

John Lennox

Reflections on the Intelligent Design Debate



John Lennox (b. 1943) is a mathematician and philosopher at Oxford University. He has lectured widely in academic and popular venues, and has debated scientific naturalists, such as Richard Dawkins. His piece here attempts to sort out the structure and strategy of the various design arguments that have been constructed—arguments about an intelligence outside of, yet operating on, nature. He reviews the various arguments that have been used historically and offers observations about why these arguments are sometimes resisted in the name of science. Students of the debate will find the taxonomy of argument types that he creates to be very helpful. Whatever the strengths and weaknesses of the controversial intelligent design arguments may be, Lennox observes, what is fundamentally at stake is the concept of *information*: whether they provide a vision of reality that can adequately account for its origin and existence.

The intelligent design debate is part of a wider discussion about the relationship of science to religion that is often felt to be one of deep hostility and antagonism as, for instance, encapsulated by Richard Dawkins's recent popular book *The God Delusion*. The inadequacy of this conflict thesis is reflected in the equally recent book *The Language of God* by Francis Collins, director of the Human Genome Project, and has been admirably documented by John Brooke. Indeed, the fact that there are eminent scientists who believe in God and eminent scientists who do not shows that the real conflict is not between science and religion at all but between the diametrically opposed worldviews of materialism and theism, and there are scientists on both sides. The central issue at stake, therefore, is which worldview is supported by

science? It is in that context that I wish to reflect on the matter of intelligent design.

At a 2006 discussion in Oxford, I asked a group of scientists and theologians whether it was legitimate to look for scientific evidence of the involvement of intelligence in the origin of the universe and in its laws of operation. The response was overwhelmingly positive. However, protest was elicited when it was suggested that this question lay behind the notion of intelligent design. The ensuing discussion revealed that now ID is freighted with very different connotations, namely, that of a stealth creationism that concentrates solely on attacking evolutionary biology and is antisience in spirit.

This semantic shift spawns unfortunate consequences. It obscures the long and distinguished

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philosophical and theological pedigree of the idea of intelligent causation. It fails to do justice to the divergence of scholarly interpretations of the Genesis account, even among those who ascribe final authority to the biblical record, and shifts the focus away from the fact of creation to the timing of creation. Finally, concentration on evolutionary biology alone can lead to failure to take account of wider evidence for intelligent causation from other sciences such as physics and cosmology and, importantly, from the philosophy of science.

It may be helpful to distinguish between a broader theory of intelligent design that deals with that wider evidence and a narrower theory that concentrates on biology. For example, William Dembski says, "Intelligent design is the field of study that investigates signs of intelligence. It identifies those features of objects that reliably signal the action of an intelligent cause" (the broader perspective) whereas Dembski and Michael Ruse define intelligent design as "the hypothesis that in order to explain life it is necessary to suppose the action of an unevolved intelligence" (the narrower perspective).

The term *intelligent design* is intended to separate the recognition of design from the identification of the designer with a view to regarding the first issue as falling within the remit of science. However, this attempt can be misunderstood in that highlighting the first issue has led to accusations of avoiding the second in order to conceal a theistic or even a creationist agenda. Now it is, of course, difficult to think of design at the big-picture level of the universe and life without thinking of God as the putative designer, and many if not most of those people espousing intelligent design are theists. Perhaps it would be best if worldview commitments, since we all have them, were made explicit so that we could then concentrate on the arguments themselves and avoid the all-too-common genetic fallacy: "you believe X only because you are a Y."

The other danger of too forced a separation between the recognition of design and the identification of the designer is the inadvertent communication of the erroneous impression that the former question is strictly scientific whereas the latter, not being strictly scientific, is nonrational and the sciences (of whatever kind) can contribute nothing to it.

Nevertheless, it is surely clear that the two questions are logically separate. If the first Earth visitors to Mars were to see a sequence of thousands of piles of titanium cubes where each pile contained a prime number of cubes and the piles were arranged in ascending order—2, 3, 5, 7, 11, 13, 17, 19, and so forth—they might well conclude that intelligent life had been there before them, but they would not be able to say anything about the identity of the intelligence involved. SETI raises the same issue and is discussed in detail in Dembski's *The Design Inference*.

IS ID SCIENCE?

This question can be somewhat misleading. Consider the parallel questions: Is theism science? Is atheism science? Most people would probably give a negative answer to both. But if we interpret the question as, Is there any scientific evidence for theism or atheism, then the answer might well be positive. For instance, E. O. Wilson holds that "scientific humanism" is "the only worldview compatible with science's growing knowledge of the real world and the laws of nature." Incidentally, atheists of his persuasion can scarcely object to Christians using science to support the New Testament claim that there is evidence of God in the created universe. We deal below with the related question as to whether ID is science in the sense of making testable predictions.

WHY IS ID PERCEIVED TO BE ANTISCIENCE?

For context we need to consider design arguments in general. They come in two levels. Level I consists of arguments that the scientific laws by which the universe operates are designed (in the sense that they are the result of intelligent input) and the phenomena of the universe are the evidence of their fruitfulness. Level II consists of arguments that the phenomena themselves involve direct input from a designing intelligence rather than emerging as a consequence of the (designed) laws.

The arguments at each level fall into two types: Type I are arguments from the history, philosophy, and methodology of science; and Type II are arguments from the detailed results of the sciences—cosmology, physics, biology.

Crucial for our understanding of the ID debate is the observation that Type II arguments split into two very different kinds. Type IIA are arguments that flow from an acceptance of mainstream science; and Type IIB are arguments that involve challenging mainstream science. Obviously IIB arguments are much more controversial than IIA arguments and inevitably attract more (media) attention.

Now, Type IIB arguments are not unimportant—indeed, science in general is kept healthy and advances as a result of being challenged, sometimes even resulting in a paradigm shift that leads to great advance (Galileo's questioning of Aristotle and Wegener's work on plate tectonics, to give but two examples). It is understandable, however, that arguments of Type IIB are not likely to be taken seriously unless they are supported (and preceded) by other arguments of Types I and IIA.

TYPE I ARGUMENTS: THE HISTORY, PHILOSOPHY, AND METHODOLOGY OF SCIENCE

At the heart of all science lies the conviction that the universe is rationally intelligible. For Albert Einstein this was something to be wondered at:

You find it strange that I consider the comprehensibility of the world... as a miracle or as an eternal mystery. Well, a priori, one should expect a chaotic world, which cannot be grasped by the mind in any way... the kind of order created by Newton's theory of gravitation, for example, is wholly different. Even if man proposes the axioms of the theory, the success of such a project presupposes a high degree of ordering of the objective world, and this could not be expected a priori. That is the "miracle" which is being constantly reinforced as our knowledge expands.

Sir Roger Penrose, whose understanding of the depth and subtlety of the relationship between physics and mathematics is unquestioned, writes:

It is hard for me to believe... that such SUPERB theories could have arisen merely by some random natural selection of ideas leaving only the good ones as survivors. The good ones are simply much too good to be the survivors of ideas that have arisen in a random way. There must be, instead, some deep underlying reason for the accord between mathematics and physics.

Now science itself cannot account for this resonance. "Science does not explain the mathematical intelligibility of the physical world, for it is part of science's founding faith that this is so." What does account for it? Our answer will depend not so much on whether we are scientists or not, but on our worldview. From a theistic perspective, the rational intelligibility of the universe makes perfect sense in light of the rationality of God the Creator. Indeed, it would seem that this was the driving force behind the rise of science. Melvin Calvin, Nobel Prize winner in biochemistry, writes:

As I try to discern the origin of that conviction [that the universe is orderly], I seem to find it in a basic notion discovered 2,000 or 3,000 years ago, and enunciated first in the Western world by the ancient Hebrews: namely that the universe is governed by a single God, and is not the product of the whims of many gods, each governing his own province according to his own laws. This monotheistic view seems to be the historical foundation for modern science.

More recently, Peter Harrison has made a strong case that a dominant feature in the rise of modern science was the Protestant attitude to the interpretation of biblical texts, which spelled an end to the symbolic approach of the Middle Ages. We are not, of course, suggesting that there never has been religious antagonism to science. T.F. Torrance points out that the development of science was often "seriously hindered by the Christian church even when within it the beginnings of modern ideas were taking their rise." He nevertheless supports Melvin Calvin: "In spite of the unfortunate tension that has so often cropped up between the advance of scientific theories and traditional habits of thought in the Church, theology can still claim to have mothered throughout long centuries the basic beliefs and impulses which have given rise especially to modern empirical science, if only through its unflinching faith in the reliability of God

the Creator and in the ultimate intelligibility of his creation.”

It is sometimes claimed that notions of intelligent design fail to be scientific because they make no testable predictions. But this is surely as far from the truth as it could be if one of the major impulses behind the rise of science is the confirmation of a prediction, based on biblical texts, of the rational intelligibility of the universe. Putting it a different way, Richard Swinburne writes: “Note that I am not postulating a ‘God of the gaps,’ a god merely to explain the things that science has not yet explained. I am postulating a God to explain why science explains; I do not deny that science explains, but I postulate God to explain why science explains. The very success of science in showing us how deeply ordered the natural world is provides strong grounds for believing that there is an even deeper cause for that order.”

THE REDUCTIONIST ALTERNATIVE

The alternative, indeed, the only possible option under atheistic assumptions, is ultimately to ascribe the rational intelligibility of the universe to purely material causes. An example of this extreme kind of (ontological or conceptual) reductionism is given by Francis 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.”²¹ The telltale words that reveal such reductionism are “no more than” or “nothing but.” Remove them and usually something unobjectionable remains—our memories certainly involve the behavior of nerve cells. Add the words “nothing but” and we have changed a scientific statement into a statement of materialistic belief—and nothing more.

If Crick’s thesis is true, we could never know it, as John Polkinghorne shows when he describes such a reductionist program as containing the seeds of its own destruction:

Ultimately it is suicidal. Not only does it relegate our experiences of beauty, moral obligation, and religious encounter to the epiphenomenal scrap-heap. It also destroys rationality. Thought is replaced by

electro-chemical neural events. Two such events cannot confront each other in rational discourse. They are neither right nor wrong. They simply happen.... The very assertions of the reductionist himself are nothing but blips in the neural network of his brain. The world of rational discourse dissolves into the absurd chatter of firing synapses. Quite frankly, that cannot be right and none of us believes it to be so.

Indeed. None of us believes that a Rembrandt painting is nothing but a distribution of molecules of paint on canvas. Any adequate explanation of the painting both involves the materials and mechanisms involved—the canvas, the paint, and the tools by which it is applied—and the intelligent agent Rembrandt. The fundamental point at issue in intelligent design (in the broad sense) is the same: Is a mechanistic description of the universe adequate as explanation in the fullest sense?

TYPE IIA ARGUMENTS IN PHYSICS AND COSMOLOGY

A complete explanation of a Rembrandt painting involves both mechanism and agency seen as complementary levels of explanation. They neither compete nor are they the same kind of explanation. Rembrandt will not be found in a minute analysis of the chemistry of the paint: it is rather the organization and execution of the whole painting that points to him. Similarly, when Kepler made his brilliant observational deduction that the planets move in ellipses ‘round the sun as focus and Newton later explained these motions in terms of his law of gravity, they did not conclude that their discoveries of law or mechanism obviated God. Kepler said: “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, and which he revealed to us in the language of mathematics.” Sir John Houghton has captured the idea well: “Our science is God’s science. He holds the responsibility for the whole scientific story.... The remarkable order, consistency, reliability and fascinating complexity found in the scientific description of the universe are reflections

of the order, consistency, reliability and complexity of God's activity."

Thus, the two explanations, the first in terms of law and mechanism, the second in terms of agency (God), run in parallel and, far from the second inhibiting work on the first, it was, certainly for many of the pioneers of science, their central motivation. Similar things may be said for the fine-tuning arguments from cosmology that have been discussed by many authors. Arno Penzias, who won the Nobel Prize for discovering the microwave background radiation that indicated a finite age to the universe, sums up his position: "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." It needs to be emphasized that these design arguments flow out of mainstream science, in this case the Standard Model in cosmology. They do not arise out of ignorance of science but out of knowledge of science.

At the heart of the majority of the fine-tuning arguments lies the conviction that space-time had a beginning some thirteen to fifteen billion years ago, which is of interest in connection with the question mentioned earlier of whether intelligent design theories make testable predictions. For centuries the Genesis account has been available with its magisterial opening words: "In the beginning God created the heavens and the earth." It must be fairly obvious, surely, that if these words had been taken seriously by scientists, the attempt to find scientific evidence for such a beginning, and thus challenge the Aristotelian paradigm of an eternal universe, would have started long before it did. In the event, when evidence began to pile up that the cosmos had a beginning, ironically it was fiercely resisted by prominent scientists (like Sir John Maddox, then editor of *Nature*) because they thought it would give too much leverage to those who believed in creation! It is particularly apposite that it was Penzias who wrote, "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." Note the word *predicted*.

TYPE IIA ARGUMENTS IN BIOLOGY

Type IIA arguments are not restricted to physics and cosmology. They are used to question the notion that evolutionary biology demands atheism (a Type IIA anti-intelligent design argument). For instance, chapter 4 of Dawkins's recent book, *The God Delusion*, titled "Why There Is Almost Certainly No God," is devoted to showing, "Far from pointing to a designer, the illusion of design in the living world is explained with far greater economy and with devastating elegance by Darwinian natural selection." For Dawkins, God and evolution are alternative, mutually exclusive explanations. However, he commits the category mistake of failing to distinguish agency from mechanism. Dennett does the same, but in such a way that the reader thinks he has dealt with the matter of agency, when he has not even addressed it: "Love it or hate it, phenomena like this [DNA] exhibit the heart of the power of the Darwinian idea. An impersonal, unreflective, robotic, mindless little scrap of molecular machinery is the ultimate basis of all agency, and hence meaning, and hence consciousness in the universe." Leaving aside the question of whether Dennett's grandiose claim for DNA is true, DNA as a molecular machine may well be impersonal, unreflective, robotic, and mindless. Most machines are. But that says absolutely nothing about whether they have been designed or not—in fact, most machines have been.

To quote Sir John Houghton once more, "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 these processes may appear, implies there can be no watchmaker."

On this view, the evolutionary viewpoint, far from invalidating inference to intelligent origin, simply backs it up one level—from primary to secondary causation. On seeing a car for the first time, a person might suppose that it is made directly by humans, only later to discover it is made in a robotic factory by robots which, in turn, were made by machines made by humans. It was not the inference to intelligent

origin that was wrong but the concept of the nature of the implementation of that intelligence. Direct human activity was not seen in the factory because it is the existence of the factory itself that is the product of that activity.

In this vein Charles Kingsley wrote to Darwin suggesting that his theory of natural selection provided “just as noble a conception of Deity, to believe that He created primal forms capable of self-development...as to believe that He required a fresh act of intervention to supply the lacunas which He Himself had made.” Though Kingsley was not a scientist, Darwin was so impressed by his words that he cited them in the second edition of *On the Origin of Species*, possibly with an eye to influencing his more skeptical clerical readers.

The fine-tuning arguments from physics and cosmology are, of course, independent of evolutionary theory, yet it is important to note that the theory demands the existence of a fine-tuned universe producing exactly the right kind of materials and operating according to complex laws that are consistent with supporting life. Such anthropic fruitfulness could then be regarded as evidence of creative intelligent activity. Keith Ward speaks of evolution as “having been chosen by a rational agent for the sake of some good that it, and perhaps it alone, makes possible.” John Polkinghorne speaks of creation as “realising the inbuilt potentiality with which the Creator has endowed it.” Theistic evolution has thus commended itself to many scientists, from Asa Gray and Richard Owen in Darwin’s day to the present.

Even the late Stephen Jay Gould thought that regarding Darwinism as necessarily atheistic was going beyond the evidence: “Either half of my colleagues are enormously stupid, or else the science of Darwinism is fully compatible with conventional religious beliefs—and equally compatible with atheism.” However, Dawkins and Dennett think not. Dennett regards Darwin’s idea as a kind of corrosive acid, which “threatens to destroy all pre-Darwinian views of the world; in that, instead of the universe’s matter being a product of mind, the minds in the universe are a product of matter. They are nothing more than the results of an undirected, mindless, purposeless process.” He claims that “natural selection somehow

designs without either itself being designed or having any purpose in view” characterizing it as “mindless, motiveless, mechanicity.” In the language of Aristotle, Dennett’s claim is that it is the very nature of the efficient cause (evolution) that rules out the existence of a final cause (divine intention).

TYPE IIB ARGUMENTS IN BIOLOGY

It is, in part, this kind of assertion that leads to the Type IIB question whether the evolutionary mechanism will bear all the weight that is put on it, for instance, by Richard Dawkins: “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.”

Does natural selection really account for the existence of life as distinct from its variations? Surely it cannot be quite so straightforward for the simple reason that, until life exists, there is no mutating replicator on which natural selection can operate. Theodosius Dobzhansky, one of the pioneers of evolutionary biology, who said that “nothing makes sense in biology except in light of evolution,” also said that “prebiological evolution is a contradiction in terms.”

This question of what accounts for life’s existence is at the heart of the (narrower) ID debate, a debate that received an unexpected stimulus when eminent philosopher Antony Flew gave as the reason for his conversion to theism after over fifty years of atheism that the investigation of DNA by biologists “has shown, by the almost unbelievable complexity of the arrangements which are needed to produce life, that intelligence must have been involved.... It has become inordinately difficult even to begin to think about constructing a naturalistic theory of the evolution of that first reproducing organism.”

It will be objected that this is an antiscientific God-of-the-gaps solution of the sort “there is no plausible material process for X, therefore X must involve the input of intelligence.” We must take this objection seriously, though we first of all record a warning by an expert on the origin of life, Nobel laureate Robert Laughlin, of the danger of an evolution of the gaps:

Evolution by natural selection 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 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 did it! The human brain works on logical principles no computer can emulate—evolution is the cause!

The origin of life has not been observed, so scientists use the historical methods appropriate to the investigation of unrepeatable past events and make inferences to the best explanation. It is therefore clear how an evolution-of-the-gaps could be just as metaphysically motivated for an incautious atheist as a God-of-the-gaps could be for an incautious theist. For materialists there simply must eventually be a solution in terms of material processes alone, so they might as well call it evolution, filling in the details as they are found—for they must be found.

Now many scientists who are theists and all who are atheists insist that science restricts its explanation to material processes. They therefore reject Level II arguments. The theists among them often use Level I arguments for the existence of God. To warn of the dangers of Level II God-of-the-gaps arguments, they might cite Newton's letter in which he said that his law of gravitation could explain the motion of planets around the sun but not their motion around their own axes, which needed a "divine arm." Progress in physics, they might well add, has removed the need for this kind of divine intervention and has led us to a seamless scientific understanding of the evolution of the cosmos in terms of material processes involving cause and effect, chance and necessity. There are no singularities—except (for many) at the beginning. We can see all of this cosmic development as the fruit of mathematical and physical laws that express the Creator's mind. So why can the same not hold for the origin of life?

As a scientist, the author takes such reasoning and the concomitant charge of intellectual laziness that is often leveled at God-of-the-gaps-type arguments very seriously indeed but, nevertheless, thinks there is more to be said both from a scientific and from a theological perspective. Let us take the theological

perspective first. If there is a God who does anything in the world indirectly, then, as Alvin Plantinga argues, logic would tell us that God must do something directly. What is that direct something? Most theists would agree that it was causing the universe to exist, creating it originally, and maintaining it throughout its history. The initial act of creation would then appear as a singularity to any scientific analysis based on purely material processes.

Cosmology speaks of precisely such a singularity and is not embarrassed to do so. Its understanding of physics leads back to the big bang singularity where, according to Stephen Hawking, "the laws of physics break down." Once we admit that God has acted directly at least once in the past to create the universe, what is there in principle to prevent God's acting directly more than once, whether in the past or in the future? For nature's laws are not independent of God. From a Level I perspective, they are mathematical formulations of the regularities with which God has endowed the physical universe and so, as C. S. Lewis has argued, it would be absurd to think that they constrained God so that the Divine could never do anything special: "Could we not sensibly conclude, for example, that God created life, or human life, or something else specially?"

Apparently not, says Paul Davies: "There's no need to invoke anything supernatural in the origins of the universe or of life. I have never liked the idea of divine tinkering: for me it is much more inspiring to believe that a set of mathematical laws can be so clever as to bring all these things into being." So Davies assumes that if God created life specially, it would demean God into a kind of cosmic magician who constantly interferes with the universe. However, this reaction is surely unwarranted. After all, if the claim that God created and upholds the universe is not demeaning, why should the claim that God created life, especially if human life bears the Divine image, be demeaning?

1. It is not as if claims were being made (from a biblical perspective, now) that God was constantly tinkering with the universe. For instance, in the Genesis creation narrative it is interesting that the number of special commandments—"And God said..." is relatively small and the series

of such commandments (however long it took) came to an end. Indeed, the surprise is how few such special actions of God are claimed in the Bible as a whole.

2. To say that the universe and life have been brought into existence by mathematical laws is astonishing. Apart from begging the question of where the laws came from, such laws are abstract mathematical formulations that by their very nature (laws are not material), far from bringing anything into existence, cannot even cause anything. Newton's laws of motion will tell you a billiard ball's trajectory once it has been hit and the fact that it will remain at rest if it is never hit—but the laws will never move the ball. Or, more simply, $2 + 2 = 4$, but this fact has never put any money in anyone's pocket.
3. Davies says that he does not "like the idea of divine tinkering" to which one might respond, first, that it is perhaps unwise to decide the nature of reality by our likes or dislikes but rather on the basis of evidence and, second, that the pejorative word *tinkering* scarcely does justice to a God who has the power to create the universe and life.

David Hume has persuaded many scientists that special activity by God (miracle) involves a breaking of the laws of nature and is therefore ruled out *a priori* as scientifically impossible. However, C. S. Lewis and others have shown that Hume's objection involves the misunderstanding of the nature of law mentioned in my second point above. The laws are a description of what normally happens in the universe, but God the Creator can do something special directly without breaking the laws. For example, at the heart of Christianity is the claim that Jesus was raised from the dead by a direct injection of the power of God. It is noteworthy that a mathematical physicist of the eminence of Sir John Polkinghorne does not think that his position as a scientist is compromised by his belief in the resurrection of Jesus, even though, from the perspective of explanation in terms of unguided material processes, the resurrection is a singularity.

Thus, scientists who are Christians would appear to be committed to at least two singularities, (1) creation itself, the beginning of space-time, and (2) the resurrection of Jesus within space-time. There is therefore, surely, no in-principle reason not to consider the origin of life as a potential third singularity, provided, of course, that the evidence warrants it.

This is the key question. However, since many scientists will feel that we have long since left the realm of science for fairyland, it is important first to discuss what kind of scientific evidence we might expect if the origin of life has a supernatural dimension and is not explicable solely in terms of purely material processes.

First, we should expect that explanations in terms of material processes fail at certain points. This logical observation, however, is the focus of a major objection, hinted at earlier: is it not an intellectually lazy, antiscientific attitude simply to give up the attempt at material explanation after the first few tries and say God did it?

Our response is that it might well be. However, pure mathematics has something to teach us here. If mathematicians have tried to prove a conjecture in pure mathematics for a long time, like the anciently posed task of trisecting an angle with straightedge and compasses, and they fail, there will come a time when they will try to mount an attack in the opposite direction and try to *prove* that the conjecture is false. This was done after many centuries in the case of angle trisection by Pierre Wantzel in 1836. Consequently, no one tries to do it any more.

Now, origin-of-life research burst on the world in 1953 with the announcement of the results of the Miller-Urey experiment—the production of some of the amino acid building blocks of protein in a simulated primeval soup bombarded by electricity. However, over the subsequent fifty-four years, it has been realized that the real problem was not obtaining the building blocks of life (although that problem is still with us) but getting those building blocks in the right order as revealed by the genetic code whose discovery ranks as perhaps the greatest ever scientific achievement.

Subsequent research has produced several emergent and self-organizing scenarios that, although of

great interest, seem rather to highlight and intensify this problem rather than solve it, as is, somewhat ironically, very well expressed by Paul Davies:

Life is actually *not* an example of *self*-organisation. Life is in fact *specified*, i.e. genetically directed, organisation. Living things are instructed by the genetic software encoded in their DNA (or RNA). Convection cells form spontaneously by self-organisation. There is no gene for a convection cell. The source of order is not encoded in software; it can instead be traced to the boundary conditions in the fluid.... In other words, a convection cell's order is imposed *externally*, from the system's environment. By contrast, the order of a living cell derives from *internal* control.... The theory of self-organisation as yet gives no clue how the transition is to be made between spontaneous, or self-induced organisation—which in even the most elaborate non-biological examples still involves relatively simple structures—and the highly complex, information-based, genetic organisation of living things.

This brings us to the meat of the problem—to explain the genesis of the specified computer-language-like structure of DNA that Dennett calls a “mindless scrap of molecular machinery.” Now it may justifiably be said that fifty-four years is not a very long time in science. So why not simply keep on trying to establish the truth of the conjecture that the origin of biological information is a purely material process and not give in to a God-of-the-gaps thinking? Well, that might be the thing to do provided that, to use mathematical terminology, the conjecture is not provably false.

But is this not to fall afoul of the “impossibility of proving a negative” dictum? Not in principle, as is seen from my mathematical example. More importantly, physics gives us more relevant examples. Take, for instance, the law of conservation of energy that prohibits the existence of certain material things, such as perpetual-motion machines. It is therefore pointless to argue that, although people have failed to construct perpetual-motion machines in the past, it would be against the spirit of science to give up on the construction of such a machine. Physics itself says they are impossible constructions. Any machine will use more energy than it produces.

Of immediate relevance to our discussion are the following parallel observations. The first is due to a

pioneer of information theory, Leonard Brillouin: “A machine does not create any new information, but it performs a very valuable transformation of known information.” The second comes from the brilliant mathematician Kurt Gödel, who proved certain far-reaching impossibility theorems in mathematics, like the incompleteness of arithmetic:

The complexity of living bodies has to be present in the material [from which they are derived] or in the laws [governing their formation]. In particular, the materials forming the organs, if they are governed by mechanical laws, have to be of the same order of complexity as the living body.... More generally, Gödel believes [Gödel sometimes expressed himself in the third person] that mechanism in biology is a prejudice of our time which will be disproved. In this case, one disproval, in Gödel's opinion, 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.

Nobel Laureate Sir Peter Medawar thought there might be some kind of law of conservation of information and, more recently, William Dembski argues for a nondeterministic law of conservation of information along the lines suggested by Brillouin to the effect that, although natural processes (involving only chance and necessity) can effectively transmit complex specified information, they cannot generate it so that information is not reducible to physics and chemistry.

Now there is clearly a great deal at stake here—in particular a radical challenge to materialistic philosophy and, if we add in the fact that the concept of information, especially information with a semantic dimension, is notoriously difficult to define, it is not surprising that the question of the validity of such a law of conservation of information is still a topic of hot debate. Making due allowance for this fact, however, just as we can test the plausibility of the law of conservation of energy by finding the energy flaw in a putative perpetual-motion machine, we can test the plausibility of a theory of information conservation. If information is conserved in some meaningful

sense, then we would expect that any scenario that claimed to get information for free (by chance and necessity) was flawed and that information had to be smuggled in somewhere. That seems to be exactly what is found in all scenarios hitherto offered, for instance, by Dawkins and others.

To put it another way, there seem to be two kinds of gaps: bad gaps and good gaps. The bad gaps are those that are targeted in God-of-the-gaps accusations, those that science will eventually fill. The good gaps are those that are revealed by science, such as the information gap discussed just now. We emphasize that it is science that reveals the good gaps, and not theology. However, theology can help illuminate where they are likely to be (witness creation). We would therefore argue that, just as the beginning of space-time is a good gap in the explanatory power of physics, the origin of life is a good gap in the explanatory power of molecular biology. Biology is not reducible to physics and chemistry.

John Polkinghorne also suggests a similar differentiation:

We must never rest content with a discussion in such soft-focus that it never begins to engage our intuitions about God's action with our knowledge of physical process.... If the physical world is really open, and top-down intentional causality operates within it, there must be intrinsic "gaps" ("an envelope of possibility") in the bottom-up account of nature to make room for intentional causality.... We are unashamedly "people of the gaps" in this intrinsic sense and there is nothing unfitting in a "God of the gaps" in this sense either.

These arguments amplify work by scientist and philosopher Michael Polanyi, who asks us to think of the various levels of process involved in constructing an office building with bricks. First, there is the process of extracting the raw materials out of which the bricks have to be made. Then there are the successively higher levels of making the bricks—they do not make themselves; bricklaying—the bricks do not self-assemble; designing the building—it does not design itself; and planning the town in which the building is to be built—it does not organize itself. Each level has its own rules. The laws of physics and chemistry govern the raw material of the bricks; technology prescribes the art of brickmaking; architecture

teaches the builders; and the architects are controlled by the town planners. Each level is controlled by the level above. But the reverse is not true. The laws of a higher level cannot be derived from the laws of a lower level; although what can be done at a higher level will, of course, depend on the lower levels. For example, if the bricks are not strong, there will be a limit on the height of the building that can safely be built with them.

The same is true of a printed page. As Nobel laureate Roger Sperry has said: "The meaning of the message is not to be found in the physics and chemistry of the paper and ink." We are suggesting here that information and intelligence are fundamental to the existence of the universe and life and, far from being the end-products of an unguided natural process starting with mass energy, they were involved from the very beginning. Interestingly, Paul Davies writes,

The increasing application of the information concept to nature has prompted a curious conjecture. Normally we think of the world as composed of simple, clod-like, material particles, and information as a derived phenomenon attached to special, organised states of matter. But maybe it is the other way around: perhaps the universe is really a frolic of primal information, and material objects a complex secondary manifestation.

However, the proposal that information be regarded as a fundamental quantity has been around for centuries. "In the beginning was the Word... all things were made by him" wrote John, the author of the fourth gospel. The Greek for "Word" is *Logos*, a term used by Stoic philosophers for the rational principle behind the universe and subsequently invested with additional meaning by Christians to describe the Second Person of the Trinity. The term *Word* itself conveys to us notions of command, code, communication, meaning, and thus information, as well as the creative power needed to realise what was specified by that information. The Word, therefore, is more fundamental than mass energy. Mass energy belongs to the category of the created. The Word does not.

It is surely very striking indeed that at the heart of the biblical analysis of the creative acts, so readily dismissed by many, we find the very concept which science has shown to be of paramount

importance—the concept of information. Perhaps if these profound biblical ideas had been taken more seriously by scientists they would have concluded more rapidly that information is important. Just as with the fact of the beginning, a scientific prediction could have been theologically informed in this way.

I have spent a relatively long time on these arguments of Type IIB, not because they are more important—although I believe that the last point is of immense significance—but because they are the most

controversial and the most misunderstood. I would conclude, however, by recalling once more that the main arguments to intelligent causation are of Types I and IIA. The evidence of God is to be seen mainly in the things that we do understand and not in the things we don't. If those of us who favor such arguments keep this perspective, we can then evaluate and use some arguments of Type IIB without giving the impression that all our eggs are in the God-of-the-Bad-Gaps basket.

STUDY QUESTIONS

1. As clearly as you can, describe Lennox's classificatory scheme for sorting out the different types of design arguments.
2. Lennox divides design arguments into one class that reflects on the history, philosophy, and methodology of science and another class that deals with specific findings within science in order to conclude that there is an Intelligence behind the universe. Which scientific disciplines are involved? Discuss and assess.
3. In the eighteenth century, the God-of-the-gaps had to retreat from nature as science advanced more explanations for natural phenomena. Explore how contemporary ID theory could be seen as a reiteration of a God-of-the-gaps fallacy of offering agency explanations for matters eventually covered by mechanistic explanations.
4. Explore the claim that the concept of information is one of the most important points of contact between science and theology.

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