

TWO KINDS OF CAUSALITY
PHILOSOPHICAL REFLECTIONS ON *DARWIN'S BLACK BOX*

- Jakob Wolf -

1. MICHAEL BEHE'S THEORY OF IRREDUCIBLY COMPLEX SYSTEMS.

In his book *Darwin's Black Box*, Michael Behe demonstrates with a wealth of empirical detail that irreducibly complex biochemical systems exist. The cell, cellular transport, cilium, the mechanism of vision, the immune system and the blood-clotting cascade are all examples of irreducibly complex systems. The definition of an irreducibly complex system is that it is one "composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning."¹ Behe provides the telling example of the "I-cell disease". A child born with this disease is severely handicapped and has a maximum life expectancy of five years. The only element missing from this child's cells is a small mechanism in the extended chain of reactions that conveys protein from the cytoplasm to the lysosom. Only a minuscule segment of the system is lacking, but its absence is sufficient to cause the system to malfunction: without it the organism will not survive for long. But Behe's most major and wonderfully illuminating example of an irreducibly complex system is the now famous mousetrap. A mousetrap is an irreducibly complex system in which all the components must be present, each in its proper place, if the system is to work. There must be a solid platform to which the parts are nailed. There must be a spring, a hammer, a holding bar that keeps the spring tense, and a catch for the holding bar that can be moved by a slight touch, so that the holding bar springs out of the catch and the spring is released. All these components must be simultaneously present and mutually adjusted; otherwise the trap is worthless. No one would see it as anything other than junk. No incomplete functional precursors precede the essential structure of this mousetrap.

Behe further demonstrates that the emergence of these systems cannot be explained by neo-Darwinian theory, which has it that all evolution can be explained in terms of natural selection working on variations produced by, amongst other things, random mutations. This theory suggests, then, that evolution progressed *gradually*, but the difficulty it faces is that no irreducibly complex

¹ Michael J. Behe *Darwin's Black Box* 1.ed. Touchstone 1998 (paperback) p. 39.

system can emerge gradually. No such system can result from the continuous enhancement of the original function, with that same function continuing to be its crucial part. The system cannot emerge from small, successive modifications of some functional precursor because any such precursor of an irreducibly complex system which lacks a part, however small, is ipso facto unable to function. Its chances of survival are tenuous in the extreme. No such deficient system would be promoted by natural selection; it would be eliminated.

To illustrate this point: There is no way a bicycle might be evolved into a motorcycle through the modification of its structure. Any such stepwise metamorphosis is an impossibility. A bicycle fitted with just some of the components of a motorcycle, e.g. a piston and a sparking plug, would be unable to function, or at least would certainly not qualify as an enhanced bicycle possessed of superior survival potential than its more mundane counterpart. Bicycles and motorcycles are two disparate systems, both of which both need to be integrally functional if they are to stand a chance of survival in the market or in use. There is no such thing as one of these systems smoothly evolving into the other by passing through a continuum of successive discrete stages. A motorcycle represents an entirely new system, a novel concept. Granted, the fundamental structure of the bicycle is inherent in that of the motorcycle, but the latter has been totally transformed by the integration of a number of new components.

Against this, Richard Dawkins has argued that even imperfect systems may enhance an organism's survival chances. He adduces the example of the evolution of the eye. An eye capable of indistinct vision, or an eye able only to distinguish between light and darkness, is better than no eye. That is probably true, but the possibility of vision at all presupposes an irreducibly complex system in the form of a cell sensitive to light and able to react in a specific way to visible radiation. There is no question that a system may undergo continuous improvement as a result of natural selection, but that process can never lead to the emergence of a new irreducibly complex system with fresh components integral to it. If we consider, say, the progression from the first cumbersome bicycles to a modern lightweight racing model, we do not doubt that the bicycle has evolved, and that its improved features are explicable by reference to survival chances in the market. All the same, a racing cycle is precisely not a motorcycle, and never will be. A Darwinian explanation predicated on a notion of continuous, gradual, successive evolution may indeed explain some changes - changes within one and the same complex system - but is incapable of explaining the evolution of increasingly complex systems. So far from commanding the resources to explain their emergence,

Darwinian explanation consistently presupposes the existence of irreducibly complex systems. It is also highly conceivable that natural selection is able to explain why some irreducibly complex systems survive and why some perish. Some systems survive only briefly, others for longer. Dinosaurs and mammoths died out, and their extinction may very well be explicable by appeal to the notion of the survival of the fittest. Either the environment changed or else other complex systems emerged with superior capacities for survival so that dinosaurian or mammoth systems no longer ranked amongst the fittest. But natural selection remains incapable of answering the key question concerning the emergence of irreducibly complex systems. It only explains why some decline and die out.

Behe's critique of neo-Darwinism is not targeted at the theory of common descent. It is highly probable that more complex systems descend from their less complex ancestors. Behe does not query this claim: the motorcycle is indeed a descendant of the bicycle. In fact, Darwin was not the originator of that theory, which antedates Darwin. What is specifically Darwinian about Darwin's theory is the thesis that the evolution can be explained solely by natural selection, which is an unintelligent cause – a thesis not proven by the doctrine of common descent.

The discovery that biochemical functions involve irreducibly complex systems is the result of the revolutionizing research in biochemistry that began 50 years ago. This research uncovered the secrets of the cell, affording us insights into the most fundamental structures of life at molecular level. This landmark was the result of a monumental research effort involving the expenditure of vast resources, an enormous number of working hours, an unsparing investment of concentration, perseverance, intelligence and ingenuity. The upshot of this corporate endeavour was the discovery that that life consists of irreducibly complex systems. The difference between the living and the non-living was not, as was once held, a distinction between kinds of matter – an assumption prompted by the perceptible differences between hide and hair, sand and rocks. No, the difference, rather, is that living matter is constituted by irreducibly complex systems, while inorganic material is not. The prefix *bio-* in the name of the science *biology*, refers to the circumstance that in this science, living matter is investigated at the level of its organization in irreducibly complex systems. Behe writes:

The result of these cumulative efforts to investigate the cell – to investigate life at the molecular level – is a loud, clear, piercing cry of "*design!*" The result is so unambiguous and so significant that it must be ranked as one of the greatest achievements in the history of science. The discovery

rivals those of Newton and Einstein, Lavoisier and Schrödinger, Pasteur and Darwin. The observation of the intelligent design of life is as momentous as the observation that the earth goes around the sun or that disease is caused by bacteria or that radiation is emitted in quanta.²

2. THE FURORE OVER BEHE'S THEORY.

I consider Behe's argument to the existence of irreducibly complex systems and its corollary that neo-Darwinian theory is unable to account for them, to be convincing and well grounded. So far, he has shown himself capable of delivering fully adequate responses to all the objections raised.³ As far as I am able to judge, no philosophically respectable counterarguments have been articulated that refute Behe's claims. Consequently, I would contend that the interesting issue raised by Behe's book is not whether his thesis is sound, (since I think it clear that it is) but why so many people from the scientific community determinedly resist the obvious. As Behe writes:

The magnitude of the victory, gained at such great cost through sustained effort over the course of decades, would be expected to send champagne corks flying in the labs around the world. This triumph of science should evoke cries of "Eureka!" from ten thousand throats, should occasion much hand-slapping and high fiving, and perhaps even be an excuse to take the day off. But no bottles have been uncorked, no hands slapped. Instead, a curious, embarrassed silence surrounds the stark complexity of the cell. When the subject comes up in public, feet start to shuffle, and breathing gets a bit laboured. In private people are a bit more relaxed, many explicitly admit the obvious but then stare at the ground, shake their heads, and let go at that. Why does the scientific community not greedily embrace its startling discovery?⁴

Irreducibly complex systems are just as difficult to overlook as the famous 'elephant in the room', Behe argues. Why does the scientist elect not to see the elephant? Why does he or she choose to deny the obvious, namely the conclusions that flow from the empirical data, preferring instead Darwinian explanations, which are farfetched and highly speculative and in no way prompted by the empirical data? Why are there so many hypercritical and often hostile reactions to

² Op.cit. p. 232.

³ *A Response to Critics of Darwin's Black Box* 2001, to be found on www.iscid.org.

⁴ *Darwin's Black Box* p. 232.

Behe's book?⁵ Why the consternation? Scientists do not normally get into this sort of state when discussing scientific results. The reaction reveals that the discussion is about more than scientific findings: that important issues in science theory and philosophy are at stake.

An important reason for the heat produced by the theory of irreducibly complex systems and its associated arguments for intelligent design and teleology is that many scientists see these concepts as undermining the very foundations of science and so constituting a fatally retrograde step. These concepts are seen as threatening to plunge us back into a pre-Darwinian age, or even to that predating the mathematical physics of the 17th and 18th centuries whose chief protagonists were Galileo and Newton. The advent of the new astronomy and physics meant the overthrow of the Aristotelian physics and teleological causality, hitherto held to be the principle undergirding the entire universe. For centuries, Aristotelian physics had blocked scientific advance, and the revolution in thinking heralded the spectacular progress that science was henceforth to enjoy. The theory of intelligent design held its own in biology for a little longer: it was broadly accepted and remained almost a commonplace until Darwin.⁶ Darwin's theory was seen as making the intelligent design theory redundant and signifying the wholesale repudiation of teleology in biology, which led to delirious rejoicing in the scientific community.

I admit to finding the reaction to intelligent design theory understandable. Therefore I think it is very important in discussions about intelligent design to make it very clear that this notion neither poses a threat to science nor compromises scientific research; on the contrary it represents an advance in our understanding of nature. The concept of intelligent design in biology is neither superfluous nor reactionary; rather, it is indispensable and forward-looking.

3. EPISTEMOLOGICAL ARGUMENTS IN SUPPORT OF BEHE'S THEORY: TWO KINDS OF CAUSALITY.

⁵ The book *Intelligent Design Creationism and Its Critics* ed. Robert T. Pennock MIT 2001 includes particularly virulent critiques. These do not confine themselves to objective arguments but impugn the personal motives of those who champion intelligent design theory. They are suspected of being solely interested in ideological and political power, and of seeking to gain influence and access to government funding. Feelings often run high and it is hard not to get the impression that the critics of intelligent design theory see it as a covert terrorist attack on science.

⁶ This is why pre-Darwin versions of the theory were somewhat wanting. In his highly influential book *Natural Theology* of 1802, the examples of teleological systems offered by William Paley are a confused mix of truly irreducibly complex systems like the watch, and pure projections of how he thinks things ought to be. To be robust and precise a theory needs to be challenged. Darwinism presents that challenge.

To offer support of a different kind to the case for the indispensability of intelligent design in biology, I shall devote this section to a few epistemological arguments that provide further underpinning for Behe's empirical demonstration by clarifying the relationship between explanations of natural phenomena based on unintelligent causes and those based on intelligent causes.⁷

The reason why an irreducibly complex system is not susceptible to explanation by reference to an unintelligent cause-effect-relation is that the relevant causality always goes in one direction only. In the case of unintelligent causes, the nature of the relation between cause and effect is mechanical release. This is standardly illustrated by the example of one billiard ball striking another and so causing the second to be set in motion. No intelligence is involved in this cause-effect-relation, which is unidirectional. The cause is the cause of an effect, which in turn is the cause of a fresh effect, etc. so that we get cause -> effect -> cause -> effect etc., with the effect incapable of being the cause of that which caused it. The reason why this kind of causality only has one direction has to do with temporal succession. However, the circumstance that this species of causality only has one direction does not preclude the effect having an effect on the cause whose effect it is, for this state of affairs obtains if the ends of the cause-effect-chain meet with the chain becoming a circle. But this does not amount to two-way directionality, which requires that the cause-effect-relation works in both directions *absolutely simultaneously*. Causal directionality is only two-way, then, if the effect is the cause of the cause that *simultaneously* causes it. In the case of unintelligent causes, the cause always *precedes* the effect.

However, in an irreducibly complex system we are confronted with a cause-effect-relation which runs in two directions. Each part in such a system is at once the cause of the other parts and the whole, and an effect of the other parts and the whole. The whole is both an effect of the parts and a cause of the parts. The causal connection between the parts and the whole is simultaneously an instance of two-way cause < - > effect. The parts are both cause and effect, and the whole is both cause and effect. A very simple example is given by a plant, which qua organic whole is the cause of the life of the leaves, while the leaves are at the same time the cause of the life of the plant. This mode of causality, which works with absolute simultaneity in both directions, cannot possibly be explained by an unintelligent cause since, constrained by temporal succession, such causality always has just one direction. The explanation of an irreducibly complex system requires appeal to what transcends temporal succession.

⁷ This analysis is inspired by Immanuel Kant's analysis in his work *Critique of Judgement* from 1790; see the paragraph

However, the fact that we cannot explain the system by appeal to unintelligent causes does not mean that all epistemic footholds are denied us. We are familiar with two-way causality from the intentionality involved in human agency. For instance, a house is the cause of the money received in rent; but, at the same time, the anticipation of rental was the cause of its being built. In this case something is both cause and effect for the causality in play is a species of intelligent, teleological causal nexus that is only present in the case of an integrated purposive whole, or a whole in which intelligent input inheres. The intention informing the construction of the house is that it should earn revenue. We may note, then, that ordinary human life presents us with irreducibly complex systems that resist explanation in terms of unintelligent causes: they take the form of human artefacts, products and machines, which are themselves purposive. In human intelligence as cause, we meet something that is intrinsically independent of unintelligent processes but which harnesses them in the fulfilment of its purposes. The relations between the parts in an internal-combustion engine, for instance the sparking plug, the gas and the piston, are unintelligent, mechanical, but the overall function of the engine is the result of intelligent design: thanks to the operation of the engine in the vehicle, I can use it as a form of transport.

When confronted with irreducibly complex systems in nature, we are prompted to compare them to human artefacts in which human intelligence has been invested. This comparison affords us some grasp of the system, but we do not acquire the same sort of knowledge as we do when we identify the concrete cause of something. We gain only analogical understanding. When Behe describes these systems he draws on analogies with human artefacts, mousetraps, outboard motors, cycles, motorcycles, motorcycle fabrics, the mailing system, a garage operated by an automatic gate opener using a licence-scanner, a spaceship, a city, etc. The impact of Behe's book is owed in large measure to his exceptional ability to illustrate systems by appeal to striking analogies. This kind of illuminative and visual vividness gives us a handle on the nature of these systems, for an *aesthetic* factor must inform the description as well as the apprehension of these systems, if we are to begin to understand them.⁸ An explanation based on unintelligent causes is something we can more readily grasp: we become apprised of the cause of the phenomenon. We are equally confident about our grasp of the notion of a man-made machine: we are cognizant of its teleological cause. But when it comes to some irreducibly complex

containing the critique of teleological judgement.

⁸ That Kant recognized this explains why he dealt with aesthetics and biology in the same book *Critique of Judgment*, a fact that has puzzled many.

system in nature we cannot fully comprehend it because we are not ourselves the cause of it. We have to content ourselves with analogical understanding and it is clear that analogies have their limits. One complication derives from the fact that the parts of an organism are produced by itself, which is not the case with the machine. This does not mean, however, that an analogical grasp is merely an illusion, a projection. It *does* afford genuine cognition: we are confident in our belief that intelligence is at work in nature. So the human artefact analogy is not “merely” an analogy; it is the optimal key to understanding.

When we encounter irreducibly complex systems in nature, then, we encounter phenomena which resist explanation by unintelligent causes. We cannot fully account for such systems: they transcend our explanatory powers. When we try to get to grips with a causality which proceeds in two directions at once, it strikes us as mind-bending – mind-boggling. It would seem that human thought is so structured as to think linearly, for we inevitably find ourselves attacking the problem by resolving the complex system into something that presents a linear succession. If the mind fails to recognize that in facing the complex whole it has come up against a limit, it will find itself driven to desperately speculative remedies. If you insist on resolving the dual-directional causality into a unidirectional version, blind dogmatism will invariably result.

But we are able to conceive of an intelligence which is capable of apprehending the complex wholes of nature, namely, the very intelligence that created them. We can call this intelligence divine, for humans are never going to be endowed with such intelligence.

4. A TRANSCENDENT CAUSE.

We are confident that the intelligence which is in a machine, has been introduced into it from the outside and are equally confident that the intelligent purpose which is at work in the irreducibly complex system, has been introduced into it from outside it. It cannot have emerged in virtue of some power inherent in the parts. But this is where our confidence ends. For empirical data does not afford us any insight into the transcendent cause, it only tells us that it is there and that it is intelligent. We can frame interpretations, but interpretations are never conclusive. That does not mean however, that interpretations are necessarily subjective or arbitrary: they are standardly the object of critical discussion and some will invariably emerge as superior to others. For instance, in my judgement, the interpretation advanced by Nobel laureate Francis H.C.Crick to the effect that

the intelligence in nature's artefacts derives from aliens is inferior to the interpretation that that intelligence is the work of divine transcendence. First of all, the very idea of the existence of aliens is a highly speculative conjecture. Secondly, and more importantly, these putative aliens are denizens of the universe. The further question prompts itself, then, as to the origins of alien intelligence. If appeal is then made to the existence of other inhabitants of the universe we are faced with an infinite regress. I would maintain that the most persuasive interpretation on offer is that to the effect that the intelligent cause is a transcendent cause, beyond the universe. The intelligence in the irreducibly complex system is accordingly a manifestation of transcendence vis-à-vis the universe.

I submit, then, that the intelligent design in the universe is a manifestation of a *hidden God*. The divine is hidden in the sense that we know it only through its effects. We know nothing about its essence and will. If we were to know more about the hidden God, it would have to make itself known in ways that go beyond manifesting itself in irreducibly complex systems. It would have to reveal itself. In his theology, Martin Luther makes a distinction between God hidden and God revealed. I find this distinction very useful. The hidden God is the creator, who may be apprehended by all in their interpretations of empirical experience. It is otherwise with God revealed: God only reveals his essence and will to believers. Christianity, for instance, claims that God has revealed himself in a human being, Jesus of Nazareth. In his deeds and teaching the essence and will of God is purportedly revealed, and is revealed as love and goodness. But recognition of this revelation as such is bound up with faith. There are no empirical data which undergird the claim that a particular human being is God. God revealed presupposes belief, but God hidden does not. God hidden is a pre-Christian God. We cannot say whether the hidden God is Allah or the Father of Jesus Christ or is otherwise identifiable. Only revelation and belief can advance claims on that score. God hidden is neither a Christian nor a non-Christian God.

I think the notion of God hidden is an apt one in this context. It enables us to meet all the objections against the notion of an intelligent cause predicated on the fact that we do not only find intelligence and teleological design in nature, but also dysteleology and meaningless waste, disease, deformity and destruction. These things are empirical considerations that have to be put alongside the fact there exist irreducibly complex systems. Such objections can be met by the reference to the hiddenness of the intentions and volitions of the transcendent being. We cannot know from empirical experience whether the hidden creator-god is good or evil, life-enhancing or destructive. It is to make a belief-claim to say that God is good and loving.

In brief, the point of distinguishing between the hidden and the revealed God is to demonstrate that the concept of transcendence neither presupposes nor contradicts a specific religious belief. The concept of a hidden transcendence emerges solely out of an interpretation of empirical data and presupposes no specific belief. Accordingly, the theory of intelligent design is not contingent on biblical fundamentalism or religious dogmatism. Many of Behe's opponents regard Behe's theory as the articulation of a new creationism. This is mistaken if by creationism is meant a position based on biblical fundamentalism, for Behe's theory is not based on the Bible but on empirical data. His book is not a contribution to the discussion between creationism and Darwinism; it is a contribution to a classical philosophical problem, which we are still trying to solve.

Some scientists, for instance James A. Barham, do not reject the notion of a teleological cause in the explanation of biological systems, but they maintain that the teleological cause is *immanent*; it *inheres* in the self-regulating system. This has not been proven, and I hold it to be impossible. If we look at the relationship between the individual parts of the system, then the relationship between them is unintelligent, mechanical. But if we look at the system as a whole we see intention and purpose. Viewed in isolation, enzyme-catalysed chemical reactions are unintelligent, mechanical, but if we look at these reactions as, say, integral to the blood-clotting cascade, they are intelligent. The intelligent design observable in the system is evinced by each part performing its function at the right time and in the right place. But the teleological cause cannot be localized as something internal to the organism, neither in the isolated part nor in the relation between the parts. Barham launches a concept he calls the *Orpheus principle*,⁹ according to which the system may fruitfully be compared to a symphony performed without a conductor: the parts act as though they were individual agents. In my view, this explanation only shifts the question about teleology from the whole to the parts. If the parts act teleologically, intelligently, you have to ask, where does the intelligence manifested by the parts come from? The intelligence informing the parts must also be transcendent. If you look at one isolated part and its effect on another, you observe no teleology in the relationship between the two, only an empirically observable unintelligent causality. It is only from the perspective of the consideration of the whole that you are able to observe teleology in the effect. If you claim to be able to observe teleology, it is because you are projecting the teleology you observe in the whole into the parts. For the causality operative between the parts is of the unintelligent, mechanical type, guided by the self-regulating system. The intelligent cause is not a material, extended cause at work in one part or another of the complex whole; rather, teleology is

⁹ www.isid.org. "Brainstorm topic: Natural selection and teleology" march 8. 2002.

immanent in the sense that it works *within* the system, but it is not identical with the system: the teleological cause is external to it. It is a mistake to think of teleology as localized in the system in the manner of an object situated in space. You must always ask those, who talk about self-organizing systems: where and what is the “self”? I think the answer is that it works in the system, but at the same time it transcends the system. And you must always ask those, who talk about a spontaneous emergence of order: what does spontaneous mean? I think it means without any recognizable cause. You can see the effect in nature, but the cause is unknown.

To me the most apt way of expressing this is to say that the transcendent intelligence is *manifested* in the system, or that the system participates in transcendent intelligence. I would claim, for instance, that intelligence and consciousness is not an entity in the brain, but nor is it identical with the brain qua system: it is manifested in the brain. Our consciousness and intelligence participates in divine intelligence and consciousness without being identical with it. The divine intelligence is able to create ‘out of nothing’; ours is merely able to grasp that everything is created by a higher intelligence, whereas it is itself only capable of creation to the extent of being able to manipulate what already exists.

5. THE RELATIONSHIP BETWEEN THE TWO MODES OF EXPLANATION.

The present analysis serves to make perspicuous the relationship between an explanation involving unintelligent causes and one predicated on the existence of an intelligent cause. An unintelligent cause and an intelligent cause are *categorically* distinct, which means that the relationship between the two explanatory modes cannot figure on one and the same continuum. If you start out by explaining a natural phenomenon in terms of an unintelligent cause, it makes no sense to appeal to an intelligent cause at some point where you discover we can make no further progress in explanation based on unintelligent causes. If we set about explaining the blood-clotting cascade by reference to unintelligent causes, the invocation of an intelligent cause is pointless. In this sense, then, the two modes of explanation are mutually exclusive. It is a case of either/or. But by the same token, neither of them circumscribes the other, so teleological explanation has no cramping effect on explanations couched in terms of unintelligent causes. Since we are unable to predict the bounds of unintelligent explanation, we should pursue as far as we are able our attempts to explain any natural phenomenon. We must not curtail our investigations. There have been cases

of phenomena that were considered insusceptible to explanation in terms of unintelligent causes which proved in fact to be amenable to them. Contrariwise, it would be indefensible to claim that teleological explanation is eliminable.

Qua discontinuous modes of explanation, however, the relationship is inclusive: the two modes are mutually complementary in biological science. We cannot dispense with the intelligent design explanation because deprived of it the definition and understanding of an irreducibly complex system would remain forever inaccessible to us. You might say that the intrinsic condition of the system is an intelligent cause, but that its extrinsic conditions are unintelligent causes.

In this sense, then, the two species of explanation are mutually compatible. They conflict only if you erroneously believe that the intelligent design explanation can be tacked onto its unintelligent counterpart and thus limiting the latter, or if you hold that the explanation which is based on unintelligent causes renders the intelligent design explanation redundant.

As a result of neo-Darwinism's ontological pretensions, the exclusion of the intelligent design explanation is today the norm. For the scientific community ought more properly to respond to Behe's book by conceding the truth of his thesis: irreducibly complex systems cannot be explained in neo-Darwinist terms. When we investigate nature in neo-Darwinian mode, we prescind from the fact that the objects of our enquiry are self-organizing, irreducibly complex systems. Which is to say that we embark on our research against the background of a methodological reduction.

Now the relevant concession on the part of the scientific community ought not to be problematic since it is common practice for science to choose to abstract from something of whose presence it is fully cognizant. When a physicist wants to examine light and the colour spectrum, he or she is interested in these subjects qua electromagnetism considered in abstraction from their visual aspect. When you examine the colour spectrum in physics, you prescind from the perspective on which colours figure as distinctive qualia. A painter has a different perspective on colour from the physicist. By the same token, if a doctor perceives a human being in terms of biochemistry in order to cure some condition, he or she neglects to attend to the fact that a human being is obviously more than biochemistry. One perspective excludes the other. A chosen perspective presents at once an opening up and a closure: you open one eye, as it were, but close the other. The manifold of sciences represents a manifold of angles on a given subject matter, and both nature and human beings may be viewed in a variety of perspectives. If neo-Darwinism claims to represent the sole veridical perspective, accounting all other perspectives illusions, it goes beyond methodological reduction and claims ontological supremacy in the absence of any legitimate basis for so doing.

What neo-Darwinism neglects is not something insignificant or obscure. It is something significant and obvious, fundamental to the constitution of biology: namely irreducibly complex systems.

The neo-Darwinist ought instead to concede outright that his or her research proceeds on the basis of a reduction, a concession that in no way constrains that scientific activity. Working in the field of unintelligent causation, he or she can go on analyzing systems, dissecting them to investigate their functions, exploiting these insights manipulatively in order to cure diseases and push back the frontiers of biotechnology. The concession has no bearing on the practice of science. Its implications are restricted to science theory, conceptions of reality and philosophy.

Similarly, the theory of intelligent design must concede that it is not itself an explanatory science, but "merely" a descriptive one. It describes empirical facts, which are inexplicable to the extent that no immanent cause is identifiable. Now we standardly characterize scientific claims as ones that are not just descriptive but also explanatory in nature. On this characterization, intelligent design theory fails to qualify as science. But since the term *science* is possessed of such a positive aura, to say that something is not scientific becomes tantamount to saying that it is arbitrary or subjective. But that is too quick. If I make an assertion to the effect that grass is green, it would, on this criterion, not count as a scientific assertion because it offers no explanatory content. But nor is it an arbitrary or subjective assertion, for it is plainly true. Consequently, the claim that intelligent design theory is not scientific rests on a clear misconception. Its claim on our assent is as firm as that of the fact that grass is green. Rather than neo-Darwinism rightfully assuming the status of plain fact, as Richard Dawkins would have it, that belongs to intelligent design theory. So I propose that we extend the application of the term *scientific* to include rigorous and exact descriptions of empirical data and, further, that we draw a distinction between explanatory and descriptive science. Much recognized scientific work is in fact not explanatory in nature but descriptive. Morphologies are a case in point. Anatomy and comparative anatomy likewise confine themselves to description. They are not concerned with the question of how the emergence of certain anatomical structures came about: their remit is the comparison, rather, of anatomical structures that may be seen as variants of the same design. Intelligent design is a descriptive science. The description of a system as irreducibly complex is a feat requiring scientific insight of the first order, but it does not address the question of how the system emerged. You might indeed hazard an interpretation concerning the cause, but an *interpretation* is not the same as an explanation.

Further, intelligent design theory has *heuristic* value. It conduces to the discovery of things that might otherwise have gone unnoticed. It is well known that Goethe discovered a bone in the human

jaw whose presence was required by his morphological theory. That bone is known today as *sutura incisiva Goethei*. Similarly, Michael Gene has demonstrated the heuristic merit of the theory in describing the biochemical structure of the flagella of the bacterium *Thermotoga maritima*. He came across a description of a biochemical structure whose metaphorical equivalent would be a functional mousetrap without a hammer. The design theory strongly suggested to Gene that this must be wrong, and his surmise was vindicated: the description needed correcting along the lines that Gene had proposed. The neo-Darwinian theory would not have prompted this hypothesis, which pointed towards a determinate line of enquiry.¹⁰

6. NATURALISM AND RELIGIOUS INTERPRETATION.

There is an urgent need today for science to concede that it presupposes the existence of irreducibly complex systems, explicable only by an appeal to an intelligent, transcendent cause. It should concede, that the organic world owes itself to an intelligent cause. This means that science cannot credibly espouse the world-view which has it that nature only comprises unintelligent processes. The claim that natural science entails philosophical naturalism does not withstand scrutiny. Indeed, is more likely that science presupposes a religious interpretation of the world than that it precludes it.

In our tradition, science has standardly been interpreted in naturalistic terms. Naturalism is a philosophical position that makes the methods and findings of natural science its foundation and justification, but it is the only approach to dispose of the intelligent design explanation on which it is grounded. Naturalism holds that all the phenomena we encounter are explicable in terms of immanent causes, and the success of scientific explanation rendered that view hegemonic. We are all of us, and not just those who champion naturalism, under its sway. Its influence is entrenched in the Western world regardless of what people ostensibly think or believe. Naturalism thoroughly permeates the spiritual atmosphere of our age: it is the air we breathe. This constitutes a further reason for the highly-charged reaction to the theory of irreducibly complex systems and their transcendent cause: that viewpoint is perceived as impugning naturalistic philosophy. We are not accustomed to the intertwining of empirical experience and religious hypotheses. It is a coupling that is viewed as provocative.

¹⁰ www.iscid.org "Brainstorm" Topic The Utility of IC, 28. Feb. 2002.

Many theologians and religious people have sought to answer the challenge from neo-Darwinism by saying, that the theory of natural selection as the cause of evolution is compatible with the belief that God created the world. Defenders of the compatibility of neo-Darwinism and the religious construction include scientists such as Michael Denton and Paul Davies. In the same vein, a typical statement from The National Academy of Sciences reads:

Many religious persons, including many scientists, hold that God created the universe and the various processes driving physical and biological evolution and that these processes then resulted in the creation of galaxies, our solar system, and life on Earth. This belief, which sometimes is termed "theistic evolution" is not in disagreement with scientific explanations of evolution. Indeed, it reflects the remarkable and inspiring character of the physical universe revealed by [science].¹¹

The perceived absence of conflict between the claim that God created the world and the neo-Darwinian explanation of its emergence derives from the fact that those who espouse both views maintain that the laws of nature are themselves self-constituting. But this means that these theorists have in fact surrendered to neo-Darwinism by rendering the religious interpretation otiose. In this synthesis of neo-Darwinism and religious belief, the latter is a mere speculative appendage to the neo-Darwinian explanation. The religious interpretation represents an otiose account: for once the neo-Darwinian explanation is deemed sufficient, the claim that God created the world becomes a redundant thesis grafted onto it. In consequence, religious belief becomes completely private and subjective – and of no intrinsic interest. This synthesis is unconvincing. In disguising the fact that the creation of the world cannot be accounted for both in terms of both immanent and transcendent causes, it conceals an incoherence. If neo-Darwinism is correct, it radically undercuts the meaningfulness of all talk about transcendence and God. On that head, Dawkins is absolutely right.

In this naturalistic age, it is reckoned a provocation and a scandal to claim that a religious hypothesis flows from empirical science. The religious hypothesis in focus here is every bit as empirically based as is neo-Darwinism, but it is considered outrageous to suggest that the religious hypothesis is not a superfluous adjunct but one of the very presuppositions of science. The relationship between science and the religious construction is not the relationship between two

¹¹ National Academy of Sciences 1999 p.7.

totally disparate worlds, a natural world and a world of supernatural belief: the religious interpretation and the scientific explanation share one and same world as their foundation.

I am convinced that the recognition of the empirically demonstrable existence of irreducibly complex systems and the religious interpretation they arguably compel would have momentous consequences. It would deliver something in the order of a revolution in our perception of nature and the world. For if *this* interpretation were to become the air we breathe, it would mean a transformation of the religious environment – a tectonic shift, in sharp contrast with the negligible impact of all two-world theology, New Age religion and biblical and Islamic fundamentalism. These religious interpretations of reality count as insubstantial illusions at the bar of empirical science. Reality is the test of all things, and all these nebulous religious interpretations are utterly without bite when it comes to explaining empirical experience.

7. OVERLOOKING THE ELEPHANT.

I believe our conception of nature is in thrall to naturalism. Naturalism is an ideology and, notoriously, ideologies induce blindness: history has witnessed ideologies that have blinded people to what is most obvious. In the 1970s, the ideology that men and women are alike was promoted in the name of equality. The ideology led people to overlook the obvious fact that men and women are profoundly different. I believe that there is a veritable paradox here: precisely because something is staring us in the face we overlook it. It is not because it is hard to make out that we overlook it, but because it is blindingly obvious. So too with the ideology of naturalism. This accounts for our failure to see the elephant in the room – the obvious: that nature consists of irreducibly complex systems. When we look at the world nothing could be more unmistakable than that it comprises systems, wholes and structures and that they are intelligently informed. Plants and animals and human beings all exhibit systems and morphologies, which interact intelligently. But in neo-Darwinian science an eliminative reduction denies this and we overlook the obvious.

I agree with Behe, that drawing the attention to the obvious, to the unacknowledged elephant, ranks with the Copernican declaration that it is the Earth which that orbits the sun and not vice versa. The consequence is an epoch-making shift. We see the world anew, with momentous implications for ethics, our treatment nature and of one another, because how we treat something is contingent upon what we see it as.

8. AN EVOLUTION SCENARIO.

The evolution from one irreducibly complex system to another is not continuous. It takes place via a reorganization of the system whereby it integrates new components into itself. Lynn Margulis's theory of the mitochondria's original freestanding status prior to being "swallowed" by a bacterial cell may be used as an illustrative example. What happens is not that the bacterial cell ingests the mitochondria, but that the two cells – one now inhabiting the other – adapt to the situation. They integrate in a symbiotic interaction to their mutual benefit. The successful cell that is integral to the constitution of all organisms is engendered. Margulis uses this example to argue that interaction and symbiosis is a pointer to the evolution of more complex systems. But that is not quite right. Rather, the symbiotic interaction has as its precondition the two systems' already being irreducibly self-regulating complex systems. It is the integrative capacity of the system that grounds the evolution of more complex ones. To take another example, an insect sitting on a leaf and being consumed by another triggers the evolution from plant-eating organisms to insect-eating organisms. It is a contingency that one organic system comes into contact with components that it is able to integrate into itself, with its transformation into a new and more complex system in consequence. It looks as if a creative intelligence is unceasingly at work in the system, one able not only to preserve it but also to cause it to evolve and be transformed into something more complex. The intelligent cause is capable of forging new ideas for systems. The huge variety of morphologies and structures that characterizes life in the universe are ideas that the intelligent cause has conceived. The manifold is not the result of some antecedently-given evolutionary blueprint; rather, it is driven by chance. Neo-Darwinism is right about emphasizing chance as a factor in the evolution, but it is not the most important one. The most important factor is the ability of the intelligent cause to create radically novel systems. The best analogy to the transcendent cause is therefore not the engineer working to an antecedently specifiable goal, but the *artist* who is possessed of a great faculty of combination, a vivid imagination and who takes delight in the variety of form. The transcendent imagination far exceeds the human. No human imagination could ever have conjured up the ladybird or the giraffe.

This scenario does not contradict the theory of common descent, but it is opposed to any simplistic notion of shared ancestry. For instance, the chimpanzee is not the ancestor of man in the sense that man is the endpoint of a continuous development that traces back to the chimpanzee. The

chimpanzee and man emerged from a common ancestor; both are variants of an original form, a prototype. Indeed, the notion of "a common ancestor" stands in need of clarification. But that is a topic for another time.