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BOOK REVIEW

Mercè Piqueras

# James E. Lovelock: Homage to Gaia. The life of an independent scientist

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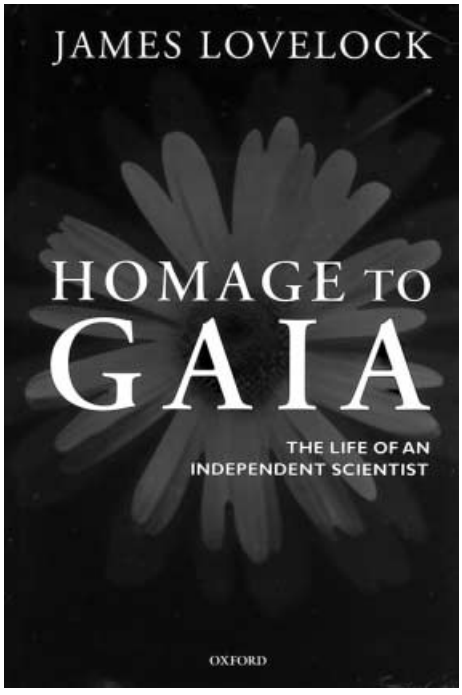
When British mathematician Sir Michael Atiyah ended his 4-year term of office as the president of the Royal Society in 1995, he made a call to scientists "to criticize the establishment when necessary" and to "demonstrate that independence of thought really is the hallmark of a scientist" [1]. Sir Michael no doubt thought highly of James Lovelock, fellow himself of the Royal society, who is the paradigm of independent science – not only independence of thought but also of action. A chemist and inventor, James Lovelock, widely known as the father of the Gaia hypothesis, became fellow of the Royal Society, the world's oldest scientific academy, in 1974. Two years earlier the unorthodox, independent scientist felt both surprised and honoured when he learnt that Nobel laureate and former colleague Archer Martin intended to propose him for the fellowship of that institution. Readers of *Homage to Gaia* will realize that Lovelock's whole life is a history of independence. While the book is the autobiography of a scientist, it is nevertheless a very atypical autobiography of a most atypical scientist. Lovelock's description of his private and professional life, along with his discoveries, and the ins and outs of science make up a mixture which absorbs the reader.




The late Bernard D. Davis, microbiologist at Harvard Medical School, wrote that "for those who are reasonably successful science is a wonderful way of life" and that they "are paid for having fun". He also noted that Francis Crick had remarked that science is both monastic and hedonistic. According to Crick, the scientist's job is a form of play, and dedication to research is not so self-sacrificing as it may seem [2]. Davis viewed science as a creative activity, and so does Lovelock. One has the impression that, for Lovelock, science has indeed been a wonderful way of life and a form of play – although there were periods when his life was also monastic and economically austere – and has become even more so since he decided to become an independent scientist.

*Homage to Gaia* helps us understand the unusual scientific path followed by Lovelock. He has always been a maverick. As a child, he learnt more from books borrowed in the public library, from talking to his peers, from roaming the Brixton streets, and from his rambling and cycling to explore the countryside than from textbooks and schoolteachers. Lovelock was also an atypical university student. He enrolled in Birkbeck College of London University while working as a laboratory assistant at a consulting firm that specialized in the

M. Piqueras
International Microbiology
E-mail: mpiq@retemail.es

chemistry of photography. It was his boss, Humphrey Murray, in fact, that urged him to study at Birkbeck College in the evenings. When, in 1939, the Government closed all London colleges because of the war, Lovelock moved to Manchester. One of his professors there was Alexander Todd, who would be awarded the Nobel Prize in Chemistry in 1957 for the discovery of the structure of nucleosides, components of DNA and RNA. Despite the excellence of Todd's work and the high quality of organic chemistry taught at Manchester University, Lovelock admits that he found the subject boring and preferred to attend lectures on history, economics and other matters of greater interest to him. In spite of a mediocre academic record, Todd recommended Lovelock for employment at the National Institute for Medical Research (NIMR). So began a 20-year period of medical research, during which Lovelock developed his talents as an inventor. At the NIMR, he also became acquainted with bacteriology, which later helped him refine his Gaia hypothesis. He admits, however, that it was only after having met the biologist Lynn Margulis that "a bacterium ceased for me to be merely a membrane bag holding some genes and proteinaceous mechanisms which could reproduce itself". After they met, in 1971, Margulis became a close collaborator of Lovelock in the development of his Gaia hypothesis.

In his autobiography, Lovelock writes "It may seem hard to believe now, but in the 1950s and earlier, society respected its scientists and paid them well. They were seen neither as threatening inventors of nuclear power and bombs, nor as makers of poisonous chemicals to destroy the environment. They suffered a mild disrespect, in that the public saw them as figures of fun, but they regarded their mad professors with affection; certainly never saw them as a threat" (p. 280). The opinion about scientists is indeed quite different now, when a sector of society considers science to be evil and researchers almost diabolic. Nonetheless, never before has the public showed so much interest in science and the news arising from scientific discoveries. Fear has replaced affection in the way society regards its "mad professors". As for Lovelock, a sector of the scientific community has regarded him not with fear but rather with a lack of confidence in the scientific value of his work. His independent way of doing science has been a double-edged sword: whereas he has been able to work in the areas that interest him most, the fact that he has not been backed by an official institution has been a hindrance for official acceptance of his Gaia theory. In 1995, Sherwood Rowland and Mario Molina were awarded the Nobel Prize in Chemistry for their research, which had contributed to understanding a global problem with catastrophic consequences. From studies carried out in 1970–1974, they concluded that the depletion of the ozone layer was due to the accumulation of chlorofluorocarbons in the atmosphere. Their research would not have been possible, however, without the aid of the most widely known of Lovelock's inventions: the electron capture detector (ECD). The awareness that chlorinated pesticides such as DDT and dieldrine had spread worldwide was also possible thanks to the exquisite sensitivity of the ECD, which was at least 1,000 times greater than that of any other detector available at the time Lovelock invented it.

Lovelock has devoted a chapter of his autobiography to the ECD, which he invented in 1957. He describes its invention as "perhaps the most important event in my life as a scientist". In fact, besides the significance the ECD has had in the study of atmospheric chemistry, it allowed Lovelock to start a career as an independent scientist. Since then he has been able to support his research with funds from Hewlett Packard and those obtained from his inventions. The roots of his Gaia hypothesis, which considers the Earth as a system in which living and non-living components interact so that the planet maintains its thermal and chemical stability, grew out his work, in the 1960s, at the Jet Propulsion Laboratory in California. Lovelock had the intuitive feeling that life would be recognized everywhere because it reduces entropy. In fact, metabolic processes would change the composition of a planet's atmosphere and generate chemically anomalous gases. The Earth's oxygen-rich atmosphere is far from a state of chemical equilibrium, yet it is stable and seems to have been so for most of its history. He thus inferred that some mechanisms must be present that keep the atmosphere stable. What started as just a hypothesis, has since become a strong theory backed by an increasing amount of evidence and studied from different disciplines. "Gaia" has even been a topic on the agenda of several international scientific conferences supported by prestigious institutions.

James Lovelock has not been awarded any Nobel Prize, although he did receive the Blue Planet Prize from Japan in 1997. His achievements in atmospheric chemistry and in global ecology have been recognized by other prizes such as the Norbet Gerbier Prize of the World Meteorological Association, the Amsterdam Prize for the Environment in 1991, and the Volvo Prize in 1996. However, because his research has not been carried out in a university laboratory, he has remained out of the mainstream. The opinion that the scientific community has regarding those who decide to do research on their own is evident in the refusal Lovelock received from *Nature* (where he had published previously) when he submitted his first a paper as an independent scientist. The journal rejects articles sent from private addresses.

Lovelock often admits "I may be wrong, but..." Whereas he recognizes the possibility of error, and is respectful of those who do not accept his ideas on Gaia, he nonetheless conveys the feeling that he is sure of what he tells. This feeling is also present in his book. The Epilogue is a discussion of his religious beliefs. His agnosticism, which is noted also in other places in the book, does not prevent him from considering the possibility of a hereafter, where his body will merge with the

chemistry of this blue planet. This thought seems to comfort him.

*Homage to Gaia* is recommended for those that are already acquainted with Lovelock's work, and want to learn more about his life and achievements. It will also be enjoyed by readers keen on science but unfamiliar with Lovelock's work.

## References

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2. Davis BD (2000) The scientist's world. Microbiol Molec Biol Rev 64:1–12