**Biocivilisations, A New Look at the Science of Life**

**by Predrag B. Slijepcevic, Chelsea Green Publishing UK (2023)**

I recently discovered a preprint of a publication by Predrag B. Slijepcevic and Chandra Wickramasinghe, “Reconfiguring SETI in the microbial context: panspermia as a solution to Fermi’s paradox” (1)

I have not yet read the article as published. Nonetheless, I find the ideas and the Gaian philosophy a great advance over Lynn Margulis and James Lovelock’s original Gaian Hypothesis. These concepts regarding the super-intelligence of a planetary living organism resonates with my explorations. In my opinion these New Biology explorations are the most significant advances that I have read since Carl Woese’s “A New Biology for a New Century (3). I did seek out more recent publications about this controversial topic by the authors. Chandra Wickramasinghe is the world’s foremost proponent of Panspermia and his work is often referenced in Panspermia.org. I was overjoyed when I found that Biocivilisations was recently released and I bought the book from Amazon.

My hope was to find some new material and arguments to promote the dual complementary ideas of Panspermia and Gaia Planetary Intelligence. There are other scientists and philosophers establishing this transformative idea, for example Adam Frank, David Grinspoon and Sarah Walker published last year (2). To quote these authors -

*“Our approach follows the recognition among researchers that the correct scale to understand key aspects of life and its evolution is planetary, as opposed to the more traditional focus on individual species “*

Neither work goes quite far enough in explaining the relationship between Gaia and Panspermia. Indeed, I was ready to pan Biocivilisations, because the first two sections and the greatest part of Biocivilisations did a poor job of explaining the fundamental philosophy underlying PBS’s conclusions. It was difficult to follow his line of thought because the structure jumped around and often required the reader to go to outside sources listed in the Notes section to explain some very obscure subjects such as Biosemiotics and Evolutionary Epistemology. As a general public science publication, it was rather boring. However, there are worthwhile facts and leads in these two sections that are valuable and many insights into Lynn Margulis work and thoughts about Gaia.

I was further disappointed because there were no expected references to Panspermia within the first 200 pages. This may be excusable. Because the Panspermia connection in the SETI paper is very lucid, this leads me to suspect that most of Biocivilisations was written over many years prior to the collaboration between PBS and CW. I was ready to write a negative review, however Part III “Looking Forward” has fully reversed my opinion. There are five arguments that fulfill my expectation and Panspermia is finally addressed. I fully agree with PBS in his Argument #1: Copernican Turn that “Biology is ripe for a transformative change similar to the Copernican Revolution.” PBS makes 4 more arguments that are clear, concise and most valuable in our common effort to change the New-Darwinian paradigm. I would advise a new reader to first read Part 3 before tackling the body of the book.

The Gaia Theory originally introduced by Lynn Margulis and James Lovelock describe the Earth as a holistic, integrated, planetary-scale living organism. This radical idea profoundly challenges the current mechanical Neo-Darwin paradigm. (5,6) By taking one more small step beyond the original homeostatic Gaia concept we attribute intelligence and predictive decision making to Gaia and the terrestrial microbiome. Adding intelligence to a planetary microbiome goes far beyond the pale for many biologists. Nonetheless, there is clear scientific evidence that the terrestrial microbiome does indeed display intelligence. Among my personal favorite examples are the ability of “biocivilisatons” to have developed very difficult biochemical syntheses such as the natural product drugs paclitaxel, calicheamicin and 5’-deoxy-5’-fluoroadenosine. (7) Also, the Horizontal Gene Transfer (HGT) of the C4-photosynthetic pathways into dozens of different grass species and genera during the Miocene geological era. (8) There was no Darwinian advantage for this C4 v. C3 plants during this period of relatively high CO2 concentration atmosphere. There was a large decrease of CO2 levels from the Oligocene (9) This *de novo* photosynthetic ability allowed these grasses to thrive during the low CO2 atmospheres that occurred millions of years later during the Pleistocene glaciations. This is an example or at least an argument for Gaian climate prediction. I might invoke the dreaded teleology.

One could define the dreaded *teleology* word as a process that is a result of conscious predictive decisions. Keep in mind that a hallmark of computers and other cybernetic devices is the ability using good software to make predictions. A temporary way out of assigning consciousness to computers and other cybernetic entities this dilemma is to assume that there are multiple intelligences at work in the universe, for example, human intelligence, machine intelligence including AI and natural intelligence. All of these systems are complex networks of communications. Humans of course, have consciousness and the others arguably do not(?). I think it is only a matter of time that whatever or however consciousness might be characterized will extend to non-human entities, such as computers and planets.

Incorporating Panspermia in the preprint and in part three is the template that allows all of these seemingly unrelated discussions to fall into place. However, we must heed the words of HL Mencken *“For every problem there is a solution which is simple, clean and wrong.”* Adding the guidance of Panspermia solves many complex problems in Biology, most notably the origin of life. My argument to add to PBS, is that Panspermia and the modern paradigm vis-a-vis SETI goes something like this. There is a long history of belief that there is life on other planets and solar systems, but this fact has not been scientifically proven. Because it is unproven it is assumed that this is an unworthy and dangerous effort. For example, see the panel discussion from 1975 that features a very young Carl Sagan (4). My view is that it is philosophically equal to acknowledge the assumption of ubiquitous galactic or cosmological life as it is to assume the negative. Life outside of our planet does not exist. By making the Panspermia assumption, this allows philosophy, if not science to advance, albeit on thin ice. The benefit is it gives researchers new directions and new bio-paradigms to explore.

Gaian planetary intelligence and Panspermia explorations are intertwined. For the simple reason that a new origin theory is necessary to explain Gaia. This will have a dramatic cultural impact on our understanding of the Earth.

To quote Carl Woese:

*“Biology, therefore, has a choice to make, between the comfortable path of continuing to follow molecular biology's lead or the more invigorating one of seeking a new and inspiring vision of the living world, one that addresses the major problems in biology that 20th century biology, molecular biology, could not handle and, so, avoided.”*

Gaia and Panspermia. It is very common that biologists, environmentalist climate change enthusiasts declaim the damage that 8 billion humans and human civilization has on the planet. PBS discusses and dismisses geoengineering to regulate climate change. The following is from page 137 and I fully agree:

*“The point of contention between Gaian Science and human science revolves around the concept of Earth stewardship. Climate Change models, for example, are based on feedback control theory. As part of geoengineering efforts to reduce global warming, one idea is that sulphate aerosols could be released into the atmosphere to increase planetary albedo, thereby cooling down the planet. This geoengineering plan could work, but only if Gaia weren’t an autopoietic system. Gaia’s response to the perturbation caused by such geoengineering would result in a range of unpredictable structural changes aimed at preserving her autopoietic nature. The bottom line is that autopoietic systems cannot be modified by feedback control theory. Living systems are not machines that can be modified by input-output cybernetic models.”*

Caveat emptor. There is some discussion about this in reference (9).

I will take this one step further. Human exceptionalism is extolled universally. Although PBS argues that *“It is difficult for us to accept the fact that we* (Humans*) are not superior observers. All organisms are observers of the universe in their own way.”*

It appears to us that human civilization is the dominant biological force on the Earth. “Biocivilisatons” attacks this myth. This is a convenient anthropocentric illusion. On the other hand, Gaia is intelligent, perhaps super-intelligent. It takes Gaia thousands or even millions of years to solve a selected problem in biosynthesis or predict ice ages. Biological processes are slow. By contrast, human society with its gift of intelligence and engineering ingenuity can condense the time it takes to solve these problems to a few years. Here, I will make an about face. *Homo sapiens* is indeed special! But in a different way. We may be the solution to an existential planetary Gaian dilemma! Make no mistake, Gaia is a living entity and it can die. Gaia is no exception - it follows the first law of biology - Just Survive! There are both threats and/or opportunities that Gaia must consider. Let me modestly suggest that Panspermia gives us a clue. Gaia is aware of its place in the Galaxy. PBS and CW discuss biological tropism as communication. Our Earth receives viruses, microbes, comets and other dust particles continuously that contain genetic information. We can only guess what is contained in these messages. The emphasis is information. Gaia has been alive since the Hadean Age some 4.5 billion years ago when microbes inoculated the Earth’s hostile atmosphere. *Homo sapiens* has been existence for 200,000 years and modern civilization for a brief few centuries. My question is why humans and why now? I have my opinions, but I do not know! Perhaps you will discover the answer. Biocivilisations is an excellent book written to probe this question. Be sure to read part 3 before reading the main body.

**Bibliography:**

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4. <https://www.c-span.org/video/?530040-1/extraterrestrial-life-1975>
5. Margulis, Lynn, "Symbiotic Planet: A New Look at Evolution" (1998)
6. Lovelock, James, 1919-2022. The Ages of Gaia : a Biography of Our Living Earth. New York Bantam Books, 1990.
7. This subject is far to extensive to cover here. Email me jlpowers63@outlook.com for an exhaustive discussion. Go to Wikipedia to consider each natural product’s chemical structure and bow in awe to Nature’s ability to develop a biosynthetic pathways for each of these chemicals.
8. Christin PA, Edwards EJ, Besnard G, Boxall SF, Gregory R, Kellogg EA, Hartwell J, Osborne CP. Adaptive evolution of C(4) photosynthesis through recurrent lateral gene transfer. Curr Biol. 2012 Mar 6;22(5):445-9. doi: 10.1016/j.cub.2012.01.054. Epub 2012 Feb 16. PMID: 22342748.
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