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# *James Lovelock and Consciousness*

## *An Obituary*

James Ephraim Lovelock (1919–2022), most famous for postulating the Gaia hypothesis, which argues that Earth life as a whole resembles a coherent living being, regulating its reactive atmospheric chemistry, global mean temperature, and other environmental variables through the mutual action of life, died on his birthday, 26 July; symbolically, his life thus comes full circle, resembling one of the cybernetic loops he saw at work in the regulation of Earth's biosphere. He was 103.

A basic example of such a cycle would be algae growing in the open ocean: necessarily producing waste, such microbes (although collectively visible from satellite) emit sulfur compounds that then serve as the nuclei of forming raindrops; here, photosynthetic microbes, growing in the sun, lead to the production of clouds, thus cooling themselves and helping to regulate the global climate. Although the IPCC does not include biological feedbacks in its climate models, the Gaia hypothesis, not explicitly sought but discovered during the lead-up to the Viking missions' search for life on Mars, is arguably the greatest achievement of NASA thus far. Earth's surface is not just a rock with some life on it, but infused through and through with living organisms. Lovelock addressed what he called the 'academic apartheid' between biology and geology, and the characterization of life as a planet 'with' life, rather than a live planet, which is similar to describing a human body as a skeleton infested with microbes.

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Lovelock was a to-me fascinating character. Not just English but with a little Jewish and Gypsy in him, he once said that he took to heart what one of his Roma relatives said, that nothing happens without a reason. This, of several memories, recommends itself to me when, upon embarking upon the pleasurable task of composing an obituary for the *Journal of Consciousness Studies*, I pass, laid out on a table in the library where I am about to sit, three big books, the only ones on any of the tables, all with the word consciousness featured prominently in their titles.

My last encounter with Lovelock was before he delivered a talk at the American Museum of Natural History in the early 2000s; I sat on his left in the audience and then, just before he went on, he said he was still nervous even at his age; I smiled, squeezed his arm and told him I was writing about Gaia and would continue to do so.

There was something mischievous about him said my mother, Lynn Margulis, who helped develop his hypothesis into a theory, by giving specific examples of the non-stop contributions of microbes to the gases of Earth's reactive atmosphere. For, unlike other planets so far observed by astronomers, Earth's atmosphere is very reactive: the free oxygen ($O_2$), that composes 21 percent of Earth's atmosphere, should quickly react with and eliminate many compounds. But those compounds, continuously produced by life, maintain in stable proportions in Earth's atmosphere, much as the chemistry of our blood is not a random collection, but actively maintained.

Sharing in the lead-up to the Viking missions the same Pasadena, California, office at the Jet Propulsion Laboratory as Carl Sagan, Lovelock suggested to NASA that there was no need to go to look for life on Mars, because the recent results that Mars's atmosphere was ninety-five-plus percent carbon dioxide strongly suggested there is no life there: the atmosphere was in chemical and thermodynamic equilibrium, not maintained starkly away from it, like Earth's atmosphere.

Before his work on Gaia, Lovelock, a scientific instrument maker, discovered through use of his invention — the electron capture detector, a chemical detector of unsurpassed sensitivity — that pollutants such as residues of the pesticide DDT were now distributed in remote regions of the planetary surface, including penguins in Antarctica. Such discoveries informed Rachel Carson's clarion call, *Silent Spring*, the beginning of a global environmental movement. Mischievously, Lovelock, who would come to recommend nuclear power as a cleaner alternative than fossil fuel for Earth's energy needs, pointed out that if you can measure something you can worry

about it. His electron capture device was also used to find chlorofluorocarbons (CFCs), implicated in the thinning of the ozone ($O_3$) layer, the major threat of which, he suggested, was a slight increase in the chances of white people developing skin cancer.

In their joint office at JPL, Carl Sagan discussed with him what astronomers called the Faint Early Sun paradox: according to theories of stellar evolution, stars like ours will become up to 40% more luminous in their lifetime; but, if so, how did Earth maintain its global mean temperature, roughly at room temperature, for billions of years?

One idea, of which we hear clear echoes in the widely accepted notion of the reason for recent global warming and climate change, is that life (photosynthetic microbes and plants), by removing ever more carbon dioxide from the atmosphere, compensated for the increasingly luminous Sun. Lovelock seemed to think so, publishing one paper in *Nature*, 'Life Span of the Biosphere', which argued that Earth life will expire when it runs out of carbon dioxide to bury to keep itself cool. Echoes of the idea of the crucial role of carbon dioxide (although it currently accounts for less than half of one percent of Earth's atmosphere, as compared to more than ninety-five percent of the atmospheres of un-alive Mars and Venus) in cooling the planet have become the consensus, and almost exclusive focus, of climate change and global warming. In his last book, *Novacene*, Lovelock, a great fan of cybernetics and computer technology, contends that he knows that Earth is the only place harbouring life in the universe, and that AIs are the best future hope for controlling Earth's climate.

And here I would like to circle back to that chance encounter of consciousness tomes on the way to write this reminiscence. What is mind? Ironically, if indirectly, Lovelock may have answered this question: it is something which, if perceived out of its usual context of being the outward expression of inner human intelligence, is rife throughout nature. Lovelock answered this question, not directly, but at a remove, by showing that Earth's regulatory behaviours, and behind them, microbes, pass the Turing Test. His Daisy World, a computer model designed to counter objections by Neo-Darwinists that non-human life forms could possibly engineer global regulation, consisted of a simplified planetary system of white daisies that would grow, thus reflecting more light into space, radiating increasingly more solar energy away from a nearby star as it became more luminous, thus showing in principle how organisms can regulate global temperature. Despite the simplicity of this model (which works also with black daisies and daisy-eating animals and carnivorous

animals eating them), the Gaian regulation it easily explained had been dismissed as impossible natural selection among planets, or mystical communications among organisms. In retrospect we can conclude that growth of sensitive organisms within a certain temperature range, seen not directly but through their effects on a planetary environment, can be mistaken for, and summarily dismissed as, evidence of mind. Of course, Gregory Bateson had suggested the opposite in works such as *Mind and Nature*: that mind is not exclusive to humans, however deep our cultural tendencies for self-centred specialness and anthropocentrism. Although Daisy World models were not innovated to argue for more-than-human mind any more than were the Viking missions launched to see Earth as global biological system, in retrospect too we can understand the neurons of human brains as one particular instantiation of mind in nature. That physiology, or as Lovelock would say, geophysiology, seen out of context, is perceived as human-style mentation, suggests that what humans ascribe exclusively to the human cranium may be a substantially more encompassing and distributed process, of which our own consciousness, embodied in neurons and their electrochemical communications, may be only one example.

Biology embodies some and is simulated by other cybernetic behaviours, but it is also more, one that includes the continuous self-production of cells, organisms made of cells, and the entire biosphere. Philosophically known as autopoiesis, examples of such self-production include cells, organisms, and the biosphere itself. His scientific and intellectual partner Margulis insisted on this word, and that Earth was definitively not, as Lovelock loosely said, an organism: the living surface of Earth recycles virtually all its material wastes, something no individual organism can do, but which ecosystems can do. The main waste of the global ecosystem, the planetary physiological body of Gaia, is heat, which no organism can use for metabolism.

Before I learned after his death that he was regularly employed by the UK Ministry of Defence, and for decades he also worked for MI5, the British security service, confiding to a friend that was convinced he was the security forces' oldest retiree at 94, I wrote to him, four summers after my mother died, in 2015. I emailed Lovelock after I saw his work was being defended by Bruno Latour after a harsh book-length critique. He thanked me. 'Today is my 96th birthday', he wrote back. 'What a wonderful present to receive.'

I met Lovelock in earnest in 1986 after returning to Boston after being the victim of a violent crime in Florida, and subsequent brain surgery in Syracuse. I showed him a short story I wrote in which people in a dance club were described using terms from entomology and sperm competition theory. Did you like it, I asked? He didn't, he said, but he understood it. After watching me stoop to tie my shoelaces, he wondered aloud why the manufacturers make them so long. Looking out at Boston Common from a little bridge, he told me his science-fiction scenario of future robotic beings, descended from humans, no longer recalling their origins. In a little restaurant over sushi he said you don't have to finish something just because you paid for it. As we left the Japanese restaurant, I opened the door for him. 'I'll remember you in my will', he joked.

In his eighties he walked 630 miles along England's south-west coastal path; this exercise may have helped extend his life, surprisingly long for someone who was already taking digitalis and amyl nitrite for his heart in the 1980s. In that same restaurant his mischievous mind turned from heart health to the opposite, and he mentioned the name of a toxin that would induce a heart attack indistinguishable from a natural one.

He was mischievous.

I also walked through the woods with him and my mother in Western Massachusetts, and along a beautiful beach in Cornwall, on the occasion of the first Gaia conference. These times in nature with him and Lynn contrasted with his later prescription on how to minister health to a warming planet. A lover of nature, he sought and lived in the Welsh mountains. He loved to be by himself, out of the way, at the edge of things. As often as possible, he lived in out-of-the-way sites, immersed in nature, the Wiltshire hills, for example, and the craggy shore of western Ireland, where he had a laboratory house (which I visited in 1980, on the way back from a summer abroad at Oxford) and instruments to measure trace chemicals in the atmosphere.

He was born and died on his birthday, and I also appeared, quite randomly, on this date that would later bookend his life, making it in a sense a grand cycle, coming back to when and whence he came, as if illustrating the cybernetic circularity, not just of his own life, but of Earth life in general, its reuse of limited resources, its smooth cosmic operationality, its autopoeitic informational closure.

He is survived by his second wife, Sandy (nee Orchard), whom he married in 1991, and his sons, Andrew and John, and daughters Jane

and Christine from his first marriage to Helen (nee Hyslop), whom he married in 1942.