A DEFINITIVE DESIGN BOOK

by a leading biblical creationist has now been *expanded*, *updated*, and *colour-illustrated*.

Even Richard Dawkins, the leading atheistic evolutionist, proclaimed, "Biology is the study of complicated things that give the appearance of having been designed for a purpose." In reality, they look designed because they ARE.

In 2008, creationist heavyweight Dr Jonathan Sarfati wrote the first edition of *By Design*. The book presented case after case, in many different areas, of design in the living world. And it did not pull back from affirming the world's true history, as revealed by the Designer Himself, in the Bible. The biblical history of the Fall and Flood answers problems that the 'mere design' view has always had trouble with: Why do some things appear poorly designed? Why are many creatures designed to kill other creatures?

Now 15 years have passed, and scientists have discovered even more design than previously known. New discoveries have expanded our knowledge of the amazing machinery in each 'simple' cell. The field of biomimetics—engineers copying design in nature—has made huge strides. And this expanded edition does full justice to the amazing designs with lots of full-colour illustrations.

The updated *By Design* book will likely become a classic work in the creation movement. It should be as crucial for the topic of design as Dr Sarfati's commentary, *The Genesis Account*, is for a historical Genesis 1–11.

"When master logician/scientist Jonathan Sarfati takes on another front of the creation/evolution battle, his fans know they're going to experience an intellectual feast of cut-and-thrust philosophical swordsmanship with the opponents of Genesis creation/intelligent design. But readers are in for an additional treat, too—his passion for digging into the details of life's breathtaking designs."

–DR CARL WIELAND, RETIRED MANAGING DIRECTOR (CEO) OF *CREATION MINISTRIES INTERNATIONAL* (AUSTRALIA)

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Evidence for nature's Intelligent Designer—the God of the Bible

Updated and colour-illustrated

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By Design: Evidence for nature's Intelligent Designer—the God of the Bible

Dr Jonathan Sarfati

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Foreword to the first edition

Don Batten, Ph.D: senior scientist, speaker, and writer for Creation Ministries International, Australia.

My colleague, Dr Jonathan Sarfati, is renowned as a leading thinker, writer, scientist and logician—a champion for the truth of Genesis as history. And virtually all exegetes would agree that Genesis is history, were it not for the sad fact that many have been bluffed and intimated into accepting the 'scientific' revisionist version of history.

Jonathan's books, *Refuting Evolution* (1 and 2), and *Refuting Compromise*, are some of the world's best-selling and highly regarded creation books. I think that this powerful new book is a definitive one on 'intelligent design'.

Sarfati's passion for describing the incredible designs in the natural world shines through. While never disparaging the ID movement, he forthrightly presents and builds on the design argument. He also sets the record straight about how creationists of the past have pioneered design arguments (including 'irreducible complexity', albeit with different terminology)—but he does this without detracting from the contributions of our natural allies within ID.

Not surprisingly, given his doctorate in physical chemistry, the author devotes a chapter to decisively exposing 'chemicals-to-life' evolution as a product of wishful thinking. The chapter is a treatise in itself.

Sarfati deals head-on with the objections that Genesis-avoiding ID folk tend to sidestep, or handle badly. For example, the issue of so-called 'poor design', and also why there are 'bad things' in nature. And of course, he dispatches with aplomb the old canard, revived in modern form by God-hater Richard Dawkins, namely, 'Who designed the Designer?'

Many, both laypeople and scientists, owe their confidence in God's Word (and humanly speaking, even their faith in Christ) to design arguments for biblical creation, and doubtless many more will as a result of this potent book.

Enjoy the feast!

Dr Don Batten

Preface to updated and illustrated edition

The first edition of *By Design* (2008) was one of the first (if not the first) in-depth book to present design in nature from a biblical ('young-earth') creationist perspective. This was both timely and necessary. One reason was the rapidly increasing evidence for design in so many areas of scientific research. Another was the fact that the mainstream Intelligent Design Movement has always tended to favour billions of years of earth history, and so lacks a history of design and the subsequent Fall from perfection.

Over 15 years have now passed since the first edition was released, a long time in this modern era of scientific discovery. There are now many more amazing examples of design in the natural world and the field of biomimetics or biomimicry—copying designs in nature—has skyrocketed. As such, an updated version of *By Design* is long overdue.

The original book also suffered from a scarcity of illustrations—although this topic lends itself to plenty of them—and those included were black-and-white. Only full-colour images can come close to doing justice to this important topic, and nowhere is this more obvious than in the chapter on colours and patterns. To this end, we've packed the new edition with many stunning, full-colour photographs and diagrams.

We hope readers will find the new—and old—design information presented in this book interesting, and instructive, and will give all glory and honour to the Designer.

Acknowledgments

I gratefully acknowledge the valuable specialist assistance in checking draft chapters (in alphabetical order):

- Don Batten, Ph.D. (plant physiology, research into the boundaries of the created kind, editor of *The Creation Answers Book*)
- E. van Niekerk, M.Eng. (engineering, checking updated edition)
- Mark James, B.Sc. (Hons, chemistry) (proofreading updated edition)
- Carl Wieland, M.B.B.S. (equivalent of US M.D., for overall editing of first edition)

Finally, I thank my own *Shulamit*, my wife Sherry, for her love and support, as well as for extensive and helpful editing of the updated edition.

Plato and Aristotle in *The School of Athens* by Raphael

Introduction: A brief history of design

The Design Argument has a long and distinguished history. Philosophers have used the design of life and the universe to point to a Designer for millennia.

Since life originated in the past, neither its design nor alleged evolution can be observed directly by experimental science. But evolution or creation might conceivably have left some observable *effects*. This chapter discusses the criteria that are used in everyday life to determine whether something has been designed and applies them to the living world.

Argument from design to designer

Many philosophers have argued that the living world shows evidence of design, which points to one or more designers. This is often called the *teleological argument*.[1]

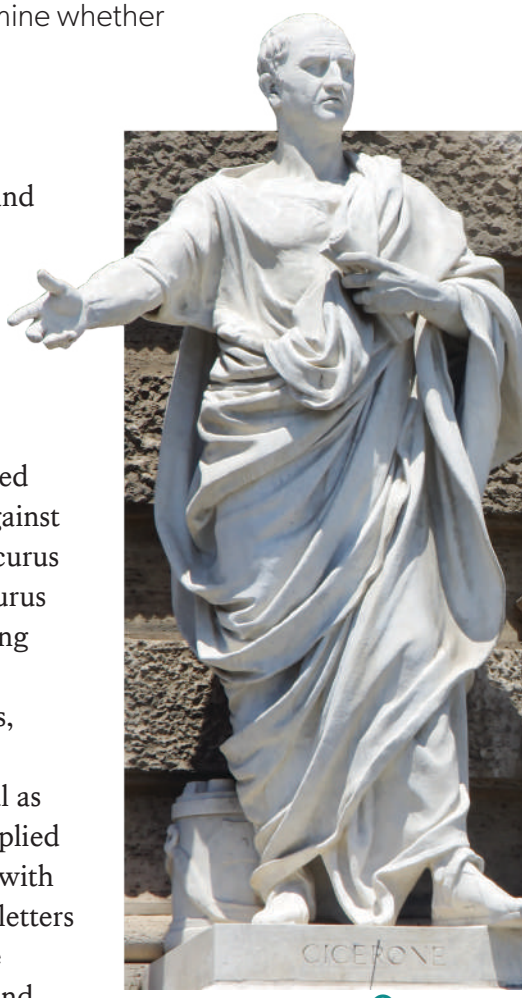
Plato and Aristotle

Plato (c. 428–c. 348 BC) said that two things "lead men to believe in the gods", one based on the soul, and the other "from the order of the motion of the stars, and of all things under the dominion of the mind which ordered the universe."[2]

His greatest student, Aristotle (384–322 BC),[3] argued from the order in the stars that there must have been a "First Unmoved Mover which is God, a living, intelligent, incorporeal, eternal and most good being who is the source of order in the cosmos."

Cicero

The Roman orator and statesman Marcus Tullius Cicero (106–43 BC), in his book *De Natura Deorum* (*On the Nature of the Gods*), vigorously used design arguments against the evolutionist Epicurus (341–270 BC). Epicurus taught that everything formed by chance collisions of particles, which could form anything as beautiful as the world. Cicero replied that this was on par with believing that if the letters of the alphabet were thrown on the ground often enough, they would spell out the *Annals of Ennius*. And he pointed out that if chance collisions of particles could make a world, why then can they not build much less-complex objects, like a colonnade, a temple, a house, or a city, that nobody doubts were designed?



❶ Bust of Plato.
(Marie-Lan Nguyen, 2009, CC BY 3.0)
❷ Bust of Aristotle
❸ Cicero

Paul the Apostle

One of Paul's most famous passages on the designer is Romans 1:20:

> For his invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have been made. So, they are without excuse.

Church teachers

The early Latin apologist Felix Marcus Minucius (AD 3rd century) argued for design in his *Octavius.* In the form of a Christian v pagan dialogue, *Octavius* had similarities to Cicero. Gregory the Theologian (of Nazianzus) (AD 329–389) used arguments from design. But one of the most famous is Thomas Aquinas (1225–1274), who proposed "Five ways", or what he considered five proofs for the existence of God in his *Summa Theologica*:

> The fifth way is taken from the governance of the world. We see that things which lack knowledge, such as natural bodies, act for an end, and this is evident from their acting always, or nearly always, in the same way, so as to obtain the best result. Hence it is plain that they achieve their end, not fortuitously, but designedly. Now whatever lacks knowledge cannot move towards an end, unless it be directed by some being endowed with knowledge and intelligence; as the arrow is directed by the archer. Therefore, some intelligent being exists by whom all natural things are directed to their end; and this being we call God.

Sir Isaac Newton

Newton (1642/3–1727), widely regarded as the greatest scientist who ever lived, wrote more about theology than science! For example, he wrote:

> This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent Being. ... This Being governs all things, not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called "Lord God" Παντοκράτωρ [*Pantokratōr*], or "Universal Ruler". ... The Supreme God is a Being eternal, infinite, absolutely perfect.[4]
>
> Opposition to godliness is atheism in profession and idolatry in practice. Atheism is so senseless and odious to mankind that it never had many professors.[5]

Furthermore, Newton thought that his own most important work was his posthumously published *Observations upon the Prophecies of Daniel, and the Apocalypse of St. John* (1733).

Sir Isaac Newton in 1702 by Godfrey Kneller

William Paley by George Romney

William Paley

A famous design advocate was the English clergyman and staunch anti-slavery campaigner[6] William Paley (1743–1805). In 1763, he was Senior Wrangler (the top mathematics undergraduate at Cambridge University), but he is most famous for his best-seller *Natural Theology* (1804). The best-known argument was someone finding a watch while walking in a barren countryside. From all the intricate machinery that was organized in the right way, the only logical conclusion was that it had a maker who "comprehended its construction and designed its use."

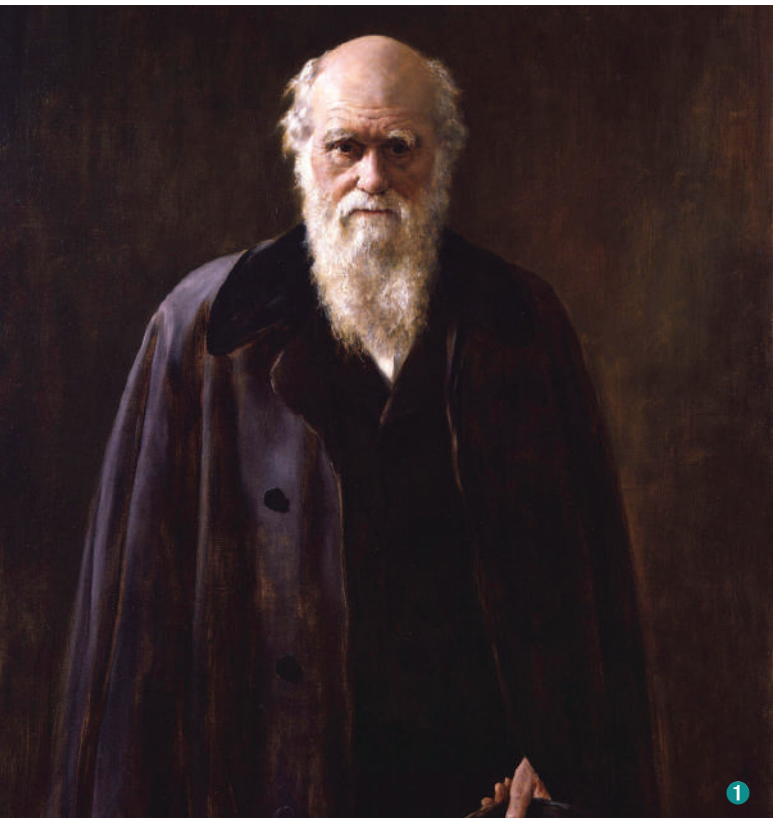
Paley also argued that the eye was designed, by comparing it with designed optical instruments such as telescopes and microscopes. *Natural Theology* was once required reading in British Universities for several decades, and it was a highly influential work for generations.[7]

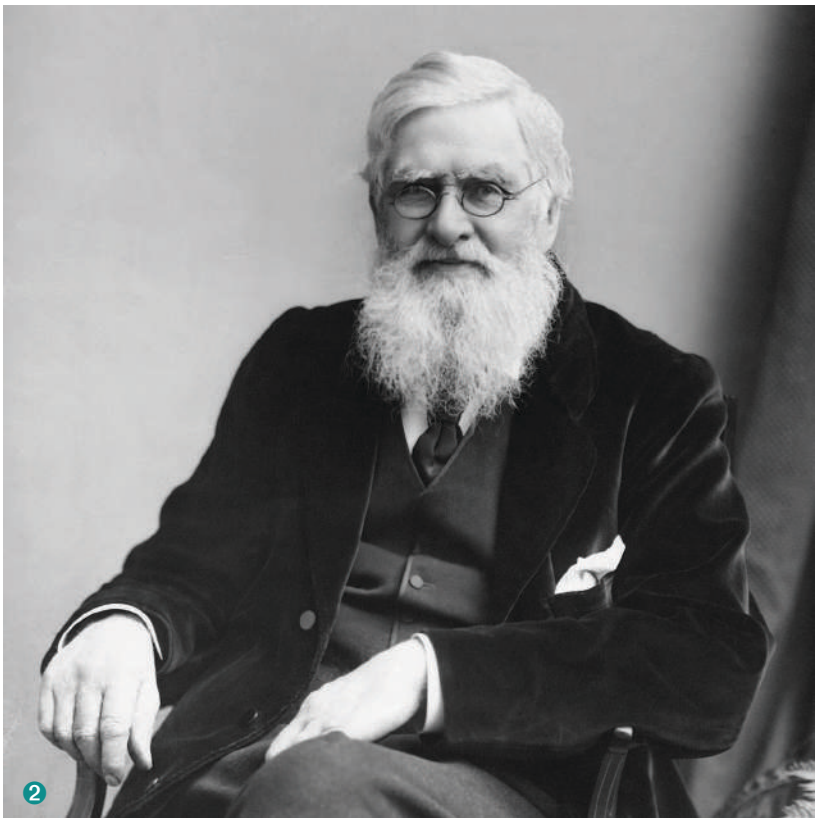
Critics

David Hume

Many claim that Paley's argument was refuted by the Scottish philosopher David Hume (1711–1776) in *Dialogues Concerning Natural Religion* (published 1779). However, Paley's work was written almost 30 years *after* Hume, and according to philosopher Frederick Ferré (1933–2013), it is not vulnerable to most of Hume's objections.[8] Also, Hume's character Philo, representing Hume's views against Cleanthes' design argument, in the end agrees that the design argument is cogent!

David Hume by Allan Ramsay, 1766





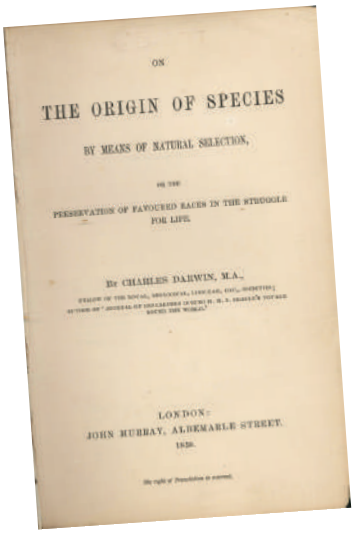
Charles Darwin and Alfred Russel Wallace

Even the hardened anti-theist Prof. Clinton Richard Dawkins (b. 1941) agreed that Hume's response was inadequate, because he had failed to provide an alternative for the origin of complexity. But Darwin (1809–1882)[9] and Wallace (1823–1913)[10,11] took an idea found in Paley and developed by Edward Blyth (1810–1873), *natural selection*.[12] But Blyth and other design theorists invoked natural selection as a *conservative* force. That is, it weeded out the unfit (thus 'conserving' the quality of an animal population) and had a role in the development of new *varieties*. But Darwin and Wallace asserted that it was a *creative* force. Supposedly it could act on small variations and accumulate them; so, over eons of time, it could build up increased complexity. Dawkins famously said:

> An atheist before Darwin could have said, following Hume: "I have no explanation for complex biological design. All I know is that God isn't a good explanation, so we must wait and hope that somebody comes up with a better one."
>
> I can't help feeling that such a position, though logically sound, would have left one feeling pretty unsatisfied, and that although atheism might have been logically tenable before Darwin, Darwin made it possible to be an intellectually fulfilled atheist.[13]

1 Charles Darwin
2 Alfred Russel Wallace, circa 1895
3 Edward Blyth

Critics of Darwin


ON
THE ORIGIN OF SPECIES
BY MEANS OF NATURAL SELECTION,
OR THE
PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE.
By CHARLES DARWIN, M.A.,
LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1859.

Title page of Charles Darwin's *On the Origin of Species* (1859)

Right from the time Darwin first wrote *Origin,* many have criticised his views. Woodward summarized the rise of the modern design movement.[14,15] But long before the modern design movement, one of the most notable anti-evolutionists was the former Darwinist ornithologist and barrister Douglas Dewar (1875–1957), of the UK. He was a leader in the Evolution Protest Movement and wrote several books on biological design.[16]

In the US, engineer Henry Morris (1918–2006) founded the Institute for Creation Research in 1970. He started the modern creationist movement with his book, co-authored with theologian John Whitcomb (1924–2020), *The Genesis Flood* (1961). This landmark book was probably the factor most responsible for the worldwide revival, beginning last century, of biblical creation as taught by the Church for its first 1,800 years.[17] His colleague, biochemist Duane Gish (1921–2013), frequently gave talks that majored on the design in living organisms and critiques of evolutionary origin-of-life theories. He was very successful in debates with evolutionists, often on US university campuses.

Information

About the same time, A.E. Wilder-Smith (1915–1995), with three earned doctorates in science, argued against Darwinism on design grounds. He pioneered the use of the *information* concept. This was made more famous and put on a rigorous mathematical footing by mathematician William Dembski (b. 1960), who has earned doctorates in both mathematics and philosophy of science. The most thorough is his book *The Design Inference*, published by the prestigious Cambridge University Press (1998, updated 2023).[18] Another mathematical critic of Darwinism was Lee Spetner (1927–2024). He taught information and communication theory at the Applied Physics Laboratory of Johns Hopkins University from 1951 to 1970. Dr Spetner's book *Not by chance!* argues that mutation and selection are insufficient to explain the encyclopedic quantities of information in living creatures.[19]


Henry Morris


John Whitcomb


Duane Gish


A.E. Wilder-Smith


William A. Dembski
(W.R. Elsberry, CC BY 4.0)


Lee Spetner
(Spetnik, CC BY-SA 4.0)

Irreducible complexity

Meanwhile, biochemist Dr Michael Behe (b. 1952) revisited *practical* examples of design. But he expounded on the discoveries of biochemical processes and sub-microscopic machinery that Darwin never dreamed of.[20] He is most famous for introducing the phrase 'irreducible complexity':

Michael Behe.
(Image courtesy of Discovery Institute)

> By irreducible complexity I mean a single system which is composed of several interacting parts that contribute to the basic function, and where the removal of any one of the parts causes the system to effectively cease functioning. An irreducibly complex system cannot be produced gradually by slight, successive modifications of a precursor system, since any precursor to an irreducibly complex system is by definition non-functional. Since natural selection requires a function to select, an irreducibly complex biological system, if there is such a thing, would have to arise as an integrated unit for natural selection to have anything to act on. It is almost universally conceded that such a sudden event would be irreconcilable with the gradualism Darwin envisioned.

This describes a biological feature that would meet Darwin's challenge:

> If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down.

Behe gives the example of a very simple machine: a mousetrap. This would not work without a platform, holding bar, spring, hammer and catch, all in the right place. If you remove just one part, it won't work at all—you cannot reduce its complexity without destroying its function entirely.

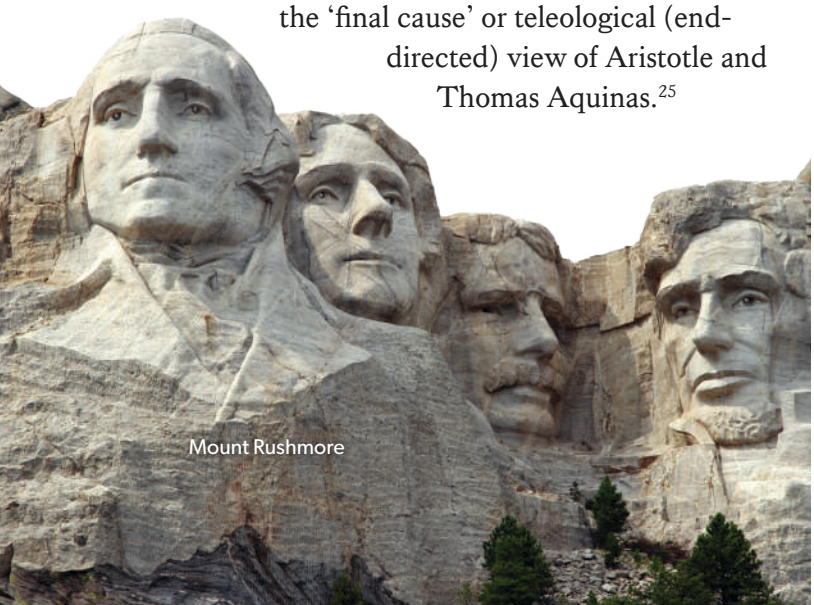
The thrust of *Darwin's Black Box* is that many structures in living organisms show irreducible complexity, far in excess of a mousetrap or indeed any man-made machine. He shows that even the simplest form of vision in any living creature requires a dazzling array of chemicals in the right places, as well as a system to transmit and process the information. The blood-clotting mechanism also has many different chemicals working together, so we won't bleed to death from minor cuts, nor yet suffer from clotting of the entire system.

Subsequently, Behe wrote *The Edge of Evolution* (2007).[21,22] This book aims to see exactly what

the supposed neo-Darwinian processes can achieve. He also refines the concept of irreducible complexity that his first book made famous, with additional concepts of *steps* and *coherence*:

> In this chapter, I develop two criteria by which to judge whether random mutation hitched to natural selection is a biologically reasonable explanation for any given molecular phenomenon. The criteria, spelled out in detail over the rest of the chapter, are the following:
>
> First, *steps*. The more intermediate evolutionary steps that must be climbed to achieve some biological goal without reaping a net benefit, the more unlikely a Darwinian explanation.
>
> Second, *coherence*. A tell-tale signature of planning is the coherent ordering of steps toward a goal. Random mutation, on the other hand, is incoherent; that is, any given evolutionary step taken by a population of organisms is unlikely to be connected to its predecessor.[23]

Another term similar to 'irreducible complexity' is 'functionality threshold'.[24] While the former emphasizes the *composition* of the structure, the latter term emphasizes the function: it must have a minimum *functionality* to be of any use at all (and be advantageous, such as to be open to natural selection). This is also compatible with the 'final cause' or teleological (end-directed) view of Aristotle and Thomas Aquinas.[25]



Mount Rushmore

How do we detect design?

Richard Dawkins.
(David Shankbone, CC BY 3.0)

Dawkins said:

> Biology is the study of complicated things that give the appearance of having been designed for a purpose.[26]

Of course, he denies that they are designed in reality, and coined the term 'designoid' (pronounced: design-oid). But the onus is on him to prove that the appearance of design is misleading; an illusion. And this book will argue that the design inference is not limited to appearances but extends to deep analogy with things we *know* have been designed.

Even the idea of 'appearance of design' implies that design has specific features. People detect intelligent design all the time. For example, if we find arrowheads on a desert island, we can assume they were made by someone, *even if we cannot see the designer*.

There is an obvious difference between writing by an intelligent person, e.g., Shakespeare's plays, and a random letter sequence like

WDLMNLT DTJBKWIRZREZLMQCO P.[27]

There is also an obvious difference between Shakespeare and a repetitive sequence like

ABCDABCDABCD.

The latter is an example of *order*, which must be distinguished from Shakespeare, which is an example of *specified complexity*—a complex arrangement of things that represents or specifies something else.

We can also tell the difference between messages written in sand and the results of wave and wind action. The carved heads of four U.S. presidents on Mt Rushmore are clearly different from

erosional features. Again, this is specified complexity—here, an arrangement of rock that represents the heads of presidents. Erosion produces either irregular shapes or highly ordered shapes like sand dunes, but not presidents' heads or writing.

Another example is the SETI program (Search for Extra-terrestrial Intelligence). SETI would be pointless if there were no way of determining whether a particular type of signal from outer space would be proof of an intelligent sender. The criterion is again a signal with a high level of specified complexity—this would prove that there was an intelligent sender, *even if we had no other idea of the sender's nature*. But neither a random nor a repetitive sequence would be proof. Natural processes produce radio noise from outer space, while pulsars produce periodic signals. Pulsars were first mistaken for 'ET' signals by people eager to believe in extra-terrestrials, but this is because they mistook order for complexity. So evolutionists (and nearly all SETI proponents) are prepared to use high specified complexity as proof of intelligence *when it suits their ideology*. This shows once more how one's biases and assumptions affect one's interpretations of any data.[28]

Radio telescope listening to signals from space.

Explanatory filter for design

Dembski formalized an explanatory 'filter' in *The Design Inference*, proposing a way to determine whether a feature is the result of design. He proposed three possible causes of a feature: *law*, *chance,* or *design*. Dembski's method entailed seeking an answer based on these three possibilities and in that order (in the 2023 revised edition, Dembski combines the first two):

❶ **Natural Law explains regularity.** This applies even if, as the Bible teaches, the natural law is just our *description* of the regular way in which God upholds the universe. For example, a sphere is an extremely regular shape, so we should look for natural causes to explain most spherical objects. E.g., drops of water and bubbles tend to be spherical, and we can explain this by surface tension—a spherical shape minimizes area and therefore, potential energy. Similarly, planets and stars are spherical because this minimizes gravitational potential energy. Therefore, Dembski points out that we should filter out regularity and look for natural law explanations rather than special design.

❷ **Chance explains real randomness.** For natural law to explain an outcome, there must be only a limited number of possible results, all predictable from the circumstances. These are events of high probability. If there are many possible different outcomes, then natural law cannot explain it.

❸ **Design.** Only after the exclusion of law and chance is design assumed to be the cause. These events are characterized by patterns that are both specified and of vanishingly small probabilities, as Dembski points out: "Specified events of small probability do not occur by chance."

Naturally, Darwinians have objected strongly to Dembski's criteria for detecting design for living organisms. But if they are right, then it is impossible to detect design of *any* sort: divine, human, or even ET.

Dembski illustrates his filter with a practical example of differentiating genuine randomness and design. In his example, there was an accusation of *cheating*, i.e., that specific sequences that should have been random were not, and thus were the result of 'design'.

> TRENTON, July 22—The New Jersey Supreme Court today caught up with the "man with the golden arm", Nicholas Caputo, the Essex County Clerk and a Democrat who has conducted drawings for decades that have given Democrats the top ballot line in the county 40 out of 41 times ... the court noted that the chances of picking the same name 40 out of 41 times were less than 1 in 50 billion.[29]

When creationists point out the infinitesimally small probability of the naturalistic origin of life, many evolutionists respond, 'So what, *any* sequence is just as improbable. E.g., it was extremely improbable for me to be dealt that hand, but it still happened.' However, the crux of Dembski's filter is not the low probability alone; after all, any particular random sequence of 41 outcomes is also highly improbable. The proof is, try to duplicate the same series a *second* time. Critical are *two* conditions: both a small probability and that an event be *specified*, not just any event (see also *Cheating with Chance*, Ch. 14).

In voting, being on the first position on the ballot is a great advantage, since lazy voters are more likely to vote for that person. So, the exceptionally high proportion of Democrat (D) candidates in the first position put them at a great advantage, and the clerk in charge of drawing the ballots was a Democrat. Thus the 40/41 draws for Ds in the first position is an outcome of recognizable significance, and since Caputo was a D, this counts as a pattern that could be specified in advance.

Since the probability of arising at this sequence by chance was minuscule, it's no wonder New Jersey Supreme Court reasonably said:

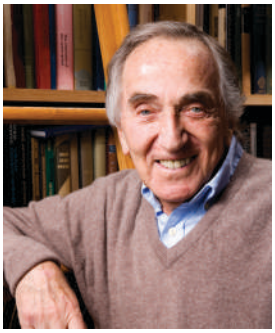
> "Confronted with these odds, few persons of reason will accept the explanation of blind chance".

However, Dembski explains that while cheating

> "...certainly is the best explanation of Caputo's golden arm... the court stopped short of convicting Caputo,... [because] the court had no clear mandate for dealing with highly improbable ballot line selections".

Application to living things

Dembski's three categories reflect an earlier recognition of these three basic categories. The leading evolutionary origin-of-life researcher, Leslie Orgel (1927–2007), confirmed this:



Leslie Orgel. (Salk Institute)

> Living things are distinguished by their specified complexity. Crystals such as granite fail to qualify as living because they lack complexity; mixtures of random polymers fail to qualify because they lack specificity.[30]

Unfortunately, a materialist like Orgel refuses to make the connection between specified complexity and design, even though this is the precise criterion of design.

Middle: Knut Schmidt-Nielsen (1915–2007).

Animal Physiology–pointing towards purpose

Furthermore, design provides a fruitful research program. Practical biological research assumes that features of living things have a function, so it makes sense to find out how they work. This makes perfect sense if these features have been designed for a purpose. So, all the useful research was carried out as if the researchers were creationists for all practical purposes. But then evolutionists try to make up just-so stories to explain how these features evolved. Yet this extra 'Evolutionary considerations' section added nothing whatever of practical value. The celebrated (and pioneer) researcher in animal physiology, Knut Schmidt-Nielsen (1915–2007), not a creationist to my knowledge, wrote, in a famous textbook on animal physiology, that:

> Examining how an animal copes with its environment often tends to show what is good for the animal. This may bring us uncomfortably close to explanations that suggest purpose, or teleology, and many biologists consider this scientifically improper.[31]

Interestingly enough, the same textbook goes on to explain animal body function and how it works well to the advantage of the organism, using engineering science and principles, such as: Fluid Mechanics (pp. 106 ff.), Heat transfer (pp. 247 ff.), and Engineering Control Theory (pp. 466 ff.).

From reading the above, one cannot help but conclude specific design of the particular animals, using engineering knowledge to do so.

Information

The design criterion may also be described in terms of *information*. *Specified complexity* means high *information content*. In formal terms, the information content of any arrangement is the size, in bits, of the shortest algorithm (program) required to generate that arrangement. A short program could form a random sequence:

1. Print any letter at random.
2. Return to step 1.

A repetitive sequence could be made by the program:

1. Print ABCD.
2. Return to step 1.

But to print the plays of Shakespeare, a program would need to be large enough to print every letter in the right place.

The information content of living things is far greater than that of Shakespeare's writings. Dawkins says, "[T]here is enough information capacity in a single human cell to store the *Encyclopædia Britannica*, all 30 volumes of it, three or four times over."[32]

No one would seriously claim that an encyclopedia could have originated without intelligence. So, it's just as irrational to believe that life could have originated without intelligence.

Even more amazingly, living things have by far the most compact information storage/retrieval system known. A microscopic cell stores as much information as several sets of *Encyclopædia Britannica*. (See *The complexity of life*, Ch. 11, for a detailed explanation of this topic.)

Mathematical description of information

Information can be defined mathematically in a way that distinguishes randomness, order and specified complexity. In terms of signal transmission, a receiver may exist in a large number of possible states (Ω_0); after a message has been received, the number of possible states drops to Ω_1. The information content of the message $I_1 = k \ln (\Omega_0/ \Omega_1)$, where k = Boltzmann's constant.[33]

Note that the definition is consistent: with a repetitive sequence, there is a restriction of possibilities, so Ω_0 is low, so the information is low. Random sequences also contain little information, because there are many possible random sequences (so Ω_1 is almost as large as Ω_0).

Can mutations generate information?

Even if we grant evolutionists the first cell, the problem of increasing the total information content remains. To go from the first cell to a human means finding a way to generate enormous amounts of information—billions of base pairs ('letters') worth. This includes the instructions to build eyes, nerves, skin, bones, muscles, blood, etc. Evolution relies on copying errors and natural selection to generate the required new information. However, the usual claimed examples of 'contemporary evolution' presented are all *losses* of information.[34]

Beneficial mutations or scorched earth?

Some mutations are 'beneficial', i.e., helping the organism survive. But even antibiotic and pesticide resistance is usually the result of a *loss*, or sometimes a transfer, of information, rather

than *new* information. I.e., they result from breaking something, not making something—not surprising, because there are far more ways of breaking something than making it.

The Mexican tetra (*Astyanax mexicanus*), a blind cave fish. (Keaton Halley)

Other beneficial mutations include wingless beetles on small, windy desert islands—if beetles lose their wings and so can't fly, the wind is less likely to blow them out to sea.[35] This has nothing to do with the *origins* of flight in the first place, which is what evolution is supposed to explain (see Ch. 4). Another beneficial mutation is creatures in dark caves with shrivelled eyes—in the darkness, there is no natural selection against blind creatures. Indeed, shrivelled eyes would be an advantage because they are less vulnerable to infection and damage. But this has nothing to do with how sight originated. Still another example: shrews that have disabled genes for sensitivity to hot pepper chemicals can feast on plants containing them.[36]

Malarial resistance

Behe's second book, *The Edge of Evolution*, covers the issue of beneficial mutations and the limits of Darwinian processes. As his Ph.D. research involved malaria, he applies his expertise to the malarial parasite (*Plasmodium falciparum*) and the mutations that have enabled humans to combat it, and the parasite's measures to counter human-made drugs.

One of the most effective anti-malarial drugs has been *chloroquine*, because the parasite took a while to develop resistance to it. Behe shows that chloroquine resistance likely involves *two* specific mutations occurring together in the one gene. Resistance to other antimalarial drugs needed only one mutation each. Behe works out the probability of this double mutation occurring in the same gene, using other scientists' figures for the parasite's population, etc. It is therefore not surprising that resistance to chloroquine took far longer to develop.

Chloroquine resistance shows that even a double mutation requires a long time, even with parasites that have an enormous population and a short life cycle. This indicates that it takes many generations for a double mutation to appear. If it takes so many mutations, then this would require a very long time for human-like creatures with long generation times and relatively small populations. Behe shows that it would never occur even with evolutionary time assumed. And this is just one double mutation in a gene. So, any adaptation that requires two or more specific mutations to work will *never* evolve in a human. Yet, such must have happened *numerous* times if humans arose through evolutionary processes.

Behe also points out that the chloroquine-resistant parasites do *worse* than the non-resistant ones where there is no chloroquine. It seems that the reason that the parasite is resistant to chloroquine is diminished concentration in the parasite's vacuole, and one mechanism is *impaired uptake*. Such impairment suggests that the double mutation is informationally downhill, as usual. According to one paper, "Chloroquine-resistant parasite isolates consistently have an

import mechanism with a lower transport activity and a reduced affinity for chloroquine."[37]

Sometimes information loss is the reason for that some bacteria are resistant to antibiotics. For example, resistance can result from a mutation impairing a cell pump so the germ pumps in less of its would-be executioner.[38]

The phenomenon of beneficial information loss leads to another of Behe's major points: *there is not so much an arms race as trench warfare or a* ***scorched earth policy***. Many of the changes are *destroying machinery that the enemy could otherwise use*. For example, defenders might blow up their own bridges to prevent an enemy crossing, sabotage their country's factories if the enemy is using them to produce weapons, or burn their crops so the enemy will run out of food.

Sickle cell anemia

Information loss also explains some of the human defences to malaria, such as *sickle cell anemia*. Here, a mutation in the hemoglobin gene causes the hemoglobin to be more prone to clumping together, causing the red blood cells to be sickle-shaped. One of the world's leading authorities on sickle-cell anemia, Dr Felix Konotey-Ahulu, explains:

> These misshapen cells can block the smaller blood vessels, depriving tissues and organs of oxygen. However, sufferers have done very well *with proper treatment*, becoming doctors, lawyers, etc.[39]

Felix Konotey-Ahulu.
(Courtesy of Dr Konotey-Ahulu)

Fortunately, we have two alleles for hemoglobin. So, some people inherit a sickle-cell gene from only one parent, while the other parent provides the 'backup' gene for normal hemoglobin. People with only *one* gene for sickle cell anemia only have half their hemoglobin molecules defective so that they won't clump on their own, so they don't suffer from those ill effects. But the defect has an advantage.

Fig. A.

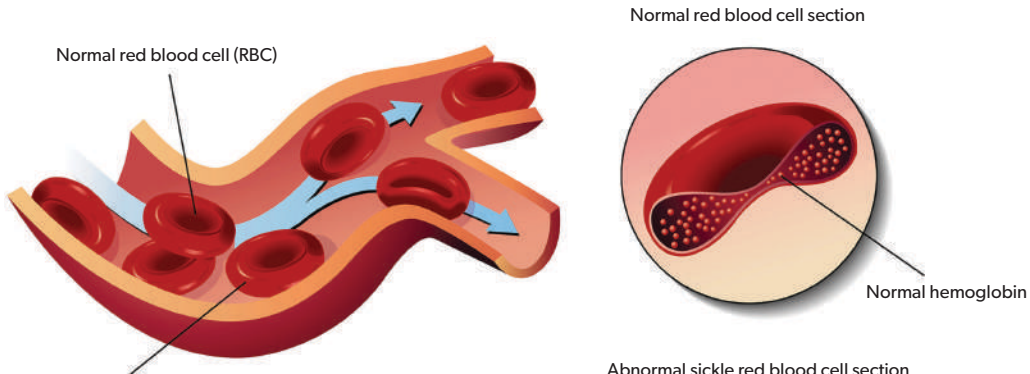
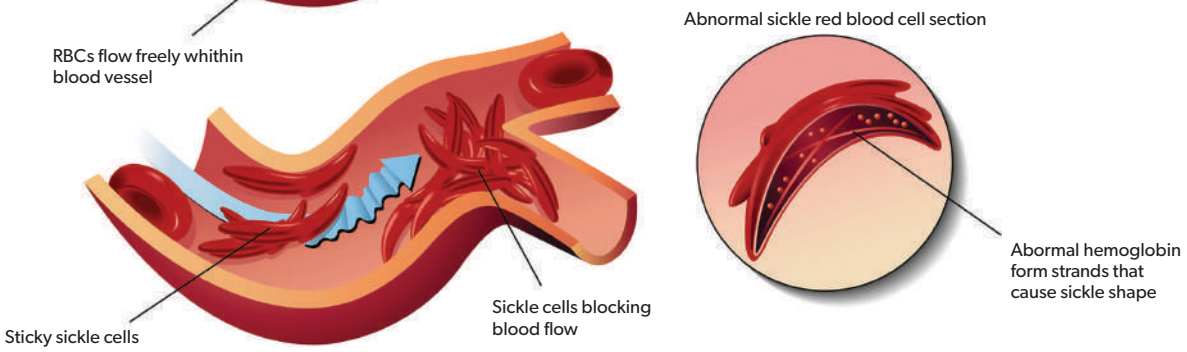


Fig. B.



The malarial parasite feeds on the hemoglobin, which is very concentrated in our red blood cells. Behe points out that the sickle mutation makes the hemoglobin more prone to clumping together when the parasite enters the cell. This clumping distorts the shape, so the spleen detects the damaged cell and destroys it, along with the parasite. So those who carry only *one* gene will suffer no ill effects from anemia, and also enjoy protection from malaria.

However, Konotey-Ahulu, cautions, "Demonstrating natural selection does not demonstrate that 'upward evolution' is a fact, yet many schoolchildren are taught this as a 'proof' of evolution." He points out that "the sickle-cell gene is still a defect, not an increase in complexity or an improvement in function which is being selected for." The unhappy downside is that "having more carriers of the sickle-cell genes results in more people suffering from this terrible disease" (those people carrying two copies of the mutated gene).

The sickle cell hemoglobin is thus a good example of 'scorched earth policy'. That is, the body's red blood cell, an oxygen carrier, is sacrificed to destroy the invader.

Breaking is easier than making

Behe provides other examples of how breaking something can help one organism in a battle with another. Yet this is no marvel of Darwinism. It is far simpler to break something than to make it, and there are often many ways to break something, but few ways to make it. Sand can grind gears to a halt. A wad of chewing gum can foul up moving parts. Honey in the fuel tank can stop a car in its tracks (some defensive mechanisms are like this: a sticky molecule that prevents a molecular machine from working).

Behe explained this further in a later book, *Darwin Devolves*.[40] Behe publicized what he had previously called the "First Rule of Adaptive Evolution"—"Break or blunt any functional coded element whose loss would yield a net fitness gain."

Scope of this book

Most of the chapters to follow cover *practical* examples of design, and point out *practical* difficulties with proposed evolutionary explanations, if any. Chapter 11 covers the origin of life, and again mainly points out *practical* chemical problems. The *theoretical* mathematical arguments of Dembski *et al.* are mostly outside the scope of this book.

Endnotes to the Introduction

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