

# Thinking about Life

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The History and Philosophy  
of Biology and Other Sciences

 Springer

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# Preface

Our previous book, *About Life*, concerned modern biology. We used our present-day understanding of cells to ‘define’ the living state, providing a basis for exploring several general-interest topics: the origin of life, extraterrestrial life, intelligence, and the possibility that humans are unique. The ideas we proposed in *About Life* were intended as starting-points for debate – we did not claim them as ‘truth’ – but the information on which they were based is currently accepted as ‘scientific fact’.

What does that mean? What is ‘scientific fact’ and why is it accepted? What is *science* – and is biology like other sciences such as physics (except in subject matter)? The book you are now reading investigates these questions – and some related ones. Like *About Life*, it may particularly interest a reader who wishes to change career to biology and its related subdisciplines. In line with a recommendation by the British Association for the Advancement of Science – that the public should be given fuller information about the nature of science – we present the concepts underpinning biology and a survey of its historical and philosophical basis.

In the first chapter of *About Life* we defined science, provisionally, as *a way of satisfying our curiosity by formulating questions about what we observe and answering them dispassionately, without making value judgements*. That definition seemed adequate at the time, but it is easy to pick holes in it. For example, the word ‘science’ is used regularly in television programmes, magazines, websites and broadsheet newspapers, but it seems to be used in different senses. How can we interpret the word when its meaning varies?

For most people, most of the time, ‘science’ means knowledge of a certain sort<sup>1</sup>: a collection of facts and beliefs that helps us to explain and predict the observable world coherently. A science textbook is a repository of such knowledge. When you study science at school or university you learn some of it. But ‘scientific knowledge’

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<sup>1</sup>The Latin *scientia* is usually translated as ‘knowledge’. Prior to about 1800, ‘science’ denoted knowledge and understanding in general; for instance, what are now loosely called ‘the humanities’ were called ‘moral sciences’. In the late 17th and 18th centuries, what we *now* call ‘science’ was labelled ‘natural philosophy’. The word ‘scientist’ was invented in the 1830s by William Whewell, first president of the British Association for the Advancement of Science, but was not widely accepted until well into the 20th century.

changes continuously. You only have to compare an old edition of a textbook with a recent one to see how much has had to be rewritten in the last 10–15 years.<sup>2</sup> Emerging techniques reveal new facts about the world and our way of thinking has to change to accommodate them. Indeed, many different factors influence the way in which science changes: political, economic, religious, and so on. Therefore, a ‘scientific fact’ – a ‘scientific truth’ – is not constant or absolute or ‘eternal’. Historians of science can tell us how, and in part *why*, our understanding of nature has changed over time. If we are to understand what science is and in what sense it can claim to provide ‘truth’, we need to understand why it changes. Therefore, much of this book is about history: the traditions from which modern science evolved and the controversies that arose in the process. Our emphasis from Chapter 6 onwards is on the history of biology.

Practising scientists use the word ‘science’ to describe their day-to-day work: planning and performing experiments, making observations, recording data, interpreting results, deducing, predicting, speculating, and communicating their findings. Before you are entitled to participate in these activities you must pass a number of examinations and serve what amounts to an apprenticeship under the guidance of one or more established practitioners. You will find yourself facing a career structure with various pay scales and competing, often intensely, with similarly qualified people. A code of professional ethics (largely unspoken) helps to regulate this competition. It should also regulate other aspects of your behaviour; good scientists do not invent data or steal each other’s results; and when appropriate, they consider their new ideas in relation to technology and public debate. Understood in this sense – what people called ‘scientists’ *do* – ‘science’ is a subject for sociologists.

However, when practising scientists are asked what ‘science’ is, they seldom answer in terms of their daily work or their ethics. More commonly they tell us that science is a special and distinctive way of thinking about the natural world, unmatched in the intricate detail, practical applicability or ‘truth’ of what it generates. But what exactly *is* this way of thinking? How is it ‘distinctive’? And in what sense is the knowledge it produces ‘true’? Most of those are questions for philosophers, but scientists should also consider them.

It is surprisingly difficult to pin down the relationships among the history, sociology and philosophy of science. Sociologists of science look at single frozen frames in the film of history. History illustrates and tests the arguments of philosophers. The history, philosophy and sociology of science are collectively labelled ‘science studies’, but they remain separate disciplines, each with its own methods and standards of quality. They are specialised subjects, though their domains overlap considerably. In this book, we shall adopt arguments and perspectives from each of them to suit our purposes, but we shall not go into details.

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<sup>2</sup> A ‘scientific fact’ may be here today but gone tomorrow as new evidence gives us greater understanding and corrects mistaken notions.

Many of our colleagues, including some eminent ones, have a deep antipathy to ‘science studies’, which they think distorts our picture of science and its status as a uniquely reliable mode of knowledge.<sup>3</sup> They say that it damages the public image and therefore the funding of science. We understand this antipathy, but the best work in the science studies disciplines should not be dismissed lightly. We need it to answer our questions about what science is, and *why* it is, and to explore the similarities and differences between biology and other sciences. In order to study the thinking behind the science of biology – which includes the whole range of knowledge from early life forms to modern medicine – we have to consider how it arose, and to understand, as well as we can, the thought process and philosophies of the pioneers of modern thought.

Without such considerations, we cannot go on to explore the most controversial topics associated with biology and other sciences today: patenting of human genes, cloning, genetic modification of crops, the obliteration of habitats, the extinction of species, and so on. These are matters that concern everyone, and we all need to be able to discuss them rationally, from an informed standpoint. We offer this book in an effort to meet that need.

The bibliography comprises publications that expand on the ideas presented in the text or offer different perspectives: some are introductory and others are more advanced, but all should be accessible to the non-specialist reader. For particular points, we have relied on professional publications and old or classical works that may interest readers with specialist backgrounds; we have cited these in footnotes at appropriate points in the text rather than adding them to the bibliography.

The book has grown from many years of reading and discussion. Among the numerous colleagues with whom we have exchanged views during the past four decades, Larry Briskman, Jürgen Lawrenz, Christopher Longuet-Higgins, Colm Malone, Jacques Monod, Karl Popper, John Porteous, Lewis Wolpert and J. Z. Young have perhaps been particularly influential. We are also grateful to Lloyd Demetrius and Carolyn Fisher for their helpful criticisms of draft chapters.

May 2008

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<sup>3</sup> Academic ‘disciplines’ are artificial categories – labels attached to different parts of a spectrum of human activity. These labels enable us to understand broadly where each individual operates and from what basis their arguments are developed.

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