life." Governments, Lovelock thinks, are "almost entirely out of touch with the natural world," [p.106] not because they are an integral part of an entire culture and institutional structure that are out of touch with the natural world, but because they are chosen by an electorate that consists overwhelmingly of members of urban society. Similarly, bad energy policy is not the inevitable product of an economy geared toward exploitation, but rather the fault of "well-meaning city dwellers with a romantic, impractical dream of clean renewable energy coupled with a misplaced fear of nuclear energy but no real empathy with Gaia or the natural world." [p. 84.] These urbanites, Lovelock complains, "know little about the Earth system that has for eons kept our planet a fit place for life" (though it is far from obvious that rural people, whether they hail from Lovelock's Cornwall or from the Corn Belt, are particularly well informed about what went on during those eons). He warns that we should trust "urban environmentalists" with environmental policy as much as we would "subject ourselves to surgery by a novice who had merely read books or viewed television documentaries" on the subject. [p. 107.] In his imagination, the future of the planet depends on our listening instead to those who still remain close to nature, and who presumably still know how to tread lightly on the earth. No, he's not referring to the world's remaining indigenous people, but rather to the affluent gentrifiers of the English countryside.

At the same time that Lovelock fantasizes himself and his fellow countryfolk as the faithful Gaian remnant that is still in touch with nature, he dreams of vast technological transformations that would mediate to an unprecedented degree the human relationship to the natural world. He proposes, for example, that we should abandon agriculture to the greatest degree possible and synthesize food "from carbon dioxide, water and nitrogen." [p. 12.] He reveals that he likes to "speculate on the possibility that we could *synthesize* all the food needed by eight billion people, and thereby abandon agriculture." [p. 132.] One imagines the world of 1950's science fiction in which earthlings have given up their inordinate attachment to what their primitive ancestors once called "food" and conveniently ingest a few pills each day. But more seriously, he is proposing the absolute industrialization of food production and an end to what little is left of the cooperative metabolic relationship between humanity and the land that was established in the horticulture of the Neolithic period.

Lovelock would like to see the human population decline drastically in the long run, but he speculates that given short-term needs for the existing population, space-age nutrition might save the day. Indeed, "it might even be possible to sustain ten billion or more living in well-planned, dense cities and eating synthesized food." [p. 141.] In such a world, "large new food factories would make simple sugars and amino acids. This would be the feed stock for tissue cultures of meats and vegetables and for junk food made from any organism that could be safely eaten." [p. 133.] This hyper-industrialization of agriculture, which seems about as "far from nature" as could be imagined, would allow farmland to be "released back to Gaia." [p.133.] It would also allow Lovelock and his neighbors to appreciate their cherished "woodlands, hedgerows and

meadows," unobstructed not only by windmills, but also by the now-redundant tillers of the soil and their unsightly farm machinery.

One aspect of what Lovelock deceptively calls our "tribal" nature is our inherent competitiveness and desire for superiority. Accordingly, in what he calls "our high-tech world" to come, there will be winners and losers, "the privileged and the poor." In other words, there will be very sharp class divisions. Sorry, it's "written in the language of our genetic code." The poor will have the opportunity to savor the exquisite taste of test-tube chicken nuggets grown from tissue cultures and feast on algae-based Twinkies for dessert. On the other hand, there will "surely be a fashion among the rich for eating real food; vegetables grown in soil and cooked with meat and fish."[p. 134.] A system of incentives is sometimes described metaphorically as "the carrot and the stick." In Lovelock's culinarily challenged dystopia, the rich literally get a carrot. So much for food production in "our high-tech world" of the future. However, the key technology in that future, and indeed, the one on which any kind of decent future depends if Lovelock is right, is nuclear energy.

Dr. Strangelovelock, Or How I Learned to Stop Worrying and Love the Nukes

The nature of one's nightmares is very revealing (perhaps we might call nightmares the royal road to the traumatic imaginary). So it might be illuminating to look at Lovelock's nocturnal terror as he recounts it:

> Most of us have unreasoning fears which creep unwanted into the mind, and bring a shudder; mine are about overwhelming torrents of muddy water, at seeing and hearing a towering wall of water bearing down on me; something moving so fast that there is no chance of escape. I tell myself it is a foolish fear; we live high enough and far enough from the ocean that no conceivable tsunami would ever reach my home, and there are no great dams, filled with miles of water, upstream on our river. But still this nightmare scene steals into my dreams. I can well understand why many have similar fears of a nuclear catastrophe, fears that sensible explanation is never able to calm. [p. 99.]

Strangely, I don't have Lovelock's nightmares of catastrophic inundation, even though I live in New Orleans, a city with near to below sea-level elevations that has actually experienced such catastrophe, rather than in Lovelock's safe pastoral paradise near Launceton, England (elevation 500 ft). Of course, nightmares usually reveal something deeper than the depth of the water that's actually likely to engulf one. Thus, for all his love of Gaia and the pastoral landscapes in which he gets close to Gaia, his most traumatic terror betrays a fear of the forces of wild nature. This is fully in accord with Lovelock's pastoral image of "good," that is, highly domesticated and controlled nature, a nature whose wildness is only fantasized. What Lovelock does not fear is the forces through which nature is domesticated and mastered. Thus, he seems quite at ease with even the most imposing forces of human technology, provided he does not perceive them as a threat to his pastoral Eden.

In contemplating society's various technological options, Lovelock gives a new meaning to NIMBYism. Faced with the terrifying specter of what he has described as "dark, Satanic" windmills, and the presumably equally Mephistophelean solar panels, he responds with a panicked "Not in my back yard!" However, when he contemplates the possibility of a nuclear power plant in his neighborhood, he responds with an enthusiastic "Nukes in my back yard!" He means this more literally than one might guess, for as he notes, "I have offered in public to accept all the high-level waste produced in a year from a nuclear power station for deposit on my small plot of land." [p. 92.]

Once again casting aside his reservations about anthropomorphizing nature, Lovelock assures us that Gaia is just as enthusiastic about nukes as he is. "I also knew that the natural world would welcome nuclear waste as the perfect guardian against greedy developers, and whatever slight harm it might represent was a small price to pay." He and Gaia both appreciate the fact that "one of the striking things about places heavily contaminated by radioactive nuclides is the richness of their wildlife." [p. 91.] And in a sense they are right, for abandoned nuclear sites make magnificent nature preserves in some ways. However, certain points seem to have slipped Lovelock's mind (and, we may assume, Gaia's also): the possibility that long-term genetic damage from exposure to radiation might turn out to be more than slight; the likelihood of gradual radioactive contamination of aquifers; the huge social, economic and personal human costs involved in the disasters that produce the contamination; and the rather obvious fact that there are much cheaper and safer ways to establish a nature preserve.

One of Lovelock's persistent themes is that alarmists have exaggerated the dangers of nuclear energy. He claims for example that *The Times* (U.K.), the BBC and other media have reported 30,000 deaths from the Chernobyl disaster, while in reality the correct figure was only 75 after 19 years. [p. 101.] But Lovelock himself vastly understates the effects of the Chernobyl disaster, just as he minimizes the health and safety risks of nuclear energy in general.

A full and accurate assessment of the health consequences of Chernobyl is impossible, because in their attempt to first conceal and then minimize the damage, the Soviet authorities never collected the necessary data to carry out such an assessment. It is documented that 31 of those first on the scene to help mitigate the disaster died within three months, but most of the 800,000 clean-up workers and 350,000 evacuees were not monitored over time. Lack of adequate resources to deal with health problems among the population in the Chernobyl fallout zones after the accident has continued to be a problem, which helps to fuel continuing disagreement over the health and safety consequences to those who remained. Highly controversial when it came out for downplaying the health impacts of the disaster, the recent Chernobyl Forum report from the World Health Organization outlined some of these effects and concluded that 4,000 people may ultimately die from radiation exposure as a result of the accident. It noted about 4,000 cases of thyroid cancer (though few victims have died from this treatable condition) and that approximately 100,000 residents still receive more than the recommended dose of radiation. The report emphasized the massive social disruption resulting from the relocation of 350,000 people and concluded that widespread mental health problems have been the most significant health impact resulting from the disaster. The report also pointed to continuing environmental impacts, noting that in "lakes with no outflowing streams," the "levels of radiocaesium in fish will remain high for decades." Finally, the enormous economic consequences of the disaster should not be underestimated. For example, 784,320 hectares of agricultural land had to be removed from production. The disaster's total costs over two decades have been estimated in the hundreds of billions of dollars. Continuing disagreement over the death rate, injuries, and illnesses resulting from Chernobyl aside, there is no reason to disregard the enormity of the risks involved in the rapid global proliferation of nuclear energy production.

The serious problems with nuclear energy are pointed out not only by alternative energy advocates but also by highly respected mainstream analysts, such as Vaclav Smil. Smil goes to great lengths to debunk unsubstantiated claims for all forms of energy production, including what he sees as alternative energy utopianism. In his acclaimed recent work *Energy at the Crossroads*, he surveys the considerable economic, health and safety burdens of nuclear and concludes that even if we choose to bear some level of such burdens, this source should still play only a limited role in the global energy future. Smil points out that the problem of waste storage and protection over long periods of time has been a particularly intractable one. In addition, he

cites Enrico Fermi's warning (made before the end of World War II) that "the public may not accept an energy source that generates large amounts of radioactivity as well as fissile materials that might fall into the hands of terrorists." [p. 29.] In an age haunted by the specter of al-Qaeda and similar groups, such a warning seems much more like simple realism than alarmism, as Lovelock claims. Smil notes that interest in nuclear energy has declined in many countries as they have had to face the problem of decommissioning reactors without having solved the problem of disposing of large amounts of radioactive waste. At the same time, fusion, despite Lovelock's optimism, seems to be "an eternally receding goal" that always remains about 50 or so years off. [p. 133.] Smil concludes that the drawbacks of nuclear fission will prevent it from producing a much greater share of energy consumption over the next half-century. [p. 310.]

One also finds damning evidence of the risks of nuclear power cited in a recent 108-page report from the prestigious and quite mainstream Keystone Center for Science and Public Policy, which is very far from taking an a priori anti-nuclear approach. The Center's report states that "if growth in commercial nuclear power plants also results in the construction of fuel cycle facilities in countries that do not now possess nuclear weapons, the risk of proliferation will increase." It is noted that proliferation can take place either through the actions of such governments or of terrorist groups not affiliated with governments. "Weapons grade materials can be obtained from states or non-state actors, or they can be developed by the non-nuclear weapons states using either dedicated weapons facilities or IAEA [International Atomic Energy Agency]-safeguarded civilian nuclear fuel cycle facilities."

The report notes that the IAEA is "responsible for safeguarding civil nuclear activities in non-weapons states" in theory; however, the reality is that the safeguards that have been established "are currently insufficient to provide timely detection when weapon quantities of HEU [highly enriched uranium] and plutonium are diverted." This problem is compounded by the fact that "significant quantities (SQ) of nuclear material, defined by IAEA for the purpose of monitoring inventories and detecting diversion or theft of materials, are significantly greater than the amount of material needed to make a nuclear weapon without detection." Furthermore, the report recognizes that efforts to prevent the acquisition of enrichment technologies have sometimes failed. Thus, "non-weapons states can operate civilian fuel cycle facilities, particularly enrichment plants, mixed-oxide fuel fabrication facilities, and reprocessing facilities. It is relatively simple to use these technologies to produce weapons-grade material."

The Keystone Center report contains other chilling implications regarding the possibility of future Chernobyl-like nuclear disasters around the world. It contends, quite reasonably, that "a reliable safety culture is critical to any safe commercial nuclear program" but notes that "the current safety culture varies greatly among countries. Consequently, the Project Team expresses "concerns about nuclear plant expansion in certain other countries that currently have significant weaknesses in legal structure (rule of law); construction practice; operating, safety, and security cultures; and regulatory oversight." The dire implications of all the dangers mentioned, should Lovelock's dream of a complete global conversion to nuclear power production be realized, are blatantly obvious.

In view of the gravity of the problems cited by sources such as Smil and the Keystone Center, we can go beyond their rather restrained conclusions, which still envision some role for nuclear energy in the global energy future. For anyone who takes the precautionary principle very seriously, any share for nuclear in energy production poses an enormous and intolerable threat to society and a heavy and unnecessary burden on posterity. Fortunately, we do not have to run such risks or impose such a burden, because there are safe, viable alternatives.

Lovelock's Hard Line Against Soft Energy

For Lovelock, on the other hand, it is these very alternatives that are so dangerous and terrifying. He explains that **"**a small event" awakened him to the evils of other proposed alternative technologies:

> Fear crystallized as sharp needles in the supersaturated spaces of my mind when, in October 2003, my near neighbors . . . told me of plans to erect giant wind turbines in the countryside near our homes. Suddenly I realized what our politicians meant by sustainable development and renewable energy, and what it would do to the last remaining good countryside of West Devon. [p. 150.]

In short, he saw an intolerable threat to nature as embodied in his pastoral ideal. We can be certain that Gaia wants Lovelock's "good countryside," including his beloved woodlands, hedgerows and meadows, to remain in its natural state. How can one envision placing something as unnatural as a "dark, Satanic" windmill in the midst of all this naturalness?

Lovelock's crystallized fear ultimately led him to a generalized opposition to all non-nuclear energy alternatives. He correctly points out that some alternatives have been falsely promoted as panaceas. Biofuels, for example, have recently been embraced enthusiastically by many governments and industries. Though they have a limited positive role to play, an effort to make them into a dominant source of energy would indeed be ecologically disastrous. Lovelock notes that using biofuels to power vehicles and to fulfill most other energy needs would require "the land area of several earths," [p. 67] which admittedly would be a major drawback. However, he dismisses all the other clean energy options that could fit quite comfortably on the one earth that we do happen to have available at the moment.

Lovelock makes the most negative assumptions imaginable about these options. For example, he claims that to produce all the U.K.'s electricity today would require 276,000 wind turbines, or about three per square mile of suitable open space, and thus ruin the environment. Furthermore, he argues, the problems of energy storage and the intermittent nature of wind make this system inefficient and unworkable. [p. 83.] He finds solar energy to be equally hopeless. He sees it as too expensive, incapable of fulfilling the demand for energy, and lacking in workable storage methods. He also claims that the cost of transporting energy from areas in which sunlight is plentiful would negate any advantages that it might have. [p. 87.] Lovelock is not totally averse to new solar-related technologies but apparently opposes only those that might produce energy. Thus, despite his pessimism about solar panels, he is enthusiastic about a scheme to address global warming by deflecting sunlight with gigantic seven-mile wide mirrors in space.

It's ironic that such speculative, science-fiction-like possibilities fire Lovelock's Gaian imagination, while the rather obvious approach of improving the efficiency and lowering the cost of solar technologies that are already in use strikes him as a kind of monumental hoax. He says that "solar cells are not yet suitable for supplying electricity directly to homes or workplaces," [p. 87] and he seems to think that this settles the matter. However, photovoltaic cells are already supplying such energy, and it is becoming more economically feasible for them to do it every day. The individual option for solar now seems justifiable primarily to those capable of making a very large initial investment and reaping the benefits in the long run. However, if the costs were socialized, solar and wind power could immediately become major energy sources for the entire populace.

Lovelock discretely fails to mention the enormous state subsidies for nuclear energy and merely assumes that vastly greater ones are justified in the future to support the huge global nuclear industry that he proposes. Current global subsidies of nuclear energy, though subject to controversy, are estimated even in conservative assessments to be in the tens of billions of dollars per year. If the OECD definition of subsidies

as "any measure that keeps prices for consumers below market levels, or for producers above market levels or that reduces costs for consumers and producers," then the total is no doubt much higher. Regarding the domestic arena, Peter Montague points out that in the U.S., the Energy Policy Act of 2005 authorizes four separate kinds of subsidies to the nuclear industry. The legislation "grants $2 billion in insurance against regulatory delays and lawsuits to the first six reactors that get licenses and begin construction," it "extends the older Price-Anderson Act, which limits [the nuclear industry's] liability to $10 billion in the event of a nuclear accident," it "provides a tax credit of 1.8 cents per kilowatt-hour for the first 6,000 megawatts generated by new plants," and, finally, it "guarantees loans to fund new atomic power reactors and other power plants using 'innovative' technology."

If such massive subsidies were merely shifted from unclean energy sources to clean ones, funds could be devoted to such projects as the installation of solar panels and wind turbines, in addition to greatly expanded research on solar and wind power, so that the full social benefits of ecotechnologies could be gained as quickly as possible. The cost of energy generation would decrease as a result of both expanded production and technological innovation. In a recent article, Nordhaus and Shellenberger claim that "some energy experts have calculated that an investment of roughly $200 billion would bring the price of solar energy down to that of coal."

If Lovelock is incapable of imagining such a shift in social investment, so much less can he envision what systems of energy production might look in a non-capitalist, ecological society with institutions that are radically decentralized, participatory democratic, and cooperativist. In short, Lovelock's assumptions about the feasibility and possible efficiency of energy alternatives are based on what is possible within the confines of the present corporate and state bureaucratic systems of decision-making and production (though he also overlooks much of what can be achieved even within those limits). Despite his attempts to draw attention to certain aspects of the operation of the "Earth system," he remains oblivious to the political and economic dimensions of the state-capitalist world system and the ecological problems they pose to any transition to an ecological society. This is less than one year's current subsidy of fossil fuels and nuclear energy, not to mention the massive subsidy that will be passed on to posterity.

It is unlikely that we will see a rapid transition to a completely non-capitalist, radically ecological world, so it is important to see the fallacious nature of Lovelock's assumptions about the possibilities for alternative energy sources under conditions similar to those that presently exist (and which would exist to varying degrees in any period of transition to a just, ecological society). Lovelock is not alone in attacking these alternatives as inherently unfeasible. For example, Prof. Jesse Ausubel of Rockefeller University cites calculations that "to meet U.S. energy demands for 2005 with wind power would require constant winds blowing onto wind farms covering more than 780,000 square kilometers of land, the area of Texas and Louisiana combined." He also claims that "photovoltaic cells covering an area of 150,000 square kilometers would be needed to meet U.S. electricity needs for a year," and "to power New York City would take 12,000 square kilometers, about the size of Connecticut." Of course, if the windmills that have taken over every square inch of Louisiana and Texas supply all our needs, we could then avoid sacrificing Connecticut at the altar of the Alternative Energy God. Nevertheless, the picture does look rather dismal if Ausubel's estimates are even vaguely accurate.

However, defenders of energy alternatives have exposed such statistics as wild miscalculation based on invalid assumptions about output and siting possibilities. Though no one has proposed that all the energy needs of a country like the United States should be met by solar energy, several researchers have estimated that photovoltaic cells could fulfill U.S. energy needs using little more than one-tenth the land area estimated

by Ausubel. Furthermore, the impact of even this level of land use could be minimized if panels could be sited rationally—that is, on rooftops and unused agricultural land. Others have pointed out that a relatively small number of high-efficiency wind farms could vastly increase alternative energy production without consuming vast areas of countryside. Denmark has already been able to produce 20 percent of its energy through wind power without turning any significant part of the country into a vast wind farm. Moreover, plans have been formulated to increase this percentage to 50 percent by 2025, while at the same time increasing the size and efficiency of individual turbines so that only one-third as many would be needed, thus drastically reducing the land or sea area needed for energy production. Wind power capacity increased 26 percent globally in 2006, and with wind producing nearly 12 percent of the electricity of a major industrial country such as Germany, its viability is hardly still in doubt.

Careful research suggests that a strong commitment to ecologically sound energy production and conservation would allow both fossil fuels and nuclear to be phased out completely. Arjun Makhijani, of the Nuclear Policy Research Institute and the Institute for Energy and Environmental Research, has done an extensive study of how the U.S. could make a successful transition to an almost carbon-free, non-nuclear system of energy production. He claims that within 30 to 50 years, "a reliable U.S. electricity sector with zero-CO_2 emissions can be achieved without the use of nuclear power or fossil fuels," using present technologies or those that have a reasonable likelihood of being developed. A movement toward socialized, cooperativist decision-making, planning, and financing could achieve this goal and more.

There is one final argument in favor of ecologically sound energy alternatives and against nuclear power that completes the overwhelming case against Lovelock's position. In reality, these other alternatives can be highly effective in reversing the global climate crisis, while nuclear energy is simply not the global warming panacea that its advocates claim it to be. A report from the German Institute for Applied Ecology points out very clearly the fundamental error of proposals for nuclear energy as a strategy for greenhouse gas reduction. The report notes that nuclear reactors do not emit CO_2 directly, and nuclear energy advocates (Lovelock being a prime example) have uncritically taken this merely apparent advantage to be a real one. However, it is obvious that any valid analysis of the effects of possible energy sources on the atmosphere must take into account *all* production of greenhouse gases, both direct and indirect, associated with the production of nuclear power. This will include "upstream" activities such as "ore mining and processing, enrichment of uranium, fuel fabrication, etc." and such "downstream" activities as the processing and storage of wastes. In addition, the production of construction materials for the entire production and disposal process must be considered. The Institute's report takes into account the production of greenhouse gases through this entire "life-cycle."

According to such a comprehensive assessment, "renewable electricity, and electricity efficiency have lower GHG emissions than nuclear electricity," and "small-scale gas cogeneration plants are close to nuclear," whereas "biogas-fired cogeneration clearly has far lower emissions than nuclear plants." The report finds that even using "the low range of nuclear GHG abatement costs to compare with the fossil alternatives (cogeneration) and renewable energy (biomass and offshore wind) as well as some energy efficiency, the alternative mix offers GHG abatement costs *three to four times lower* than those of nuclear power." The report concludes that "renewable and DSM [Demand Side Management] options (including gas-fired cogeneration with combined cycles) are more competitive in terms of GHG abatement costs, even if no external cost value is allocated to the risks of nuclear electricity."

Lovelock's Dilemma

Despite the many absurdities of *The Revenge of Gaia*, the book and the warm reception it has often received are quite significant as symptoms of the specific crisis and the "forced option" that we face at this moment. As Lovelock emphasizes, in order to escape from what will soon be an irreversible path toward ecological catastrophe, we will need to effect drastic changes in energy production in a relatively short time. Implicit in Lovelock's analysis is a dilemma that we cannot afford to ignore. If vigorous (and successful) efforts are not made quickly to institute ecologically sound alternatives on a large scale, there will certainly be a global rush to nuclear energy, especially in view of its imagined advantages in relation to the production of greenhouse gasses. This is true especially in the global South, where ruling elites are desperate to achieve rapid economic growth while avoiding the most immediate forms of ecological crisis, which are currently associated most with climate change (since the mass media, Al Gore, concert promoters, and corporate greenwashers have not yet caught on to the global biodiversity crisis).

While a few countries such as Sweden have gone to impressive lengths to maximize safety precautions in nuclear energy production and nuclear waste storage, this is exceptional. The growth in the nuclear industry is taking place almost exclusively in countries whose standards of safety and oversight of technological development assure that major disasters are only a matter of time. The kind of global program of rapid development that Lovelock advocates will result in very high probabilities of catastrophic accidents and of the use of radioactive materials for weapons production by aggressive militaries, authoritarian states, and freelance terrorists. Lovelock states that ideally the human population should be decreased to a billion or even a half-billion. Considering the contribution his book will make to the global proliferation of dangerous nuclear materials, he may be doing his part to achieve or exceed that goal more quickly than he hopes for.

Thomas Friedman, self-proclaimed "geo-green," can be counted on to state clearly the realities of the world energy problematic from the standpoint of liberal capitalist ideology, without any Gaian or New Age obfuscations. In a recent article, he describes the huge energy consumption in the new industrial and technological centers of the "Americanizing," "flattening," or "developing" world, and then concludes: "There is no green revolution, or, if there is, the counter-revolution is trumping it at every turn. Without a transformational technological breakthrough in the energy space, all of the incremental gains we're making will be devoured by the exponential growth of all the new and old 'Americans.'" For Friedman's "transformational technological breakthrough" read "massive development of the global nuclear industry" while awaiting the arrival of the (metaphorical) *deus ex* (literal) *machina*—nuclear fusion.

And Friedman is of course exactly right, if we accept his or Lovelock's assumptions. All things remaining equal (corporate capitalist domination, hierarchical state power, megatechnics), *There Is No (Energy) Alternative*. Without a "transformational breakthrough" in ideological space, in the space of the imagination, and in the space of action and social creation, we will be faced with the inescapable dilemma of imminent ecological collapse versus new forms of social and technological domination, tinted in various shades of institutional green.

Among the offspring of Gaia were those notorious one–eyed creatures, the Cyclopes, noted for helping to unleash vast destructive powers (and one of whose descendants gave Odysseus so much trouble). Perhaps the Cyclops is a good symbol of the kind of narrow and superficial view of human nature, of the causes of social and ecological crisis, and of possible paths toward a sustainable future that is at the core of Lovelock's Gaian Ideology. It is unfortunate that his prestige as an ecological thinker will have a certain influence in perpetuating the dominance of this foolhardy and calamitous Cyclopean single vision.