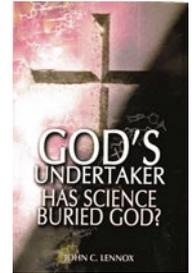


# John Lennox: God's Undertaker – has science buried God?

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*John Lennox teaches Mathematics and Philosophy of Science at Oxford University. He specialises in the interface between science, philosophy and theology, and took part last year in a live debate with Richard Dawkins. This is a stunningly thorough and helpful contribution to the discussion of the relationship between science and faith, and has been well received by Christians and agnostics alike. John offers immensely helpful summaries of the most challenging issues, and pursues a clear and logical path through what has become a rather emotionally charged debate. I learnt an immense amount from this book.*



## Preface

Why is there something rather than nothing?

Peter Atkins, prof of Chemistry at Oxford, summarises the naturalist view: *Science, the system of belief founded securely on publicly shared reproducible knowledge, emerged from religion. As science discarded its chrysalis to become its present butterfly, it took over the heath. There is no reason to suppose that science cannot deal with every aspect of existence.. Science has never encountered a barrier, and the only grounds for supposing that reductionism will fail are pessimism on the part of scientists and fear in the minds of the religious'.<sup>8</sup>*

But is naturalism demanded by science? Or is it a philosophy brought to science? Could it even be more like an expression of faith?

We need to be careful with our terms. 'Intelligent design' does not oppose evolutionary biology. If is a serious proposal then we need to ask whether there is any scientific evidence to support it, whether it leads to scientifically testable hypotheses. 'Creationism' refers not to the belief that there is a Creator but to a particular interpretation of Genesis which holds that the earth is only a few 000 years old.

## 1. War of the worldviews

There is a common impression that each new scientific advance is another nail in God's coffin. Atkins: *humanity should accept that science has eliminated the justification for believing in cosmic purpose* – and yet science has never been held to deal with questions of purpose. Dawkins defines faith as 'belief that isn't based on evidence'. And yet evidence has been at the heart of the Christian faith from the beginning. Militant atheists have created a false dichotomy in the minds of many. A 1996 survey by Larsen and Witham found that 40% of US scientists said they believed both in a God who answered prayer and in personal immortality (compared with 42% in 1916). Many eminent scientists believe in God –p17.

Science is based on a conviction that the universe is orderly, a belief first found in the ancient Hebrews 2/3000 years ago. Many scientists have been directly inspired by their faith to do science. Kepler: *the chief aim of all investigations of the external world should be to discover the rational order which has been imposed on it by God; science is 'thinking God's thoughts after him'.*

Myths of conflict – Galileo. The problem was he opposed the Aristotelian scientific orthodoxy (the geocentric universe), and only indirectly the church whose theology was based on it (not on the Bible, which had been read literalistically in order to support the theory). He held that *the laws of nature are written by the hand of God in the language of mathematics.*

The belief that science and faith have consistently been at loggerheads is a caricature. The real conflict is not between science and faith but between naturalism and theism – the issue is the relationship of science to the various worldviews held by scientists, in particular to naturalism and theism:

- EO Wilson: scientific humanism *is the only worldview compatible with science's growing knowledge of the real world and the laws of nature*
- Henry Schaeffer III (quantum chemist): *A Creator must exist. The Big Bang ripples and subsequent scientific findings are clearly pointing to an ex nihilo creation consistent with the first few verses of the book of Genesis.*

## 2. The scope and limits of science

Hard to define science. It involves hypothesis, experiment, data, evidence, modified hypothesis, theory, prediction, explanation. It also involves the method of inference to the best explanation ('abduction'). The ideal of the coolly rational scientific observer is now regarded as a simplistic myth – particle physics shows that the very process of observation gives rise to disturbances that cannot be ignored.

All scientists come to their science with a particular standpoint, be it one of faith, agnosticism or atheism. Immunologist George Klein: *I am an atheist. My attitude is not based on science, but rather on faith.. The absence of a Creator, the non-existence of God is my childhood faith, my adult belief, unshakeable and holy.* Harvard geneticist Richard Lewontin (a

materialist): *our willingness to accept scientific claims that are against common sense is the key to an understanding of the real struggle between science and the supernatural. We take the side of science in spite of the patent absurdity of some of its constructs.. because we have a prior commitment.. to materialism.*

The real battle is not between science and faith in God, but between a materialistic/naturalistic worldview and a supernaturalistic/theistic one. There's always tension when an accepted paradigm is challenged – eg Mendel's ideas on heredity were seen as inconsistent with Marxist philosophy, so Mendelian geneticists were persecuted.

Science explains. Some believe it can explain everything; this is scientism. Atkins: *there is no reason to suppose that science cannot deal with every aspect of existence.* Only science can deliver truth (not philosophy, art, music, literature). Bertrand Russell: *what science cannot discover, mankind cannot know* – how does he know this? The statement that only science can lead to truth is not itself deduced from science.

Sir Peter Medawar, Nobel Laureate, in his book 'Advice to a Young Scientist': *there is no quicker way for a scientist to bring discredit upon himself and upon his profession than roundly to declare – particularly when no declaration of any kind is called for – that science knows, or soon will know, the answers to all questions worth asking, and that questions which do not admit a scientific answer are in some way non-questions.. that only simpletons ask and only the gullible profess to be able to answer. The existence of a limit to science is .. made clear by its inability to answer childlike elementary questions having to do with first and last things – questions such as 'How did everything begin?'; 'What are we all here for?'; 'What is the point of living'* – it is to literature and religion that we must turn for answers to such questions.

Aristotle distinguished 4 causes: material, formal, efficient and final. Aunt Matilda bakes a cake from certain ingredients (material cause) into a certain form (formal cause), by a certain method (efficient cause), for a purpose (final cause – Jimmy's birthday). The final cause (purpose) lies outside the scope of science. Atkins: *science has no need of purpose.. All the extraordinary, wonderful richness of the world can be expressed as growth from the dunghill of purposeless interconnected corruption.*

Is God an unnecessary hypothesis? An understanding of the impersonal principles by which the universe works does not make it unnecessary/impossible to believe in the existence of a personal Creator who designed, made and upholds the universe. That's what's called a category mistake – because you understand how a car works doesn't mean there can be no designer of that car.

### 3. Reduction, reduction, reduction

God of the gaps – Henry Ford is not found in the bits of the engine we don't understand, but outside it, as its agent. God is not there to explain the things science has not yet explained. He is not an alternative to science as an explanation; he is the ground of all explanation. Dawkins insists on seeing God as an explanatory alternative to science; but no theologian does. Some atheists claim God gets in the way of science. Worshipping bits of nature certainly does, as does a mythological worldview. Monotheism doesn't. Xenophanes (C6BC): 'there is one God.. similar to mortals neither in shape nor in thought.. remote and effortless he governs all there is'. Aquinas saw God as First Cause. Over the door of the Cavendish physics lab are the words 'Great are the works of the Lord; they are pondered by all who delight in them'.

Methodological reductionism – reducing something to smaller parts which are easier to investigate. A mathematician called Godel proved in 1931 that in maths the whole is always greater than the sum of the parts. There are limits to reductionism. Studying the parts of a watch won't help you grasp how it works as an integrated whole. There's more to water than hydrogen and oxygen.

Epistemological reductionism – the view that higher level phenomena can be explained by processes at lower level. So psychology can be explained by biology; biology can be explained by biochemistry; biochemistry by chemistry, chemistry by physics. Crick: 'the ultimate aim of the modern development in biology is .. to explain all biology in terms of physics and chemistry'. This is physicism, a strong form of materialism. Dawkins: 'my task is to explain elephants, and the world of complex things, in terms of the simple things that physicists either understand, or are working on'. [but he doesn't, he wants to reduce life to genetics and evolutionary developments in genetics; if he reduced genetics to chemistry and chemistry to physics he'd arrive at the Big Bang, and the unanswerable question of creation].

Polanyi shows why epistemological reductionism won't always work – think about a brick building. The bricks can be explained in terms of their raw materials, but not the bricklaying, the design, the town planning. Each level is controlled by the level above – but not vv. Or take the chemistry and physics of the ink marks on this page – they don't tell you the meaning. Neither building nor ink can be understood in reductionist terms; you have to postulate both energy and intelligent activity to make sense of them. Likewise DNA – it too encodes a message; and yet materialist scientists insist the information carrying properties of DNA emerged automatically out of matter by a mindless, unguided process. That assumes that matter and energy possess the inherent potential to organise themselves in such a way that all the complex molecules necessary for life will emerge.

Ontological reductionism – Dawkins: 'the universe is *nothing but* a collection of atoms in motion, human beings are *simply* machines for propagating DNA, and the propagation of DNA is a self-sustaining process. It is every living object's *sole* reason for living' – the words in italics go beyond the science of the rest of the sentence; they are expressions of materialistic belief. Crick: 'you, your joys and your sorrows, your memories and ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules'. 55 If this were true, we'd never know it – because our thinking itself would be only a chemical neural event with no claim to rationality.

## 4. Designer universe?

The greatest philosophers have always regarded the origin of the universe as lying in some transcendent reality, as requiring some explanation beyond itself. Arno Penzias, physics Nobel prize-winner: *astronomy leads us to a unique event, a universe which was created out of nothing, one with the very delicate balance needed to provide exactly the right conditions required to permit life, and one which has an underlying (one might say 'supernatural') plan.* Recent science has awed us with mystery – from cosmology to particle physics. Einstein: *the most incomprehensible thing about the universe is that it is comprehensible.* Its intelligibility presupposes the existence of a rationality capable of recognising that intelligibility. Naturalism cannot explain this; theism can. Newton showed it wasn't only the intelligibility of the universe that is amazing; it's the mathematical nature of that intelligibility. Dawkins says science requires no faith; but *faith is inseparable from the scientific endeavour.* You can't even do maths without faith in its consistency; and its consistency cannot be proved. Theism makes sense of the rational intelligibility of the universe; reductionism undermines it. Hawking: *it is difficult to discuss the beginning of the universe without mentioning the concept of God. My work on the origin of the universe is on the borderline between science and religion, but I try to stay on the scientific side of the border. It is quite possible that God acts in ways which cannot be described by scientific laws'. And again, the usual approach of science of constructing a mathematical model cannot answer the questions of why there should be a universe for the model to describe. Why does the universe go to all the bother of existing? Is the unified theory so compelling that it brings about its own existence? Or does it need a Creator, and if so, does he have any other effect on the universe? 63.*

Theories and laws do not bring anything into existence. To seek that capacity within them seems a bit desperate.

The question of the existence of the universe is logically distinct from that of its beginning. From the ancient Greeks through to Copernicus, the majority belief was that it had a beginning. From Copernicus/Galileo/Newton the majority belief was that it did not. Now again it is that it did (evidence from the red-shift in the light from distant galaxies, the cosmic microwave background, & thermodynamics). Hawking: *many people do not like the idea that time has a beginning, probably because it smacks of divine intervention – ie our worldview influences our science.* Charles Townes, Nobel prize for physics: *the question of origin seems to be left unanswered if we explore it from a scientific point of view. Thus, I believe there is a need for some religious or metaphysical explanation. I believe in the concept of God and in his existence. 68.*

Discussion of the fine-tuning of the universe. Astrophysicist Hugh Ross suggests you cover America in coins in a column reaching to the moon, then do the same for 1b continents of similar size. Paint one coin red and put it in one of the piles. Blindfold a friend and ask her to pick it out. The odds are 1 in  $10^{40}$ . Tune the universe differently by this amount and no life would exist. Roger Penrose, mathematician, calculates that the Creator's aim in fixing the speed of expansion of the universe must have been accurate to 1 part in 10 to the power  $10^{123}$ . There are so many parameters to be got right that Ross calculates the chance of a planet with the potential for life existing is 1 in  $10^{30}$ . These are not God of the gaps arguments – it's advance in science, not ignorance in science, which has revealed this fine-tuning to us.

The anthropic principle. Some maintain that either you have to believe in fine tuning, or in the existence of multiverses – the choice is between the design of one, or blind chance requiring many.

Arno Penzias: *the best data we have (concerning the big Bang) are exactly what I would have predicted, had I nothing to go on but the five books of Moses, the Psalms and the Bible as a whole.*

## 5. Designer biosphere?

The universe revealed by physics/cosmology is fine-tuned and rationally intelligible. It looks designed. Does biology confirm this impression? Materialist scientists say that evolutionary processes involving no intelligent input are capable of producing all the complexity we see in the universe – a view forced on them by their presuppositions rather than by any evidence. Either mind produced matter or matter produced mind; they opt for the latter. Cicero: *when se see some examples of a mechanism, do we doubt that it is the creation of a conscious intelligence? So when we see the movement of the heavenly bodies.. how can we doubt that these too are not only the works of reason but of a reason which is perfect and divine?* This anticipates Paley's watchmaker argument. Bertrand Russell found the design argument logically watertight: *this argument contends that, on a survey of the known world, we find things which cannot plausibly be explained as the product of blind natural forces, but are much more reasonably to be regarded as evidences of a beneficent purpose. This argument has no formal logical defect; its premises are empirical and its conclusion professes to be reached in accordance with the usual canons of empirical inference.* 'Intelligent design' can be misleading – it may be better to talk about arguments inferring intelligent origin.

Does evolution eliminate the need for a Creator? Dawkins argues that if evolutionary mechanisms can account for the apparent design in the universe, then there is no intelligent origin. We cannot have both God and evolution. But evolution is a biological mechanism, and God may be a personal agent who designs and creates mechanisms. They are not mutually exclusive. Dawkins also states that the only watchmaker in nature is the blind forces of physics – that the evolutionary process is reducible to the laws of physics. This goes way beyond Darwin. There is a big transition here from living to non-living. In personifying the evolutionary process Dawkins appears to argue away real personal agency – but he never addresses this possibility. Sir John Houghton: *the fact that we understand some of the mechanisms of the working of the universe or of living systems does not preclude the existence of a designer, any more than the possession of insight into the processes by which a watch has been put together, however automatic those processes may appear, implies there can be no watchmaker.* Many scientists accept the evolutionary processes as the Creator's way of producing life's diversity. The

evolutionary viewpoint does not invalidate intelligent origin, it just moves it back up a level, from the organisms themselves to the processes by which they came to exist. TH Huxley: *agnosticism is of the essence of science.. It simply means a man shall not say he knows or believes that which he has no scientific grounds for professing to know or believe... Consequently agnosticism puts aside not only the greater part of popular theology, but also the greater part of anti-theology.* It was Huxley who coined the word 'agnostic'. Stephen Jay Gould: *either half my colleagues are enormously stupid, or else the science of Darwinism is fully compatible with conventional religious beliefs – and equally compatible with atheism.* Francis Collins, director of the human genome project, coins the term Bio Logos to refer to theistic evolution. He and other distinguished contemporary evolutionary biologists are both theists and Christians. The argument that the existence of mechanism does not preclude the activity of intelligent agency seems logically compelling to many scientists. There seems to be a taboo on questioning evolution. In 1999 Chinese palaeontologist Jun-Yan Chen lectured in the US on various fossil discoveries which led him to question the orthodox evolutionary line. The lack of response caused him to remark: 'in China we can criticize Darwin, but not the government; in America you can criticize the government, but not Darwin'.

## 6. The nature and scope of evolution

*Large evolutionary innovations are not well understood. None has ever been observed, and we have no idea whether any may be in progress. There is no good fossil record of any – Paul Wesson. The Darwinian theory is correct in the small, but not in the large. Rabbits come from other slightly different rabbits, not from either [primeval] soup or potatoes. Where they come from in the first place is a problem yet to be solved, like much else of a cosmic scale – Sir Fred Hoyle.*

The term 'evolution' has no single agreed meaning. The most general meaning is just 'development' – eg the coastline has evolved. But there is a specific difference between micro and macroevolution. Microevolution is variation, within prescribed limits, of already existing organs/structures. Macroevolution is large scale evolution, the coming into existence of new organisms/structures/genetic material, involving a marked increase in complexity – eg from single-celled to multi-celled organisms. Natural selection (by microevolution) obviously occurs; but is not necessarily the explanation of all evolutionary change. And it's significantly never creative – it involves the weeding out of weaker forms. The stronger ones are already there. Natural selection does not create novelty. This was a point made to Darwin by botanist Joseph Hooker, and Darwin replied *such men, as you and Lyell thinking that I make too much of a Deus of natural selection is conclusive against me... Every breeder knows that he does not produce the modification which he selects.* 105.

**What is the extent of microevolution?** All research so far indicates that variations have remained within the confines of the specific type. There is no evidence that any macroevolution results from microevolutionary processes operating over long periods of time. Geneticist Richard Goldschmidt: *the facts of microevolution do not suffice for an understanding of microevolution.* Further, 999 out of 1000 mutations have disastrous effects; cell biologists reckon at least 5 genes would be involved in the formation of even the simplest new structure, and so the chance of 5 non-disastrous mutations occurring is 1 in a million billion replications. Mathematicians point out that while theoretically it is possible eg for the eye to have developed through evolution, there hasn't been time. And, contrary to public perception, the fossil record gives no good eggs of macroevolution; we have almost no transitional forms - evolutionary novelty normally shows up 'with a bang' (palaeontologist Niles Eldredge; *we palaeontologists have said that the history of life supports [the theory of gradual adaptive change] knowing all the while it does not*). First, most species appear and disappear from the fossil record looking the same, even over millions of years; and second, they don't appear gradually they appear fully formed. The only explanation they have come up with is that of 'punctuated equilibrium' – that long periods of inactivity are broken by sudden large macroevolutionary jumps, eg in the Cambrian Explosion. What caused the jumps remains unclear. Common descent is held by some to be evidence of macroevolution – but the fact we can classify families/spp hierarchically doesn't prove they evolved from one another. Francis Collins suggests that although from our perspective *evolution could appear to be driven by chance, from God's perspective the outcome would be entirely specified.* It would seem that postulating an unobserved designer is no more unscientific than postulating unobserved macroevolutionary steps...

## 7. The origin of life

Between a living cell and any non-biological system there is a chasm as vast as it is possible to conceive. There is little sign of evolution among cells; the basic design of the cell system is the same in all living systems from bacteria to mammals. *In terms of basic biochemical design, no living system can be thought of as being primitive/ancestral with respect to any other system, not is there the slightest empirical hint of an evolutionary sequence among all the incredibly diverse cells on earth – geneticist Michael Denton.* Biochemist Michael Behe gives the eg of the tiny acid-driven motor that powers the bacterial flagellum (device that lets it swim); its motor, so small that 25,000 laid end to end would take up 1mm, consists of 40 protein parts inc a rotor, stator, bushings, drive shaft. The absence of any one would result in a complete loss of function - ie this is a case of irreducible complexity; it could not have evolved by a process of sequential mutation. He says: *to a person who does not feel obliged to restrict his search to unintelligent causes, the straightforward conclusion is that many biochemical systems were designed. They were designed not by the laws of nature, not by chance and necessity; rather, they were planned.*

**The building blocks of life.** 20 amino acids. They can't have combined into proteins in a primordial soup by an injection of energy, we now know – the atmosphere of the early earth wouldn't have permitted it, and in any case the proteins are too complex. Paul Davies says making a protein by injecting energy is like exploding dynamite under a pile of bricks and expecting them to form a house – you may inject enough energy, but you won't inject order. The odds against producing the 00s of 000s of proteins needed for life is  $10^{40,000}$  to 1. Fred Hoyle compared it to the likelihood of a tornado sweeping through a junkyard and producing a jumbo. Chance won't do it.

Stephen Meyer – what needs explaining is not the origin of order but the origin of information.

## 8. The genetic code and its origin

*What lies at the heart of every living thing is not a fire, warm breath, nor a "spark of life". It is information, words, instructions – Dawkins.*

The info content of DNA is fundamental to life; but DNA is not itself alive. It contains a database of information and the programme to produce a specified product. Each of the 10-100 trillion cells in the human body contains a database larger than the Encyclopaedia Britannica. The language and methodology of information technology has allowed us to recognise a cell as a molecular structure with an information processing capacity. The human genome contains only 30-40K genes – too few to account for the complexity of our inherited characteristics, let alone for the difference between say plants and animals. A chimp shares 98% of our DNA, but it's not 98% human, it's a chimp! Cells have extremely complex systems to protect themselves against the kinds of accidental genetic change that are supposed to be the sources of evolutionary variability. It just isn't true to see them as passive victims of the random forces of chemistry and physics. DNA did not create life; life created DNA. All living cells are controlled by info stored in DNA, transcribed into RNA and then made into protein – this is an irreducible symbiosis, in which each component requires the other two. Barry Commoner: *to some degree the theory [that the genome accounts completely for an organism's inherited characteristics] has been protected from criticism by a device more common to religion than science: dissent, or merely the discovery of a discordant fact, is a punishable offence, a heresy that might easily lead to professional ostracism.* There is more to what it means to be human than is contained in the genes. All theories on the origin of life run aground on the question 'how did the genetic code, along with the mechanisms for its translation, originate?' – bearing in mind that it's not changed an iota over 2 billion years; all living beings on earth, from bacteria to humans, use the same 64-word code. Explanations in terms of chemical bonds don't work. Explanations in terms of constituent atoms don't work – their properties are not acted on by natural selection.

## 9. Matters of information

*The problem of the origin of life is clearly basically equivalent to the problem of the origin of biological information – Bernd-Olaf Kuppers. Life is digital information – Matt Ridley*

Information can be syntactic (raw data) or semantic (data which makes sense). Jumbled letters are syntactic, ordered ones are semantic.

Davies: *Darwinism can only operate when life (of some sort) is already going. It cannot explain how life starts in the first place.* If chance and necessity are not capable of biogenesis, then a third factor must be involved: the input of information. Nobel physicist Robert Laughlin: *much of present day biological knowledge is ideological. A key symptom of ideological thinking is the explanation that has no implications and cannot be tested. I call such logical dead ends anti-theories because they have exactly the opposite effect of real theories: they stop thinking rather than stimulate it. evolution by natural selection, for instance, which Darwin conceived as a great theory has lately come to function as an anti-theory called upon to cover up embarrassing experimental shortcomings and legitimize findings that are at best questionable and at worst not even wrong. Your protein defies the laws of mass action – evolution did it! your complicated mess of chemical reactions turns into a chicken – evolution! The human brain works on logical principles no computer can emulate? Evolution is the cause!*

If we went to Mars and discovered a long sequence of piles of titanium cubes receding towards the Martian horizon where the piles each consisted of a prime number and the piles were in the correct ascending order.. then we would surely immediately conclude that this arrangement involved an intelligent input.. But if we discovered something much more complex – say a DNA molecule – then naturalistic scientists would presumably conclude that it was a result of chance and necessity!

Leonard Brillouin, on information theory: *a machine does not create any new information, but it performs a very valuable transformation of known information.* Nobel laureate Peter Medawar: *no process of logical reasoning – no mere act of mind or computer-programmable operation – can enlarge the information content of the axioms and premises or observation statements from which it proceeds.* Mathematician Godel believes that mechanism in biology is a prejudice of our time which will be disproved. One disproval will consist in a mathematical theorem to the effect that the formation within geological times of a human body by the laws of physics (or any other laws of a similar nature), starting from a random distribution of the elementary particles and the field, is as unlikely as the separation by chance of the atmosphere into its components. 152.

## 10. The monkey machine

Since July 2003 there has been a monkey typewriting random number generator simulator operating, with an initial 100 monkeys (doubling every few days) typing 1 letter per second. The current record is 24 consecutive letters from Henry IV, produced in  $10^{40}$  monkey years. The age of the universe is less than  $10^{11}$  years. Troops of monkeys could not produce the works of Shakespeare – the observable universe is not large enough to contain the necessary monkey hordes, typewriters and wpbs. The same is true for living material. The likelihood of the spontaneous formation of life from inanimate matter is 1 to a no. with 40,000 noughts after it. Dawkins has an answer – he postulates that each monkey has a target letter, so hits it 1 in 27 times (letters of alphabet plus space key); and that by some process when it hits the correct letter it's selected. Thus he introduces 2 mechanistic processes- but still no intelligence? Mathematicians pour scorn on this argument; but it does show that complex systems are not explicable without the pre-injection of the information you are seeking into the system.

Irreducible mechanisms – an illustration would be a combination lock. Get all the letters right on each spin, and you can open it. One wrong and you can't. The correct combination will never be found gradually.

## 11. The origin of information

DNA implies the need for an intelligent designer because it has an identical feature, information content, that intelligently designed human texts and computer languages possess.

Is the attribution of intelligent design to the universe science? Forensic medicine and the search for ET intelligence seem fine – why the furore when scientists claim there is evidence of intelligent causation in physics (small furore) or biology (large furore)? Is the scientific method not applicable everywhere? Does the overwhelming amount of information contained in even the simplest living system not imply intelligent origin of an even stronger kind than did the fine-tuning of the universe? Information and intelligence seem fundamental to the existence of the universe and life, and are not the end products of an unguided natural process starting with energy and matter but rather were involved from the beginning. Even physicists now suggest this. Paul Davies: *perhaps the universe is really a frolic of primal information, and material objects a complex secondary manifestation.* JA Wheeler: *tomorrow, we will have learned to understand all of physics in the language of information.*

In the beginning was the Word... God's interaction with the universe is informational – Polkinghorne.

Information is invisible and immaterial. Its carriers are material, but it itself is not. Information is not a physical entity. **God of the gaps?** The main arguments for the existence of God are based not on ignorance but on knowledge – the ordered nature of the universe, its mathematical intelligibility, fine-tuning etc. There are gaps that are closed by science and gaps that are revealed by science; the latter are recognised by science as not lying within its explanatory power. The law of conservation of energy tells us that energy is conserved; but not where it came from in the first place. The central pillar of Christianity is the resurrection of Christ, an event which involved a direct input of divine energy. No one even knows what energy is. Einstein said explanations should be as simple as possible, but no simpler. God is a good explanation for the origin of life!

An archaeologist imputes intelligent origin to the presence of scratches in a cave. A materialist explains the 3.5 billion letter sequence of the human genome in terms of chance and necessity!

What is the ultimate fact? For the atheist it's the universe; for the theist it's God. Or, to put it a different way, which came first, mind or matter? Allan Sandage, the world's greatest living cosmologist: *the world is too complicated in all its parts and interconnections to be due to chance alone. I am convinced that the existence of life with all its order in each of its organisms is simply too well put together.*

## Epilogue

Erwin Schrodinger: *I am astonished that the scientific picture of the real world around me is very deficient. It gives us a lot of factual information, puts a lot of our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us. It cannot tell us a word about red and blue, bitter and sweet, physical pain and physical delight; it knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these domains but the answers are very often so silly that we are not inclined to take them seriously.*

'I submit that, far from science having buried God, not only do the results of science point towards his existence, but the scientific enterprise itself is validated by his existence... Either human intelligence ultimately owes its origin to mindless matter; or there is a Creator. It is strange that some people claim that it is their intelligence that leads them to prefer the first to the second.'

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