In Tomorrow's Coliseum: Gaia or The Lions

Some thoughts about science and religion in the face of global warming

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The problem

Assessments of the current state of the physical well-being of our planetary home, the Earth, often speak in some combination of the terms 'sacred', 'vulnerable' or 'vengeful'. James Lovelock used 'Gaia', the ancient Greek name for the Earth goddess, to name the phenomenon by which an environmentally stressed Earth might move to protect itself against harmful activity. Though he was speaking metaphorically and not attributing agency to the planet, the question can still be asked, "Is this the 'God' to whom we must now give obedience?". Or, to put it another way: Do we face an Ecological Imperative? Is Tomorrow's God Gaia?

The concept of Gaia is a fruitful analogy that helps us understand our world. But it introduces the danger of confusion between process and person. Gaia can be used as a metaphor to describe the Earth, either as a planet passively vulnerable to physical forces and their consequences, or as a living, actively purposeful person. Both descriptions can be valid metaphors in themselves, but use of a name with such a potent double-meaning raises a problem: it blurs the defining difference between science and religion. If official enforcement of adherence to Gaian principles ever became a politically acceptable way to make people accept human responsibility for climate change, it could in the far distant future authorise persecution of non-conformists perceived to be endangering public good. Then the challenge could become serious: If forced to choose, would you say Gaia is God, or go to the lions?

The Gaia hypothesis

James Lovelock discovered that the atmosphere of Earth is very different from those of neighbouring planets, but would be, like them, uninhabitable if there were no life here. Lovelock asked, do living organisms actually create the best conditions for life, rather than just adapt to them? He concluded that yes, life does create and maintain a habitable atmosphere. The earliest life forms (beginning about 3.5 billion years ago) were anaerobic bacteria, and the greatest diversity of life is bacterial even now. At that time, the sun was dimmer, the sky clear and the surface temperature only about 30 degrees C. After oceanic algae began to produce oxygen and ever since, clouds forming over the oceans have kept the surface cool even though the sun has increased in luminosity by 25-30%. Earth was

too cool for life when it first formed, and has been getting progressively too hot since. Surface temperature on a lifeless Earth would now be about 290 degrees C, yet it is actually still in the habitable range of 10-20 degrees C.

Lovelock explains how the feedback mechanisms linking the atmosphere, the soil and the oceans maintain this stable temperature even as the sun continues to heat up. You can read about how it happens in any of his books. He likens the process to Watt's engine governor, invented to regulate the speed of a steam engine. As the engine runs faster the supply of steam is cut down, and vice versa as the engine slows. Lovelock named this process after the Greek goddess Gaia, also called the Earth Mother. The Greeks saw her as a bountiful source of life and fertility, but recognized that she also dispensed death. In the same way, a sheep farmer has to balance the annual crop of lambs by culling the older stock, otherwise he would soon run out of grass.

The Gaia hypothesis comes in three forms:

1. The **weak** form states that Gaia is "a complex entity involving Earth's biosphere, atmosphere, oceans and soil". Early scepticism that such an entity could be real is now replaced by wide acceptance of the Gaian metaphor as a fruitful general concept, especially reformulated as a model of "geophysiology". This is a now relatively uncontroversial "working model" as formulated in the Amsterdam Declaration 2001, signed by more than 1000 delegates at a conference representing four principal climate-change research units.
2. The **strong** form states that "the Gaia hypothesis supposes the Earth to be alive". This is not acceptable to many scientists, at least in part because it is hard to agree on a definition of what it means to be "alive" in this context. Critical tests are hard to design, or else produce trivial and non-falsifiable results.
3. The **extreme** form states that Life on earth "actively regulates the global environment *so as to* maintain conditions comfortable for life". This form is widely rejected, mainly because of the implication of purpose. Hostility from scientists to any such "goddess" idea echoes their long battles with creationism.

Why is global warming such a threat?

Surface temperature determines the distribution and abundance of life. In the oceans, surface waters warmer than about 10 degrees C form a stable layer resistant to disruption. Plankton and other marine life can flourish only in the surface layers within reach of the light. Their dead bodies rain down to the deep, dark bottom, removing the source of nutrients for the next generation of surface dwellers. Tropical surface waters never cool to 10 degrees, which is why 80% of the deep tropic oceans are a blue, sterile desert. In temperate latitudes in winter, the bottom waters turn over as the surface cools, bringing nutrients back to the surface ready for the next summer's growth season. Only near the poles do the surface waters remain below 10 degrees all year round, and there the waters are well mixed and full of life from top to bottom.

On land too, surface temperature is critical. Below 10 degrees, land plants stop growing; above 25 degrees, all free water is lost to them unless constantly renewed by rain or held in permanent vegetation. Tropical forest makes its own rain, but that mechanism would be disabled by the rise in global temperature of only 4 degrees. Mass extinctions would follow, on land by the spread of deserts and in the oceans by the expansion of the "lid" of

warm surface layers. So, on both land and water, global warming of the scale that some models predict (up to 6 degrees) is a real threat.

Carbon dioxide is a greenhouse gas, that is, the more there is of it in the atmosphere, the warmer the surface temperature. Abundant life draws carbon dioxide out of the air and stores it underground or in the oceans, so cooling the atmosphere. Gaian models of how life has used this mechanism to resist global warming over billions of years assume that 70-80% of the global surface is occupied by life. Until only a few thousand years ago, that was true – especially during the periods when massive amounts of carbon were captured laid down as coal, gas, oil, marine limestones and clathrates (frozen methane). Forest clearing and paving of densely populated countries don't only cause extinctions among the birds and animals we love to watch – they also reduce the capability of Gaia to keep the planet cool. The effects are already being felt in the most vulnerable regions, the Arctic and the Antarctic.

How accurate are forecasts of the progress of global warming?

Actually, they are alarmingly good – the predictions of the earliest scenarios made from data available in the 1980s have proved, if anything, rather conservative. So we have no cause to be complacent, especially as the effects of positive feedbacks begin to accelerate the warming processes. The consequences for human will be severe if the expansion of deserts, mass extinctions and sea level rise are anything like what the models predict. Imagine the size of the refugee problem if all the world's major cities that developed as ports became uninhabitable because of sea level rise.

It is not as if global warming has never happened before. We can look to the past for clues as to the consequences of sudden rises in global temperature. At the end of the Permian era, 251 million years ago, and in the early Eocene era, 55 million years ago, there were sudden natural releases of carbon into the air from volcanic eruptions and melting of frozen methane. They caused short-term increases in global temperature of up to 6 degrees C, that is, well within the range predicted for the next few hundred years. There were massive, worldwide droughts, and huge losses among plants and animals. Life itself did recover, but the species extinguished were gone. Next time, the number of extinct species would include us.

Is Gaia alive?

Lovelock predicts that Earth will be too hot for any of the higher animals within only 10 million years – that is, <20% of the time since the dinosaurs. So what does such a (relatively) short term future prospect mean for how we understand the idea of Gaia? Is it valid, or helpful, to confuse the natural physical processes of planetary science with the idea of a personal *driver* of change, a *purpose* understood beforehand, rather than a *consequence* understood only later? Does it matter whether we think of Gaia as alive or not?

It is true that Gaia has some characters of living animals: the Earth maintains long-term system balance of atmospheric gases, and repairs damage (e.g., from meteorite strikes, mostly soon rendered invisible by erosion) at a level not predicted by physics. That argues strongly for using Gaia as an inclusive metaphor summarising the means of planetary

management and their consequences, leaving aside the separate issue of whether Gaia is or is not is a personal entity. Maybe we should hope she is not.

According to Lovelock, Gaia regulates conditions for *life in general*, not for us in particular. If she is an agent with a purpose, we may not like it: after all, the Greek Earth mother idea was not necessarily benign. Lovelock sees humans as merely tolerated by Gaia, and he pictures Earth with a fever (caused by too many people); she'll feel better when they've gone. Gaia downgrades human dignity much more than the theory of evolution ever did, because Lovelock asserts that human origins and behaviour are *irrelevant* to Gaia's global purpose. We humans depend on Gaia, but she doesn't depend on us – she is indifferent to us.

Is Gaian science a substitute for religion?

Gaia started as a scientific idea that has captured the imagination of people tired of the failures of traditional religions, based on out-dated world-views, to guide humanity facing an unprecedented future crisis. But obedience to such an entity, as recommended by some as a means of co-ordinating human responses to the threat of global warming, could be risky. If Gaia is alive and active, she is also potentially vengeful. I think we should be very cautious about elevating the Gaia concept to the level of a religious authority capable of commanding obedience – even in order to persuade people to work together to avoid a common threat.

The reason I think that is because elevating Gaia to some sort of deity raises a much wider question: what is the difference between science and religion? Well, the essential difference is simple: Science is knowledge without certainty, whereas religion is certainty without knowledge. Science uses a predictable logical sequence (observation-hypothesis-test-modification of hypothesis-further test etc) to make "incremental approximations to the truth" – that is, gradually increasing improvements in confirmable knowledge by small steps. But scientific data are always provisional, so no step in the process is ever final. Science is knowledge, but is never certain. Religion, on the other hand, can leap to certainty without knowledge, as Thomas, invited to put his hand on the wounds of the risen Christ, was suddenly totally convinced of who Jesus was, but without any clue as to how the one he had known became the other he had not known.

Gaia started as science, so cannot have certainty by definition; certainty (faith) is part of religion, not science. Confusing science and religion risks a category error – a philosophical term for an error incurred when "a property is ascribed to a thing that could not possibly have that property".

What about treating Gaia as a myth, in the technical sense (a narrative expression of abstract truth, not, as popularly understood, a mere falsehood). The line between traditional mythology and religion is fine but useful to make. Many religions include an element of traditional mythology, which play a powerful role in social cohesion and enforcement of collective security that could be threatened by individual irresponsibility. Gaia includes an element of mythology, so is that another reason to think of it as a religion? A parallel case could be argued between Gaia and classic Maori deities like Tane, god of the forest, and the laws of tapu that protected Tane's children (birds, fish, trees) from careless human over-exploitation. Tribal authorities enforced tapu law out of simple self preservation, because any breaking of it could call down the wrath of the gods

on the whole tribe. In 1772, Marion Dufresne and 26 of his crew were slaughtered in self-defence by Maori avenging their fishing in a tapu area. Would widespread obedience to a religion based on Gaia's laws, under similarly stringent conditions, help protect the earth?

Those who promote the idea of Gaia in its extreme form – as a personal entity with a purpose – should be asked to explain how they can justify the idea of Gaia qualifying as a substitute for *God*, given that Gaia is:

- Not the source of ultimate truth, beauty and goodness worthy of obedience
- Not equivalent to traditional concepts of the Holy Spirit, source of love and courage in face of disaster
- The complete opposite of biblical concept of immanence of God in world, however understood
- Opposed to any concept of hope or providence
- Not even reliably true, since it is based on science subject to repeated modification

I hope, if ever I was put in a situation where I had to make a choice similar to that faced by those Christians at the threshold of the Coliseum (accept Gaia as religion or go to the lions), I would choose the lions.

Conclusion

In these dangerous times, the world needs people who have rational, compassionate faith, inspired by love, not fear. They keep in contact both with head knowledge (science, telling how things are) and with heart knowledge (wisdom, telling which things matter). They understand that we need a rational faith in the invisible realities behind both science and myth/religion in order to organise a community-level response to global crises like climate change. Gaia can help explain why, but to get action we must convince people at heart level, and that takes more than head stuff. And we need to be ready if, as the climatologists are now telling us, many uncomfortable changes are now inevitable. Local communities will be needed if the worst happens (or even if it doesn't), because it was the sense of belonging that helped people through many previous disasters, from the Fall of Rome, through the Black Death, to the London Blitz. Love and rational faith have a deep understanding of humanity based on support and values from outside this world. That is the sort of religion that will get us through.

Further Reading

Daly, H.E., Cobb, J., 1990. *For the Common Good: redirecting the economy towards community, the environment and a sustainable future.* Green Print (Merlin Press), London

Lovelock, J. 1979 *Gaia*. Oxford University Press, Oxford.

Lovelock J 1988. *Ages of Gaia*. Oxford University Press, New York.

Lovelock J 1991. *Gaia: The practical science of planetary management.*

Lovelock J. 2006. *The Revenge of Gaia.* Basic Books, New York.

Lynas, M 2007. *Six Degrees*. Harper Perennial.

Midgeley, M 2001. *Science and poetry*. Routlege.

Russell C 1994. *The Earth, Humanity and God*. UCL Press.