

Homage to Gaia

*The Life of an
Independent
Scientist*

James Lovelock

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I dedicate this book to my beloved wife Sandy

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Foreword

When this book was first published in 2000, I was already 80 years old and did not expect that the next two decades would bring much that was memorable and worth writing about. As it has turned out, I was completely wrong and the last 14 years have been as active and full of excitement and pain as my earlier life.

In 1999, Sandy and I decided to commence the new millennium by walking England's longest footpath, the one that goes from the small seaside resort of Minehead down the north coasts of Somerset, Devon and Cornwall to Land's End and then proceeds eastwards along the South coasts of Cornwall, Devon and Dorset to the ferry terminal at Sandbanks. The walk is formidable, even for the middle-aged, being 630 miles long and with 110,000 feet of cliffs to climb.

We did it in a series of one to three week spells, most of them during 1999. The total walk took 14 weeks and we treasure it as one of the most pleasurable and fulfilling achievements of our lives. At the time we walked, England had one of the world's most beautiful and exciting coastlines. Indeed part of it, the Jurassic Coast that goes around the southern coast of Dorset, has been chosen as a World Heritage site. I use the past tense about this scene of unparalleled coastal beauty because we did our walk before politicians with a liberal tendency began their act of demolition. They are replacing what was once splendour with monstrously large wind turbines and they say they do it to 'save the planet'. Their puritan forebears vandalised another kind of beauty 'to save our souls'.

I am deeply moved by our countryside and the coastal scene but I

am a scientist and know that if we want to live well with the Earth we need, first of all, to understand it. Even the best of our environmental scientists know as little about the Earth now as did the best physicians on the battlefield at Waterloo know about the bodies of their injured soldiers. We try to do our best but science is slow to find a cure. It helps to keep in mind that arrogant certainty is the antithesis of science.

Do not for one moment believe that installing wind energy on the Devon coast will “save the planet”; instead, it will hugely profit large landowners, the German economy and those whose livelihood is sustained by the subsidies we pay that have been craftily hidden in the cost of fuel.

Those who know me will sense desperation and indeed I am desperate, for already the North Devon coast begins to fill with regiments of these grotesque forms of renewable energy. How long I wonder before the scene of beach, sea and sky is transformed into an industrial landscape of power plants?

What I have just written is a small part of the topic, climate change. It has kept me unusually busy during these past years. It all started in 2004 when I first became aware of the possibilities of serious adverse climate change if nothing was done to stem the yearly increase of greenhouse gases. I was not alone. The distinguished author, Tim Flannery and the American vice presidential candidate, Al Gore, were both writing books expressing their warnings and solutions while I continued writing my book and called it *The Revenge of Gaia*. It didn't mince its words; indeed, one journalist referred to it as the scariest book he had ever read.

By 2007, when the Intergovernmental Panel on Climate Change (IPCC) made projections of the rise of sea level that disagreed with observations by competent scientists, some of us began to wonder how valid projections of the climate deduced from mathematical models were. The climate scientists and mathematicians who constructed the models were among the best in the world and we trusted their competence. The trouble was that neither we nor they knew enough about the Earth itself, and we were especially ignorant about the climate of the ocean.

The weather and the climate we know personally come from contact with that insubstantial gas that is the air; but its ability to store the heat

arriving from the Sun is 3000 times less than the storage capacity of the ocean.

Water is by far the most important substance on the Earth. Without it there would be no life of an organic kind, and a climate like that of Venus but not so hot. We cannot ignore the climate of the ocean when we try to calculate the temperature of the Earth. The ocean stores heat in subtle ways and its lower layers are as cold as 4°C. We should keep in mind the wise words of the climate scientist, Ken Trenberth, who recently said “we do not know where the heat from the Sun is going”.

To those of you who would like to read more about my views on this increasingly complex topic there is my book “The Vanishing Face of Gaia” (2009) and another due to be published in the spring of 2014 by Allen Lane/Penguin.

Despite the fast changing world Sandy and I have delighted in the last 14 years. Remarkably our romance that began in 1988 has remained as strong as ever as has our love for one another. I doubt that I could now walk the 630 miles I did in 2000, but I am fairly sure that Sandy could; even so we are still healthy and enjoy walking the six or more miles of coast path that now goes past our home.

I was proud and deeply moved in 2003 to receive from Queen Elizabeth II the invitation to be one of her Companions of Honour (CH). The singularly beautiful medal that goes with the honour she presented to me at Buckingham Palace in 2003 at the start of a 10 minute private audience.

Gaia and the thoughts and consequences of that seminal word will be with me so long as I live, and so will my gratitude to Bill Golding for his gift. But from the beginning many of my colleagues viewed it with disdain. It has been called by distinguished scientists, ‘not science, but an evil religion’; others have referred to it as merely ‘fairy stories about Greek goddesses’. Rarely, perhaps never before, has the name of a scientific hypothesis stirred so much anger and contumely.

As time passed Gaia’s fortunes rose and fell but in 2006 my cup was filled when the Geological Society of London awarded me their highest honour, the Wollaston Medal. At last after nearly 40 years of rejection Gaia was recognised in one of the footholds of respectable Earth science.

As time passed after the millennium we both found living at Coombe Mill increasingly difficult. For me it was a matter of taking care of 40

acres of meadow and woodlands mostly by myself as well as doing independent science and writing books. In addition, the consequences of our government's faith in renewable energy so increased the cost of energy that by 2007 it was costing us £6000 per year merely to keep warm in our Devon house. We used our savings to buy a house in Midwest America where the yearly cost of heating, even when winter temperatures fell as low as -20°C , was only £600.

In 2010 we decided to move from Coombe Mill to a small coastguard cottage on the Chesil Beach in Dorset. We are now downsized to four and a half rooms in a tiny house only 70 yards from the edge of the sea and on part of our beloved coast path. We are now as happy as it is possible to be.

Max Planck, the originator of quantum theory said "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it".

The truly distinguished biologists, William Hamilton and John Maynard Smith, strongly rejected the Gaia hypothesis but both of them changed their minds before they died, and I have their personal letters welcoming the hypothesis back to proper science and these letters are held by the Science Museum of London in their archive of my papers.

Although their places in the geography of science are far apart, quantum theory and Gaia share much in common. I will finish this introduction with another quote from Max Planck that reveals how much we shared a similar attitude to science and our way of doing it. He said in 1936 "New scientific ideas never spring from a communal body, however organised, but rather from the head of an individually inspired researcher who struggles with his problems in lonely thought and unites all his thought on one single point which is his whole world for the moment".

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Introduction

We were enjoying our tea break in a warm cedar-panelled room with a view down the valley to the next village, Broadchalke. Suddenly and rudely as ever, the telephone rang its strident, insistent call. No one expected Helen, my first wife, to answer it—multiple sclerosis had already disabled her. I hate telephones and always wait for someone else to pick them up. Peggy Coombs—the lady from the village who helped Helen, and who came from the Welsh valleys where they are properly outspoken—burst out, ‘Does no one in this house answer the phone?’ and dashed to still its clamour. ‘Hello. What do you want?’ asked Peggy informatively. ‘I want to speak to Dr Lovelock,’ said the disembodied voice. Peggy replied disdainfully, ‘He’s not a proper doctor but I’ll get him for you.’ The caller was a professor from a distant university who wanted me to lecture on the possibility of life on Mars. For once, thanks to Peggy, I had had time to prepare my mind and say no.

Peggy was right. I am not a proper doctor. To her and to most of us, a proper doctor is one qualified in medicine. Someone who treats the sick and who she regards with the respect earlier generations gave to the priest. A DSc was not enough to justify the title ‘Doctor’. More than this, my solitary practice in Bowerchalke spread across the sciences ranging from Astronomy to Zoology. How could anyone so divided be a proper doctor of science? For a moment, my self-doubting nature made me think of other impostor doctors like the Vicar of Unworthy in Devon, the Reverend Fiddle, DD.

When I set my heart towards independent science, I had no intention whatever of becoming a professional chemist and consultant.

That is a good and proper way of life but it was not for me. Science was and is my passion and I wanted to be free to do it unfettered by direction from anyone, not even by the mild constraints of a university department or an institute of science. Any artist or novelist would understand—some of us do not produce their best when directed. We expect the artist, the novelist and the composer to lead solitary lives, often working at home. While a few of these creative individuals exist in institutions or universities, the idea of a majority of established novelists or painters working at the ‘National Institute for Painting and Fine Art’ or a university ‘Department of Creative Composition’ seems mildly amusing. By contrast, alarm greets the idea of a creative scientist working at home. A lone scientist is as unusual as a solitary termite and regarded as irresponsible or worse.

In the early 1970s, *New Scientist* published a review of a book on Darwin’s life. The reviewer claimed the book confirmed his view that our most distinguished biologist was insane. He argued that anyone with Darwin’s reputation who chose to bury himself in a country village instead of enjoying the intellectual stimulation Cambridge offered must be mad. As I see it, the reviewer, not Darwin, was the lunatic.

I want to tell you in this book why I ‘buried myself’ in the country village of Bowerchalke. I worked happily there until 1977, when sadly the agribusiness revolution socially cleansed the village. My escape was to West Devon and to a house surrounded by trees and almost a mile from its nearest neighbour. I want to show that the solitary practice of science in a country village, or even a remote house, is both pleasant and productive.

Soon after starting work in Bowerchalke, chance favoured me with a view of the Earth from space and I saw it as the stunningly beautiful anomaly of the solar system—a planet that was palpably different from its dead and deserted siblings, Mars and Venus. I saw Earth as much more than just a ball of rock moistened by the oceans, or a spaceship put there by a beneficent God just for the use of humankind. I saw it as a planet that has always, since its origins nearly four billion years ago, kept itself a fit home for the life that happened upon it and I thought that it did so by homeostasis, the wisdom of the body, just as you and I keep our temperature and chemistry constant. In this view the spontaneous evolution of life did more than make Darwin’s world: it started a joint project with the evolving Earth itself. Life does more than adapt to the earth; it changes it, and evolution is a

tight-coupled dance with life and the material environment as partners, and from the dance emerges the entity Gaia. This book is as much about Gaia as it is about me. That part which is about me is to set the scene for the birth of what is still a revolutionary theory. I doubt if the scientific establishment would have allowed a proper doctor to work on so unfashionable a topic and one with a name that many scientists regard as politically incorrect.

The naming of things is important. Our deepest thoughts are unconscious and we need metaphors and similes to translate them into something that we, as well as the rest of humankind, can understand. For reasons that I never understood, many scientists dislike Gaia as a name; prominent among them is the eminent biologist, John Maynard Smith. He made clear when he said of Gaia, ‘What an awful name to call a theory’, that it was the name, the metaphor, more than the science that caused his disapproval. He was, like most scientists, well aware of the power of metaphor. William Hamilton’s metaphors of selfish and spiteful genes have served wonderfully to make his science comprehensible, but let us never forget that the powerful metaphor of Gaia was the gift of a great novelist. I would remind those who criticize the name Gaia that they are doing battle with William Golding, who first coined it. We should not lightly turn aside from the name Gaia because of pedantic objection. Why do scientists, who now accept Gaia as a theory that they can try to falsify, continue to object to the name itself? Surely, it cannot be metaphor envy. Perhaps it is something deeper, a rejection by reductionist scientists of anything that smells of holism, anything that implies that the whole may be more than the sum of its parts. I see the battle between Gaia and the selfish gene as part of an outdated and pointless war between holists and reductionists. In a sensible world, we need them both.

I gladly accepted William Golding’s choice of the name Gaia for my theory of the Earth and I have devoted all my working life, since completing my apprenticeship, to the furtherance of Gaia theory. It has been an exciting but bruising battle and this book tells both the story of Gaia and tries to explain how my life as a scientist led me to it. I take comfort in the fact that Gaia theory is now widely accepted by scientists in disciplines ranging from astrophysics to microbiology, they only reject the name Gaia, not the theory itself. Unfortunately, science is divided into a myriad of facets like the multi-lensed eye of a fly and through each separate lens peers a professor who thinks that his view alone is true. The danger now is that each of these fragmented

faculties who once spurned Gaia will now claim the theory as their own. We must not stand aside and let these specialists highjack the unifying concept of Gaia.

Gaia and environmentalism have never had an easy relationship. I seem to view environmental politics much as George Orwell did the socialism of his time. My heart is with the environmentalists but I see their good intentions thwarted by their failure to see that human rights alone are not enough. If, in caring for people, we fail to care for other forms of life on Earth then our civilization and we will suffer. I wonder if in the 21st century, when the grim effects of global warming become apparent, we will regret the humanist bias that led us to continue to burn fossil fuel and plunder the natural world for food. Is our distrust of nuclear power and genetically modified food soundly based? I share Patrick Moore's disenchantment with environmentalism. He was a founder of Greenpeace, but like me has an Orwellian view of the environment lobbies as they are today.

Some who read this book might think it old fashioned, and if they do, I ask them to note that I was born in 1919, when English society was still conditioned by the code of the gentleman, a culture which valued good manners, playing by the rules, admiring the good loser and above all taking full responsibility for mistakes. In certain ways, it resembled the Samurai code of another island nation. I grew up believing in it and still do but recognize now when a young woman offers me her seat on the Underground that I am no longer with it. I acknowledge the debt I owe to the United States of America for launching me on my quest for Gaia and for sustaining me throughout my independence. Now with Sandy, my American wife, to accompany me, I no longer feel, when in the United States, a mere visiting alien. If at times in this book, I am critical of American institutions, it does not come from the spite or envy of an outsider but is the concern of one member of an American family. I am critical also of academia and share the author Robert Conquest's view, expressed in his book *Reflections on a Ravaged Century*, that a surprising number of midlife academics seem selected for dogma. He was thinking of politics, but I think it applies to science also.

Few are privately wealthy enough to develop a new theory of science and support a family from their own resources. When we started in Bowerchalke, my first wife Helen and I were less than rich; we had our parents to support as well as our children. Like most young families, we were heavily mortgaged and, like an intend-

ing artist, I knew that to make a start would not be easy. No matter how good was my science, no one would sponsor it until the science critics had approved. Like art critics, their first reactions are often cautious or negative.

The answer was to do what the artist does: expect no sale for my masterpieces but live by selling ‘potboilers’. My potboilers were small research contracts and consultancies. These provided an ample income without needing more than a small proportion of my time. I had hoped that the sale of inventions would pay my bills but these turned out to be an unreliable source of income.

Strangely, wealth threatens the would-be independent as much as poverty. It would have been easy for me at several stages in my independence to have built and marketed a successful product. In the 1960s, I built a prototype leak detector that was cheaper, simpler, and over a thousand times more sensitive than those that were then on the market. I could have joined with an engineer and a marketer to form a company to make and sell it. I do not regret parting with that chance of wealth. Becoming an entrepreneur is a full-time job. Building, testing and selling a well-made product is a right and proper way of life. It provides employment, brings wealth to our country, and is a source of pride, but it was not what I wanted. How could I devote my time to science if I was concerned about the future and the welfare of my employees and my company?

As a scientist, I have been an explorer looking for new worlds, not a harvester from safe and productive fields, and life at the frontier has shown me that there are no certainties and that dogma is usually wrong. I now recognize that with each discovery the extent of the unknown grows larger, not smaller. The discoveries I have made came mostly from doubting conventional wisdom, and I would advise any young scientist looking for a new and fresh topic to research to seek the flaw in anything claimed by the orthodox to be certain. There are several examples of the use of this approach in this book. The most important was to challenge the biological dogma that organisms simply adapt to their environment. It turned out that just as we cannot observe an atom without changing its state, so neither can we, or any living thing, evolve without changing the state of the Earth. This is the essence of Gaia.

I hope that I can convince you that the independent scientist has a wonderfully interesting and rewarding life—every bit as good as that of the artist or composer, and may even be as worthwhile. I doubt if

the discovery of CFCs in the atmosphere, or the extraordinary link between the microscopic algae of the oceans and the clouds above them and, most of all, the idea that the Earth regulates its climate and composition—the Gaia theory—would have come as quickly had I stayed in employment or become an entrepreneur. Gaia has been my inspiration since it first came into my mind in September 1965. Theories in science are valued by the success of investigations and experiments they inspire; by this measure, Gaia has been fruitful. Thousands of scientists owe their employment and their grant funds to my work as an independent scientist and I include among them those who spend their time trying to disprove Gaia theory.

The four chapters that follow are about my childhood and my experiences as an apprentice practitioner of science. Then, in Chapters 5 and 6 I explain how I became an independent scientist, how I do it, and about the customers who provide support. In Chapters 7 to 9 I try to show how serious science can be done from a home laboratory and paid for from the profits of the practice. Chapter 9 is about the quest for Gaia from its start in the 1960s until the writing of this book. In Chapter 10 I explain the practical details of a life spent as an independent scientist. My more recent personal history follows in Chapters 11 and 12, and in the Epilogue, I offer Gaia as a way of life for agnostics.

Let me start by telling you about my childhood and the events that shaped my evolution as an independent scientist.