The Many Lives of James Lovelock. Science, Secrets, Spycraft and Gaia Theory. **Watts, Jonathan. 2024. Greystone Books, Vancouver/ Berkeley/London. 312 pp. (HB). ISBN 978-1-77840-248-7.**

In 2006 the Geological Society of London awarded its Wollaston Medal to James Lovelock, saying in the citation:

> Even in the illustrious history of the Society's principal medal, first awarded to William Smith in 1831, it is rare to be able to say that the recipient has opened up an entire new field of study in Earth science But such is the case with this year's winner James Lovelock…The view of the planet and the life on it as a single complex system, analogous in some ways to a homeostatically self-regulating organism, is what gave birth to the field we now know as "Earth System Sciences"…

The "self-regulating organism" in various guises espoused by Lovelock and many others was named "Gaia". It still governs much environmental thought, and, as the Wollaston citation suggests, is well imbedded in 21st century biogeochemical science linking the biosphere with the Earth's atmosphere and physical fabric.

James Lovelock (1919-2022) lived a long and intricately unfolding scientific life that has been outlined by several others (and himself). It has been summarized in a complete and well-documented entry online in Wikipedia. This is a very good starting point, but Jonathan Watts' new book is an essential complement and expansion of what has gone before, based on detailed use of the Lovelock archive, now in the Science Museum (London), Lovelock's personal correspondence, and two years of interviews with the aged Lovelock in his retirement home in coastal Dorset. The result is a compulsively readable biography, wide-ranging, sensitive and thoughtful, of a most unusual and imaginative scientist in several very human settings.

James Lovelock seems at the outset to have been an unlikely scientist, unmathematical, with a spotty school career, a variety of science-related jobs during the Second World War, an interest in chemistry, gadgeteering, and explosives, and eventually in 1948, a Ph.D. from the London School of Tropical Medicine. He spent 20 years working on a series of biomedical studies in the National Institute for Medical Research in London. But his invention of the electron-capture detector in 1957 greatly increased the sensitivity of gas chromatography and led

to his involvement in the early exploration of the Martian environment in the United States during the 1960s, and in many other studies. During the next couple of decades he took on a consulting role into subjects like the Martian atmosphere, tetraethyl lead in gasoline, the influence of petrochemical industries on the Earth's atmosphere, the atmospheric distribution of CFCs (chlorofluorocarbons), and for the UK's intelligence services, detection of explosives during the Troubles in Northern Ireland. Throughout, he lived from consultancy to consultancy, establishing personal laboratories at home in England and in a summer retreat in Northern Ireland.

Watts' approach is largely chronological, but using the interesting and original technique of relating Lovelock's life and career in separate chapters to a series of people: his parents; his first wife; children; scientific colleagues (and one opponent); British men of affairs; lovers; his second wife; then finally a thoughtful exploration of his varying approach, at life's end, to the Gaia hypothesis and environmentalism. Each is a deeply-researched essay on a scientific life that is well outside the ordinary.

A few examples. The chapter "Dian" deals with the 1960s and Lovelock's collaboration with the American scientist Dian Hitchcock to develop techniques useful in determining the presence of life on Mars. Both came to realize that on Earth oxygen, and especially methane, were the result of life, and that (as it proved) their absence on Mars and the prevalence of carbon dioxide precluded life on that planet. It was thinking about that problem together with Hitchcock that provided the spark of the Gaia hypothesis. "Victor" deals with Lovelock's relations with Lord Victor Rothschild, in charge of Royal Dutch Shell's research, who invited him in 1967 to write "a memorandum on what the world will look like in the year 2000 and what effect it will have on a company such as Shell". As Watts writes, "The correspondence between the two men, much of it confidential and unpublished until now, provides a blow-by-blow account of how a fossil fuel company came to realise it was wrecking ecosystems, degrading human health and destabilizing the climate, only to cover up the evidence, downplay the risks and blame others." Rothschild became not just a patron to Lovelock but also his entrée to the British intelligence services, which were interested in his ability using chemical tracers to find combatants and explosives. For Lovelock, one outcome of his relationship with Rothschild was to stabilize his personal finances and equip his laboratory, although

at the cost of secrecy about his work, publications and opinions. It also led Lovelock to the relationship between industrial pollutants and climate change – the climatic cooling detected in the 1960s and the countervailing warming caused by carbon dioxide emissions.

Finally (for my discussion here), there is "Lynn", a chapter outlining Lovelock's friendship and scientific relationship with the prominent American biologist Lynn Margulis, who as a master investigator of the evolution of endosymbiotic microbial life, brought new ideas to his developing Gaia hypothesis. It was she who joined Lovelock in the first scientific exposition of Gaia, "Atmospheric homeostasis by and for the biosphere: the Gaia hypothesis" in the Swedish journal *Tellus* in 1974. This was also the time that Lovelock had to come to grips with the fact that his own measurements showed that CFCs were widespread globally, and that they showed evidence of breakdown at high altitudes, releasing halogens that resulted in what came to be known as the ozone hole. This contradicted his earlier belief and pronouncements that CFCs were environmentally neutral and were not a threat to the Earth system at the heart of Gaia. Through the ups and downs of promoting Gaia, Lovelock was under fire as an apologist for the chemical industries, travails that he shared in correspondence with Margulis who acted as a concerned counterweight to her increasingly stressed colleague. She was a trenchant critic too, When Lovelock's book *Gaia: A New Look at Life on Earth* was published in 1979, she claimed that the Earth was not an enormous organism as Lovelock then claimed but an equally large ecosystem. Throughout, she remained one of Lovelock's fiercest critics and also one of his most cherished friends.

Watts' remarkable book about James Lovelock evokes a time (mainly the 1960s and '70s) when "Earth Systems Science" emerged from environmental sciences that were becoming increasingly precise and increasingly global, while at the same time the biosphere began to look increasingly fragile. During that era, when I began graduate studies at Yale under G. Evelyn Hutchinson, Hutchinson's "biogeochemistry" could, with time, merge almost insensibly into a Lovelockian organismic approach to the biosphere and its physical framework, that is, into accepting some kind of Gaian superorganism. To some of us it did, to others not so. Watt shows how even Lovelock wound a twisting path through the use of the environmental measurements he exceled at, gaining scientific triumphs but also subject to human uncertainties scientific, political and personal. These often governed how he thought

about his science, how it should be pursued, and how it should be promoted. It is rare and very thought-provoking to read a scientific biography that is so revealing of science as a human pursuit.

Eric L Mills
Department of Oceanography
Dalhousie University

and

History of Science & Technology Programme
University of King's College
Halifax, NS
e.mills@dal.ca