

NATIONAL BESTSELLER

RICHARD DAWKINS



“As readable
and vigorous a
defense of
Darwinism as has
been published
since 1859.”
—*The Economist*

THE BLIND WATCHMAKER

Why the Evidence *of* Evolution Reveals
a Universe Without Design

NATIONAL BESTSELLER

RICHARD DAWKINS



—
“As readable
and vigorous a
defense of
Darwinism as has
been published
since 1859.”

—*The Economist*
—

THE BLIND WATCHMAKER

Why the Evidence *of* Evolution Reveals
a Universe Without Design



THE BLIND WATCHMAKER

Why the Evidence of Evolution
Reveals a Universe Without Design

RICHARD DAWKINS



W. W. NORTON & COMPANY

Independent Publishers Since 1923

New York London

To my parents

CONTENTS

Introduction to the 1996 edition

Preface

1. Explaining the very improbable
2. Good design
3. Accumulating small change
4. Making tracks through animal space
5. The power and the archives
6. Origins and miracles
7. Constructive evolution
8. Explosions and spirals
9. Puncturing punctuationism
10. The one true tree of life
11. Doomed rivals

Bibliography

Index

INTRODUCTION TO THE 1996 EDITION

I have been asked to provide a new introduction for this reissue of *The Blind Watchmaker*. I thought the task would be easy. All I had to do was list the ways — there surely had to be many — in which I should reform the book if I were writing it again today. Eagerly, chapter by chapter, I scanned for errors, misguidednesses, out-of-datenesses, incompletenesses. I genuinely wanted to find them, for science — whatever the frailties of its individual practitioners — is not naturally complacent and pays lip service to the ideal of progress through falsification. But, alas, details aside, I can find no major thesis in these chapters that I would withdraw, nothing to justify the satisfying catharsis of a good recant.

This does not mean, of course, that there is no more to be said. I could easily fill another ten entirely new chapters on the perennially fascinating topic of evolutionary design. But that would be another book. Now that I think of it, it would be called *Climbing Mount Improbable* (Norton, 1996). Although each of the two books is self-sufficient and can be read on its own, it is also true that either could be read as a continuation of the other. The particular subject matter of the two books is different, just as all the chapters of the present book are different from each other, but the underlying theme is the same — Darwinism and design.

To say that I do not apologise for this Darwinian continuity would be an understatement. Darwinism is a giant subject, whose many faces are good for more books than could be finished in a full and satisfying career. Nor am I a professional ‘science writer’ who, having ‘done’ evolution, might be expected to turn his attention to physics or astronomy. Why should I? A historian can legitimately write more than one book about history rather than switch to classics or mathematics. A master chef produces yet another

book on some new aspect of cooking, correctly reasoning that gardening is best left to master gardeners. Notwithstanding the relative shelf space allocated to the respective topics in bookshops (and understating again), Darwinism is a larger subject than either cookery or gardening. It is my subject and it provides ample scope for one lifetime's expertise.

Darwinism encompasses all of life — human, animal, plant, bacterial, and, if I am right in the last chapter of this book, extraterrestrial. It provides the only satisfying explanation for why we all exist, why we are the way that we are. It is the bedrock on which rest all the disciplines known as the humanities. I do not mean that history, literary criticism, and the law should be recast in a specifically Darwinian mould. Far from it, very far. But all human works are the products of brains, brains are evolved data processing devices, and we shall misunderstand their works if we forget this fundamental fact. If more doctors understood Darwinism, humanity would not now be facing a crisis of antibiotic resistance. Darwinian evolution, as one reviewer has observed, 'is the most portentous natural truth that science has yet discovered'. I'd add, 'or is likely to discover'.

Other books have appeared in the ten years since *The Blind Watchmaker* was published, which I should like to have written and which I would certainly draw upon were I to start the book again. Helena Cronin's beautifully written *The Ant and the Peacock*, and Matt Ridley's equally clear *The Red Queen* would be bound to influence any rewriting of the chapter on sexual selection. Daniel Dennett's *Darwin's Dangerous Idea* would colour my historical and philosophical interpretations at all points, and his refreshing forthrightness would embolden my critical chapters. Mark Ridley's magisterial *Evolution* would be an ever-open source of instruction for me and my readers. Steven Pinker's *The Language Instinct* might have inspired me to tackle the subject of language from an evolutionary point of view, had he not already done it so well. The same applies to 'Darwinian medicine' were it not for Randolph Nesse and George Williams's excellent book on the subject (albeit the title wished by the publishers upon the unfortunate authors is the perversely unhelpful 'Why we get sick').

There are still those who seek to deny the truth of evolution, and there are disturbing signs that their influence is even growing, at least in local areas of the United States. Insofar as these backwoodsmen have arguments, they

mostly centre around the notion of ‘design’ — which also happens to be the principal theme of *The Blind Watchmaker*. The book had finer ambitions than to serve as a reply to such arguments, but it is still true that anybody tempted by the arguments of creationists will find definitive refutations of them — I think *all* of them — in here.

Pretend as they will to scientific credentials, the anti-evolution propagandists are always religiously motivated, even if they try to buy credibility by concealing the fact. In most cases, they know deep down what to believe because their parents recommended an ancient book that tells them what to believe. If the scientific evidence learned in adulthood contradicts the book, there must be something wrong with the scientific evidence. Since all radiometric dating methods agree that the earth is thousands of millions of years old, something obviously has to be wrong with all radiometric dating methods. The holy book of childhood cannot be, must not be, wrong.

There are grounds for hope, however. When *The Blind Watchmaker* was first published in the United States, Norton sent me on a brief tour of the country, and I did a number of radio phone-ins. I had been warned to expect hostile questioning from fundamentalist listeners and I confess I was looking forward to destroying their arguments. What actually happened was even better. The listeners who telephoned were genuinely interested in the subject of evolution. They were not hostile to it, they simply did not know anything about it. Instead of destroying arguments, I had the more constructive task of educating the innocent. It took only minutes to awaken them to the power of Darwinism as a convincing explanation of life. I got the impression that the only reason they had not seen its possibilities before was that the subject had been totally omitted from their education. Aside from some vague nonsense about ‘monkeys’, they simply did not know what Darwinism was.

I was reminded of the creationist student who, through some accident of the selection procedure, was once admitted to the Zoology Department at Oxford University. He had been educated at a small fundamentalist college in the United States and had emerged a simple, young Earth creationist. When he arrived in Oxford, he was encouraged to attend a course of lectures on evolution. At the end he came up to the lecturer (who happened to be me), beaming with the primal joy of discovery: ‘Gee’, he exulted, ‘this evolution! It really makes sense.’ It certainly does. In the words of a

teeshirt which an anonymous American reader was kind enough to send me:
'Evolution — The Greatest Show on Earth — The Only Game in Town!'

—Richard Dawkins
Oxford, June 1996

PREFACE

This book is written in the conviction that our own existence once presented the greatest of all mysteries, but that it is a mystery no longer because it is solved. Darwin and Wallace solved it, though we shall continue to add footnotes to their solution for a while yet. I wrote the book because I was surprised that so many people seemed not only unaware of the elegant and beautiful solution to this deepest of problems but, incredibly, in many cases actually unaware that there was a problem in the first place!

The problem is that of complex design. The computer on which I am writing these words has an information storage capacity of about 64 kilobytes (one byte is used to hold each character of text). The computer was consciously designed and deliberately manufactured. The brain with which you are understanding my words is an array of some ten million kiloneurones. Many of these billions of nerve cells have each more than a thousand 'electric wires' connecting them to other neurones. Moreover, at the molecular genetic level, every single one of more than a trillion cells in the body contains about a thousand times as much precisely-coded digital information as my entire computer. The complexity of living organisms is matched by the elegant efficiency of their apparent design. If anyone doesn't agree that this amount of complex design cries out for an explanation, I give up. No, on second thoughts I don't give up, because one of my aims in the book is to convey something of the sheer wonder of biological complexity to those whose eyes have not been opened to it. But having built up the mystery, my other main aim is to remove it again by explaining the solution.

Explaining is a difficult art. You can explain something so that your reader understands the words; and you can explain something so that the

reader feels it in the marrow of his bones. To do the latter, it sometimes isn't enough to lay the evidence before the reader in a dispassionate way. You have to become an advocate and use the tricks of the advocate's trade. This book is not a dispassionate scientific treatise. Other books on Darwinism are, and many of them are excellent and informative and should be read in conjunction with this one. Far from being dispassionate, it has to be confessed that in parts this book is written with a passion which, in a professional scientific journal, might excite comment. Certainly it seeks to inform, but it also seeks to persuade and even — one can specify *aims* without presumption — to inspire. I want to inspire the reader with a vision of our own existence as, on the face of it, a spine-chilling mystery; and simultaneously to convey the full excitement of the fact that it is a mystery with an elegant solution which is within our grasp. More, I want to persuade the reader, not just that the Darwinian world-view *happens* to be true, but that it is the only known theory that *could*, in principle, solve the mystery of our existence. This makes it a doubly satisfying theory. A good case can be made that Darwinism is true, not just on this planet but all over the universe wherever life may be found.

In one respect I plead to distance myself from professional advocates. A lawyer or a politician is paid to exercise his passion and his persuasion on behalf of a client or a cause in which he may not privately believe. I have never done this and I never shall. I may not always be right, but I care passionately about what is true and I never say anything that I do not believe to be right. I remember being shocked when visiting a university debating society to debate with creationists. At dinner after the debate, I was placed next to a young woman who had made a relatively powerful speech in favour of creationism. She clearly couldn't *be* a creationist, so I asked her to tell me honestly why she had done it. She freely admitted that she was simply practising her debating skills, and found it more challenging to advocate a position in which she did not believe. Apparently it is common practice in university debating societies for speakers simply to be *told* on which side they are to speak. Their own beliefs don't come into it. I had come a long way to perform the disagreeable task of public speaking, because I believed in the truth of the motion that I had been asked to propose. When I discovered that members of the society were using the motion as a vehicle for playing arguing games, I resolved to decline future

invitations from debating societies that encourage insincere advocacy on issues where scientific truth is at stake.

For reasons that are not entirely clear to me, Darwinism seems more in need of advocacy than similarly established truths in other branches of science. Many of us have no grasp of quantum theory, or Einstein's theories of special and general relativity, but this does not in itself lead us to *oppose* these theories! Darwinism, unlike 'Einsteinism', seems to be regarded as fair game for critics with any degree of ignorance. I suppose one trouble with Darwinism is that, as Jacques Monod perceptively remarked, everybody *thinks* he understands it. It is, indeed, a remarkably simple theory; childish so, one would have thought, in comparison with almost all of physics and mathematics. In essence, it amounts simply to the idea that non-random reproduction, where there is hereditary variation, has consequences that are far-reaching if there is time for them to be cumulative. But we have good grounds for believing that this simplicity is deceptive. Never forget that, simple as the theory may seem, nobody thought of it until Darwin and Wallace in the midnineteenth century, nearly 200 years after Newton's *Principia*, and more than 2,000 years after Eratosthenes measured the Earth. How could such a simple idea go so long undiscovered by thinkers of the calibre of Newton, Galileo, Descartes, Leibnitz, Hume and Aristotle? Why did it have to wait for two Victorian naturalists? What was *wrong* with philosophers and mathematicians that they overlooked it? And how can such a powerful idea go still largely unabsorbed into popular consciousness?

It is almost as if the human brain were specifically designed to misunderstand Darwinism, and to find it hard to believe. Take, for instance, the issue of 'chance', often dramatized as *blind* chance. The great majority of people that attack Darwinism leap with almost unseemly eagerness to the mistaken idea that there is nothing other than random chance in it. Since living complexity embodies the very antithesis of chance, if you think that Darwinism is tantamount to chance you'll obviously find it easy to refute Darwinism! One of my tasks will be to destroy this eagerly believed myth that Darwinism is a theory of 'chance'. Another way in which we seem predisposed to disbelieve Darwinism is that our brains are built to deal with events on radically different *timescales* from those that characterize evolutionary change. We are equipped to appreciate processes that take seconds, minutes, years or, at most, decades to complete. Darwinism is a

theory of cumulative processes so slow that they take between thousands and millions of decades to complete. All our intuitive judgements of what is probable turn out to be wrong by many orders of magnitude. Our well-tuned apparatus of scepticism and subjective probability-theory misfires by huge margins, because it is tuned — ironically, by evolution itself — to work within a lifetime of a few decades. It requires effort of the imagination to escape from the prison of familiar timescale, an effort that I shall try to assist.

A third respect in which our brains seem predisposed to resist Darwinism stems from our great success as creative designers. Our world is dominated by feats of engineering and works of art. We are entirely accustomed to the idea that complex elegance is an indicator of premeditated, crafted design. This is probably the most powerful reason for the belief, held by the vast majority of people that have ever lived, in some kind of supernatural deity. It took a very large leap of the imagination for Darwin and Wallace to see that, contrary to all intuition, there is another way and, once you have understood it, a far more plausible way, for complex ‘design’ to arise out of primeval simplicity. A leap of the imagination so large that, to this day, many people seem still unwilling to make it. It is the main purpose of this book to help the reader to make this leap.

Authors naturally hope that their books will have lasting rather than ephemeral impact. But any advocate, in addition to putting the timeless part of his case, must also respond to contemporary advocates of opposing, or apparently opposing, points of view. There is a risk that some of these arguments, however hotly they may rage today, will seem terribly dated in decades to come. The paradox has often been noted that the first edition of *The Origin of Species* makes a better case than the sixth. This is because Darwin felt obliged, in his later editions, to respond to contemporary criticisms of the first edition, criticisms which now seem so dated that the replies to them merely get in the way, and in places even mislead. Nevertheless, the temptation to ignore fashionable contemporary criticisms that one suspects of being nine days’ wonders is a temptation that should not be indulged, for reasons of courtesy not just to the critics but to their otherwise confused readers. Though I have my own private ideas on which chapters of my book will eventually prove ephemeral for this reason, the reader — and time — must judge.

I am distressed to find that some women friends (fortunately not many) treat the use of the impersonal masculine pronoun as if it showed intention to exclude them. If there were any excluding to be done (happily there isn't) I think I would sooner exclude men, but when I once tentatively tried referring to my abstract reader as 'she', a feminist denounced me for patronizing condescension: I ought to say 'he-or-she', and 'his-or-her'. That is easy to do if you don't care about language, but then if you don't care about language you don't deserve readers of either sex. Here, I have returned to the normal conventions of English pronouns. I may refer to the 'reader' as 'he', but I no more think of my readers as specifically male than a French speaker thinks of a table as female. As a matter of fact I believe I do, more often than not, think of my readers as female, but that is my personal affair and I'd hate to think that such considerations impinged on how I use my native language.

Personal, too, are some of my reasons for gratitude. Those to whom I cannot do justice will understand. My publishers saw no reason to keep from me the identities of their referees (not 'reviewers' — true reviewers, *pace* many Americans under 40, criticize books only *after* they are published, when it is too late for the author to do anything about it), and I have benefited greatly from the suggestions of John Krebs (again), John Durant, Graham Cairns-Smith, Jeffrey Levinton, Michael Ruse, Anthony Hallam and David Pye. Richard Gregory kindly criticized Chapter 12, and the final version has benefited from its complete excision. Mark Ridley and Alan Grafen, now no longer even officially my students, are, together with Bill Hamilton, the leading lights of the group of colleagues with whom I discuss evolution and from whose ideas I benefit almost daily. They, Pamela Wells, Peter Atkins and John Dawkins have helpfully criticized various chapters for me. Sarah Bunney made numerous improvements, and John Gribbin corrected a major error. Alan Grafen and Will Atkinson advised on computing problems, and the Apple Macintosh Syndicate of the Zoology Department kindly allowed their laser printer to draw biomorphs.

Once again I have benefited from the relentless dynamism with which Michael Rodgers, now of Longman, carries all before him. He, and Mary Cunnane of Norton, skilfully applied the accelerator (to my morale) and the brake (to my sense of humour) when each was needed. Part of the book was written during a sabbatical leave kindly granted by the Department of Zoology and New College. Finally — a debt I should have acknowledged in

both my previous books — the Oxford tutorial system and my many tutorial pupils in zoology over the years have helped me to practise what few skills I may have in the difficult art of explaining.

—Richard Dawkins
Oxford, 1986

THE BLIND WATCHMAKER

CHAPTER 1

Explaining the very improbable

We animals are the most complicated things in the known universe. The universe that we know, of course, is a tiny fragment of the actual universe. There may be yet more complicated objects than us on other planets, and some of them may already know about us. But this doesn't alter the point that I want to make. Complicated things, everywhere, deserve a very special kind of explanation. We want to know how they came into existence and why they are so complicated. The explanation, as I shall argue, is likely to be broadly the same for complicated things everywhere in the universe; the same for us, for chimpanzees, worms, oak trees and monsters from outer space. On the other hand, it will not be the same for what I shall call 'simple' things, such as rocks, clouds, rivers, galaxies and quarks. These are the stuff of physics. Chimps and dogs and bats and cockroaches and people and worms and dandelions and bacteria and galactic aliens are the stuff of biology.

The difference is one of complexity of design. Biology is the study of complicated things that give the appearance of having been designed for a purpose. Physics is the study of simple things that do not tempt us to invoke design. At first sight, man-made artefacts like computers and cars will seem to provide exceptions. They are complicated and obviously designed for a purpose, yet they are not alive, and they are made of metal and plastic rather than of flesh and blood. In this book they will be firmly treated as biological objects.

The reader's reaction to this may be to ask, 'Yes, but are they *really* biological objects?' Words are our servants, not our masters. For different purposes we find it convenient to use words in different senses. Most

cookery books class lobsters as fish. Zoologists can become quite apoplectic about this, pointing out that lobsters could with greater justice call humans fish, since fish are far closer kin to humans than they are to lobsters. And, talking of justice and lobsters, I understand that a court of law recently had to decide whether lobsters were insects or ‘animals’ (it bore upon whether people should be allowed to boil them alive). Zoologically speaking, lobsters are certainly not insects. They are animals, but then so are insects and so are we. There is little point in getting worked up about the way different people use words (although in my nonprofessional life I am quite prepared to get worked up about people who boil lobsters alive). Cooks and lawyers need to use words in their own special ways, and so do I in this book. Never mind whether cars and computers are ‘really’ biological objects. The point is that if anything of that degree of complexity were found on a planet, we should have no hesitation in concluding that life existed, or had once existed, on that planet. Machines are the direct products of living objects; they derive their complexity and design from living objects, and they are diagnostic of the existence of life on a planet. The same goes for fossils, skeletons and dead bodies.

I said that physics is the study of simple things, and this, too, may seem strange at first. Physics appears to be a complicated subject, because the ideas of physics are difficult for us to understand. Our brains were designed to understand hunting and gathering, mating and child-rearing: a world of medium-sized objects moving in three dimensions at moderate speeds. We are ill-equipped to comprehend the very small and the very large; things whose duration is measured in picoseconds or gigayears; particles that don’t have position; forces and fields that we cannot see or touch, which we know of only because they affect things that we can see or touch. We think that physics is complicated because it is hard for us to understand, and because physics books are full of difficult mathematics. But the objects that physicists study are still basically simple objects. They are clouds of gas or tiny particles, or lumps of uniform matter like crystals, with almost endlessly repeated atomic patterns. They do not, at least by biological standards, have intricate working parts. Even large physical objects like stars consist of a rather limited array of parts, more or less haphazardly arranged. The behaviour of physical, nonbiological objects is so simple that

it is feasible to use existing mathematical language to describe it, which is why physics books are full of mathematics.

Physics *books* may be complicated, but physics books, like cars and computers, are the product of biological objects — human brains. The objects and phenomena that a physics book describes are simpler than a single cell in the body of its author. And the author consists of trillions of those cells, many of them different from each other, organized with intricate architecture and precision-engineering into a working machine capable of writing a book (my trillions are American, like all my units: one American trillion is a million millions; an American billion is a thousand millions). Our brains are no better equipped to handle extremes of complexity than extremes of size and the other difficult extremes of physics. Nobody has yet invented the mathematics for describing the total structure and behaviour of such an object as a physicist, or even of one of his cells. What we can do is understand some of the general principles of how living things work, and why they exist at all.

This was where we came in. We wanted to know why we, and all other complicated things, exist. And we can now answer that question in general terms, even without being able to comprehend the details of the complexity itself. To take an analogy, most of us don't understand in detail how an airliner works. Probably its builders don't comprehend it fully either: engine specialists don't in detail understand wings, and wing specialists understand engines only vaguely. Wing specialists don't even understand wings with full mathematical precision: they can predict how a wing will behave in turbulent conditions, only by examining a model in a wind tunnel or a computer simulation — the sort of thing a biologist might do to understand an animal. But however incompletely we understand how an airliner works, we all understand by what general process it came into existence. It was designed by humans on drawing boards. Then other humans made the bits from the drawings, then lots more humans (with the aid of other machines designed by humans) screwed, rivetted, welded or glued the bits together, each in its right place. The process by which an airliner came into existence is not fundamentally mysterious to us, because humans built it. The systematic putting together of parts to a purposeful design is something we know and understand, for we have experienced it at first hand, even if only with our childhood Meccano or Erector set.

What about our own bodies? Each one of us is a machine, like an airliner only much more complicated. Were we designed on a drawing board too, and were our parts assembled by a skilled engineer? The answer is no. It is a surprising answer, and we have known and understood it for only a century or so. When Charles Darwin first explained the matter, many people either wouldn't or couldn't grasp it. I myself flatly refused to believe Darwin's theory when I first heard about it as a child. Almost everybody throughout history, up to the second half of the nineteenth century, has firmly believed in the opposite — the Conscious Designer theory. Many people still do, perhaps because the true, Darwinian explanation of our own existence is still, remarkably, not a routine part of the curriculum of a general education. It is certainly very widely misunderstood.

The watchmaker of my title is borrowed from a famous treatise by the eighteenth-century theologian William Paley. His *Natural Theology — or Evidences of the Existence and Attributes of the Deity Collected from the Appearances of Nature*, published in 1802, is the best-known exposition of the 'Argument from Design', always the most influential of the arguments for the existence of a God. It is a book that I greatly admire, for in his own time its author succeeded in doing what I am struggling to do now. He had a point to make, he passionately believed in it, and he spared no effort to ram it home clearly. He had a proper reverence for the complexity of the living world, and he saw that it demands a very special kind of explanation. The only thing he got wrong — admittedly quite a big thing! — was the explanation itself. He gave the traditional religious answer to the riddle, but he articulated it more clearly and convincingly than anybody had before. The true explanation is utterly different, and it had to wait for one of the most revolutionary thinkers of all time, Charles Darwin.

Paley begins *Natural Theology* with a famous passage:

In crossing a heath, suppose I pitched my foot against a *stone*, and were asked how the stone came to be there; I might possibly answer, that, for anything I knew to the contrary, it had lain there for ever: nor would it perhaps be very easy to show the absurdity of this answer. But suppose I had found a *watch* upon the ground, and it should be inquired how the watch happened to be in that place; I should hardly think of the answer which I had before given, that for anything I knew, the watch might have always been there.

Paley here appreciates the difference between natural physical objects like stones, and designed and manufactured objects like watches. He goes on to expound the precision with which the cogs and springs of a watch are

fashioned, and the intricacy with which they are put together. If we found an object such as a watch upon a heath, even if we didn't know how it had come into existence, its own precision and intricacy of design would force us to conclude

that the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers, who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use.

Nobody could reasonably dissent from this conclusion, Paley insists, yet that is just what the atheist, in effect, does when he contemplates the works of nature, for:

every indication of contrivance, every manifestation of design, which existed in the watch, exists in the works of nature; with the difference, on the side of nature, of being greater or more, and that in a degree which exceeds all computation.

Paley drives his point home with beautiful and reverent descriptions of the dissected machinery of life, beginning with the human eye, a favourite example which Darwin was later to use and which will reappear throughout this book. Paley compares the eye with a designed instrument such as a telescope, and concludes that 'there is precisely the same proof that the eye was made for vision, as there is that the telescope was made for assisting it'. The eye must have had a designer, just as the telescope had.

Paley's argument is made with passionate sincerity and is informed by the best biological scholarship of his day, but it is wrong, gloriously and utterly wrong. The analogy between telescope and eye, between watch and living organism, is false. All appearances to the contrary, the only watchmaker in nature is the blind forces of physics, albeit deployed in a very special way. A true watchmaker has foresight: he designs his cogs and springs, and plans their interconnections, with a future purpose in his mind's eye. Natural selection, the blind, unconscious, automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind. It has no mind and no mind's eye. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of watchmaker in nature, it is the *blind* watchmaker.

I shall explain all this, and much else besides. But one thing I shall not do is belittle the wonder of the living 'watches' that so inspired Paley. On the contrary, I shall try to illustrate my feeling that here Paley could have gone