Intelligent Design: The Biochemical Challenge to Darwinian Evolution?

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"For since the creation of the world God's invisible qualities – his eternal power and divine nature – have been clearly seen, being understood from what has been made, so that men are without excuse." Romans 1:20 (NIV)

ABSTRACT

The idea that nature shows evidence of intelligent design has been argued by theologians and scientists for centuries. The most famous of the design arguments is Paley's watchmaker illustration from his writings of the early 19th century. Interest in the concept of design in nature has recently had a resurgence and is often termed the Intelligent Design movement. Significant is the work of Michael Behe on biochemical systems. In his book, *Darwin's Black Box*, Behe develops the idea that many biochemical systems are irreducibly complex in the sense that each component of these systems is essential for their functioning and cannot be removed or altered without compromising the system of which they are a part. Thus traditional Darwinian evolutionary theory has difficulty in explaining their development. When applied to the question of life's origin on this planet, design arguments raise serious questions about traditional views of chemical evolution. To be considered a scientific alternative to Darwinian evolution, intelligent design needs to be empirically detectable. The development of a three-stage explanatory filter by William Dembski is arguably a fully scientific method that can, on the basis of observational data, reliably distinguish intelligent design in biological systems from undirected natural causes. However, at this stage, detection of intelligent design does not necessitate speculation on the nature of the designer, but does infer an intelligence behind the design.

INTRODUCTION

The question of the origin of life on this planet is a fascinating one. Did life begin on the surface of a cooling planet amidst the havoc of a restless environment racked by violent lightning flashes and volcanic activity? Did life flourish on earth after being transported here as bacteria-like organisms deep within the crevices of a meteor? Or is life the product of an intelligence, hidden somewhere within the universe, orchestrating life by design and careful planning? Is there evidence of that design in nature and can such evidence be used to infer the existence of a Creator, as Romans 1:20 might indicate?

Design in Nature

The idea that nature shows evidence of intelligent design is not at all new. Theologians and scientists have argued for centuries that certain natural features of our world are difficult to explain purely in naturalistic terms. The most famous of the design arguments is Paley's watchmaker illustration from his writings of the early 19th century. If you were to find a watch while crossing a field, what would you suppose about the origins of that watch? Would you think that the parts had all come together by chance, or would you suspect that the watch was the product of a watchmaker and that someone had dropped the watch as they passed by that way? Paley argues that because of its obviously intricate design and function there must have been a designer, "… who formed it for a purpose which we find it actually to answer, who comprehended its construction and designed its use".[1]

A classic example of the watchmaker-type argument is the bombardier beetle. When threatened, the bombardier beetle has an amazing way of defending itself. It squirts a boiling hot solution of chemicals at the enemy from an aperture in its hind section. Hardly a polite gesture, but then its aim is to escape, not to win friends! The heated liquid scalds its target, which then beats a hasty retreat. What is the secret to the bombardier beetle's trick? It turns out that the bombardier beetle is using chemistry. Prior to battle, specialised secretory lobes make a very concentrated mixture of two chemicals, hydrogen peroxide and hydroquinone. The mixture is sent into a storage chamber that is connected to an explosion chamber. Attached to the explosion chamber are glands that secrete catalysts into the explosion chamber. When a predator threatens, the beetle squeezes muscles surrounding the storage chamber which forces the solution of hydrogen peroxide and hydroquinone into the explosion chamber where it mixes with the catalysts. The hydrogen peroxide rapidly decomposes into ordinary water and oxygen. Subsequently, oxygen reacts with the hydroquinone to yield more water, plus a highly irritating chemical called quinone. These reactions release a large quantity of heat. The temperature of the solution rises to boiling point and vaporises into steam. The beetle then points its tail at the enemy and directs the steaming, toxic solution into the face of the would-be predator. [2]

Design theorists would argue that the defence system of this beetle is far too complicated to have evolved in a step by step, naturalistic fashion and requires a designer. For many Christians, seeing design in nature is equivalent to seeing God, and for them the picture of God as Designer or Architect makes good sense. However, while watchmaker-style

arguments are intuitively appealing and have convinced Christians for centuries that God exists, they have not been well received by the modern scientific community. This was due in no small part to the success of Darwinian Evolution in suggesting how complex structures may have evolved through natural processes.

Richard Dawkins, Oxford Zoologist and well-known defender of Darwinian Evolution, has challenged the apparent need for a designer in the bombardier beetle. In his book, *The Blind Watchmaker*, Dawkins first quotes a passage from a book called *The Neck of the Giraffe* by Francis Hitching . "The chain of events that could have led to the evolution of such a complex, coordinated and subtle process [in the bombardier beetle] is beyond biological explanation on a simple step-by-step basis. The slightest alteration in the chemical balance would result immediately in a race of exploded beetles".[3] Dawkins then responds. "A biochemist colleague has kindly provided me with a bottle of hydrogen peroxide, and enough hydroquinone for 50 bombardier beetles. I am about to mix the two together. According to the above [Hitching], they will explode in my face. Here goes … Well, I'm still here. I poured the hydrogen peroxide in the hydroquinone, and absolutely nothing happened. It didn't even get warm… The statement that 'these two chemicals, when mixed together, literally explode' is quite false, although it is regularly repeated throughout the creationist literature".[4] As mentioned previously, however, these chemicals require the presence of a catalyst to undergo significant reaction.

While Dawkins uses such apparent problems in the design literature to his advantage and doesn't offer any explanation for how the bombardier Beetle's defence may have evolved by natural selection, he does offer plausible scenarios for the evolution of other classic design examples such as the mammalian eye.[5] Typically, creationists have argued that structures such as the bombardier beetle's defensive system and the mammalian eye could not have evolved by gradual evolutionary steps because all the parts are required for it to function effectively. Dawkins demonstrates that there are eyes of varying complexity and resolving power in the animal kingdom and that it is quite conceivable that the mammalian eye evolved from a simpler eye by small steps that progressively improved upon the primitive eye.

Darwin's Black Box

While Dawkins seemingly gets the better of this exchange, the design argument has recently had a resurgence and this time it is being led by well-informed professionals and academics. Michael Behe, professor of biochemistry at Lehigh University in Pennsylvania, USA, published a watershed book in 1996 entitled,

Darwin's Black Box: the biochemical challenge to evolution, (The Free Press, New York). A black box is a term used to refer to a device that does something, but whose inner workings are mysterious. A computer is a black box to many that rely on its function everyday. They can use it, but what happens inside that box is a complete mystery. In Darwin's day, biologists knew very little about the complex biochemical systems within living organisms and such organisms were indeed remarkable black boxes to the observer. Knowledge about the intricate operations of organisms did not emerge until the development of the disciplines of biochemistry and molecular biology many years later. However, we now live in the age of molecular biology. Consequently, Darwin's black box has been partly opened to reveal the most astonishing complexity of chemical and biochemical activity. Highly elaborate biochemical systems have been discovered that display a level of sophistication that defies an explanation for their existence by evolutionary mechanisms.

Behe begins his book by pointing out that Darwinian evolution is not the impenetrable theoretical fortress that its proponents would have us think. Now it should be made clear that very few, creationists included, would deny that Darwin's evolutionary mechanism of natural selection successfully explains how small changes have occurred in species over time. This is often called microevolution. What Behe and others such as Michael Denton in *Evolution: A theory in crisis* and Phillip Johnson in *Darwin on Trial,* have exposed in recent years is the inability of Darwinian evolution to explain the big questions, such as how life arose on this earth in the first place. Further, how did the great diversity of life evolve from the theorised primordial soup in a step by step fashion? A growing number in the scientific community are now beginning to ask whether Darwinian Evolution has the answers to these questions.

However it would be completely wrong to suggest that most evolutionists are admitting to these flaws in their theory. For instance, in *The Meaning of Evolution,* George Simpson, one of the founders of modern Darwinian evolution, asserts, "Although many details remain to be worked out, it is already evident that all the objective phenomena of the history of life can be explained by purely naturalistic … factors. They are readily explicable on the basis of … [natural selection and random mutation]. Therefore, man is the result of a purposeless and natural process that did not have him in mind".[6] Richard Dawkins, in another of his popular books *The Selfish Gene* writes "Today the theory of evolution is about as much open to doubt as the theory that the earth goes around the sun…".[7]

However, and much to the an-

noyance of evolutionists such as Dawkins, they haven't managed to convince western society of the 'fact of evolution'. According to a Gallup poll close to 50% of Americans are creationists of the conservative variety, another 40% believe in some sort of God-directed evolution over millions of years and only 9% are Darwinian evolutionists.[8] However, those 9% do control the academic world.

As noted, up until now design theories have not faired well in academic circles. This may be partly because creationists have not developed an alternate theory that could be empirically tested and examined by the scientific community. As philosophers of science have pointed out, for scientific paradigms to shift there has to be a new paradigm available to take its place. You cannot shift into a vacuum. Currently, however, new paradigms are being developed. Design arguments are now being supported by conventional scientific arguments. In *Darwin's Black Box*, Michael Behe asks the question - Can complex natural systems such as the Bombardier beetle be accounted for by small changes over millions of years – that is by natural selection? His answer to this question? We can't really tell because we don't know enough about the components of the system to determine whether the beetle's defence could have occurred by chance.[9] But, Behe contends, there are biochemical systems where modern biochemistry has elucidated most of the components and these systems can be examined for evidence that supports either a design or evolutionary model.

Behe begins his examination of biochemical systems with an unusual illustration – a household mouse trap. The function of the mouse trap is to kill mice so that they cannot go about their messy destructive business in our homes. A mouse trap consists of five parts - a wooden base, a spring, a hammer (to break the mouse's back), a sensitive catch (releases when slight pressure is applied) and a metal bar (connects to the catch and holds the hammer back when the trap is charged).[10] This simple mechanical system is an example of what Behe calls an irreducibly complex system. It is irreducibly complex because all the components are essential if it is to function as designed. If the hammer were removed the mouse could help itself to the cheese, dance on the trap all night long and not be pinned to the wooden platform. If there were no spring, the hammer and catch would sit loosely and again the little rodent would be completely safe. In fact, if any single part were not present the trap would be completely ineffective in catching mice.

Evidence of design in biochemical and molecular systems

As previously indicated, we live in the age of molecular biology, where scientific inquiry focuses on the universe within – ie, the make-up

of the cell. Extraordinary advances have been made in the understanding of cell structure and function at the molecular level. The cells of an organism depend on their biochemistry for function. Chemical events upon which cells rely for their daily existence and function are organised in stepwise fashion. A specialised class of protein molecules called enzymes (enzymes may be considered as the molecular tools of the cell) mediate the conversion of one target molecule (chemical substrate) into another, which is in turn worked on by the next enzyme in the sequence. One can think of these sequences much like the assembly line of a factory, each worker along the line uniquely modifies the product being assembled. Thus each enzyme, or assembly line worker, depends on the previous one for its activity. Removing, or disabling one enzyme in a biochemical pathway effectively shuts down that pathway as there will be no more substrate molecules produced for the next enzyme in the sequence. Because of the interdependence of each enzyme on earlier enzymes in the pathway, one can consider such pathways to be irreducibly complex, much like Behe's mouse-trap. Such displayed interdependency makes it difficult to envisage how such pathways may have evolved, especially if the final product of a pathway is, for example, energy required by the cell for function. Often the energy generated is then required at certain crucial steps in the pathway itself. In other words, the entire pathway has to operate for the cell to go about its business and the idea that it can evolve in piece-meal fashion must necessarily compromise the function of the cell. As stated by Behe, this situation "...would be a powerful challenge to Darwinian evolution. Since natural selection can only choose systems that are already working, then if a biological system cannot be produced gradually it would have to arise as an integrated unit, in one fell swoop, for natural selection to have anything to act on".[11]

$$A \xrightarrow{e_1} B \xrightarrow{e_2} C \xrightarrow{e_3} D \xrightarrow{e_4} E$$

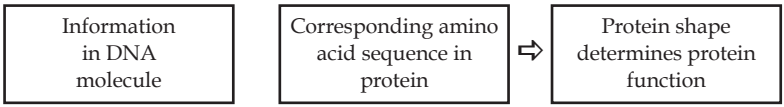
Schematic diagram of a typical biochemical pathway

Chemical substrate A is converted to B by enzyme e_1. Substrate B is then converted to C by enzyme e_2 and so on until product E is formed by enzyme e_4.

Another cellular mechanism that displays irreducible complexity is that for transmitting genetic information, either from one cell to another or in the formation of a completely new organism. Deoxyribose nucleic acid or DNA, the genetic material, is a complex molecule consisting of sugars, phosphate and nitrogen containing bases. Its structure allows for the transmission of genetic information which is encoded in the base sequence of the molecule. All the information that will ever be needed

by an organism is encoded within the cells as molecules of DNA. DNA is like the hard disc of the computer containing all the programs needed at various times during the life of the cell. This complex information system can be accessed by specialised cellular enzymes. One such enzyme, called RNA polymerase, actually reads the chemical code of DNA, stored as a series of chemical bases, and sets in motion an exceedingly complex chain of events culminating in the formation of other protein molecules. The order of bases read by RNA polymerase in DNA determines the order of amino acids in the protein molecule. The order in which these amino acids appear in the protein molecule is crucial. Its three dimensional shape (and hence function) depends upon the sequence of its amino acids. In terms of the flow of genetic information, one can consider this relationship between the DNA chemical bases, the order of amino acids in protein, and the shape and function of the protein itself, all to be irreducibly complex. Information in DNA determines the structure and shape of the enzyme molecule, which in turn determines which chemical substrate it may interact with in a biochemical pathway. Interference with the transmission of this information at any point will dramatically alter the final enzyme product. Minute changes in the sequence of bases in DNA can mean that the enzyme subsequently produced cannot take its place in the biochemical assembly line for which it is intended, or dare we say designed. The resulting failure of a biochemical pathway can be fatal to the cell.

DNA can also be completely replicated so that genetic information can be passed on to daughter cells. This is an essential feature of cell replication and indeed, on a grander scale, development of an organism's offspring. Thus the name of the game for the perpetuation of life on this planet is information storage and transmission. But here is the catch; and a perfect example of irreducible complexity. DNA *stores* the information needed to *synthesise* the enzymes needed to *replicate* itself and it can't replicate itself without these enzymes. This is circular dependency at its best! Genetic information contained in DNA codes for the DNA replicating enzyme, DNA polymerase. DNA polymerase reads the chemical code of DNA and faithfully creates another exact duplicate molecule. So without the information in DNA coding for DNA polymerase, there can be no replicating enzyme and without the replicating enzyme and a pre-existing DNA molecule, there can be no new DNA to be passed on to new cells. In other words, to be able to synthesise a new DNA molecule prior to cell division, there must be a pre-existing DNA molecule which not only directs the synthesis



Relationship between DNA information and protein function

The information in DNA determines the amino acid sequence of a protein which in turn determines protein function.

of DNA polymerase, but acts as a template or pattern for the new daughter DNA molecule. Because of the interdependency of DNA and its replicating enzyme, the process of accessing information in DNA and transmitting genetic information to daughter cells displays a high degree of irreducible complexity. The interdependent nature of this relationship is shown in the diagram below.

There are seemingly endless examples of design in molecular systems, anything from enzyme catalysed metabolic pathways to large molecular structures. Michael Behe discusses a number of these complex systems at length, including blood clotting systems, bacterial flagella and a variety of other biochemical systems.[12]

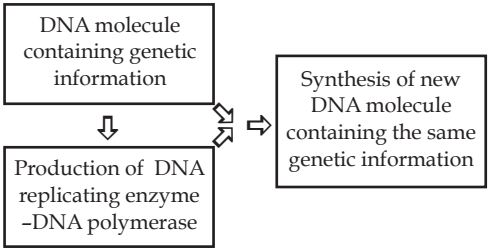


Diagram illustrating the relationship between DNA and its replicating enzyme. *Information in DNA is used to synthesise DNA polymerase. In turn, DNA polymerase uses the original DNA molecule as a template to make another new DNA molecule.*

Origin of the Primordial cell

Biochemical systems make for fascinating study. But how did they come to exist anyway? How did life arise on this planet in the first place? Pick up any biology or biochemistry textbook and you can read how life supposedly started on this planet. The work of Stanley Miller and Harold Urey at the University of Chicago during the early 1950's set the groundwork for the concept of chemical evolution.[13, 14] Their apparatus replicated what was thought to have been the atmosphere of primitive earth and this mixture of gases was subjected to high voltage discharges simulating lightning. Organic molecules produced were trapped and removed from the

reaction system and subsequently analysed. The variety of basic organic compounds (much like simple pieces of Lego) which they detected, were considered to be the building blocks of biological macromolecules which would in turn become the building blocks of the first primordial cell. However, it is a far cry from Lego building blocks to a functional Lego model. Such experiments eventually gave rise to the concept of a primordial "soup" from which life could arise and give something for natural selection to work on. (The term "soup", commonly used in textbooks that deal with biochemical origins, is misleading. Such a term suggests a nutrient rich liquid, in contrast to the dilute oceans theorised for the developing primordial world. However, a complete critique of the Miller and Urey experiment is beyond the scope of this paper.) In any case, the validity and meaning of such experiments is now under scrutiny.[15, 16, 17] It is now apparent that there are enormous problems with the concept of forming biological building blocks from inorganic chemicals by naturalistic processes. In fact, Professor Klaus Dose comments:

More than 30 years of experimentation on the origin of life in the fields of chemical and molecular evolution have led to a better perception of the immensity of the problem of the origin of life on earth rather than to its solution. At present all discussions on principal theories and experiments in the field either end in stalemate or in a confession of ignorance. New lines of thinking and experimentation must be tried.[18]

Leaving aside the technical problems of such chemistry, let us ask ourselves what a primordial organism would need to survive, replicate and to get the theorised evolutionary ball rolling. Firstly, it would require a method for capturing energy (as in the case of photosynthetic organisms that make their own food) or a mechanism for utilising energy derived from pre-formed organic molecules. Both methods involve very complex biochemistry even in the simplest of organisms. Secondly, cells must possess a membrane to keep the outside environment from disturbing the staggering array of chemical reactions required. Thirdly, there must be a system by which genetic information can be stored and accessed. Organisms store such information as a chemical language in the sequence of bases that make up the DNA. The genetic information is used to direct the synthesis of other important molecules needed by the cell for normal functions. Fourthly, this information must be converted into the molecular tools the cell requires to function. Finally, there is the all important requirement for cellular division and self-replication. The stored genetic information must be replicated and passed onto daughter cells in order to produce descendant life forms.

All these processes are of extraordinary complexity despite the apparent "simplicity" of the first theorised primordial organisms. For such organisms to exist, all the biochemical systems must not only function correctly in their own right, but must also coordinate with the other systems. Because of the interdependency of these systems, such a cell can also be considered to be irreducibly complex. Thus, the primordial cell, like any other, would depend on its energy-generating biochemistry in order to operate crucial metabolic processes and synthesise essential molecules. Information for molecular synthesis is stored in DNA. Energy generated by the cell is required for DNA synthesis and cellular replication. DNA synthesis depends upon enzymes whose blueprint is contained in DNA. None of these systems could function if it were not for the cell membrane separating the cell's biochemical reactions from the external environment. Indeed, synthesis of the membrane itself is directed by enzymes encoded by information in DNA.

Surprisingly, there are no suggested mechanisms available to satisfactorily explain the molecular evolution of individual biochemical systems such as those mentioned above, let alone explain how such interdependent systems would develop in a coordinated fashion with a common goal in mind; the development of a functional cell. Behe devotes a chapter in his book to an analysis of the published scientific literature concerned with mechanisms of molecular and biochemical evolution. He examines scientific papers published in the *Journal of Molecular Evolution* (JME) since 1971, the first year it was established. He concludes that while there are many papers that examine comparisons of the order in which

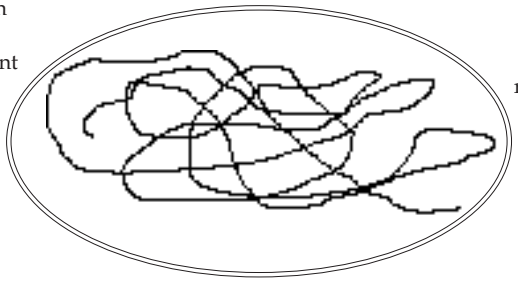


Diagram showing the basic requirements of a cell to sustain life.

Cells must be separate from their environment to allow biochemical reactions to generate energy, synthesise proteins, allow for DNA replication and cell division.

amino acids appear in the same proteins, or the order of bases in DNA molecules from different species, there is nothing in the literature that describes mechanisms of molecular evolution that relate to the formation of complex biomolecular structures within the cell. "In fact, *none* of the papers published in *JME* over the entire course of its life as a journal has ever proposed a detailed model by which a complex biochemical system might have been produced in a gradual, step-by-step Darwinian fashion." [19]

Detecting Intelligent Design

Behe's biochemical challenge to Darwinian evolution has made a significant impact on the scientific community. His book was reviewed in prestigious scientific journals such as *Nature*. Here was a credible, well-informed biochemist with an argument that could not be easily dismissed. Darwin had admitted himself that "If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous successive, slight modifications, my theory would absolutely break down".[20]

Recently, Behe's renewal of the intelligent design argument has been strengthened by the contribution of another design theorist, William Dembski. One of the major criticisms of Behe's book was that even though living things may look like they are designed there is no scientific way of determining whether they are. Even evolutionists who have serious objections to the design argument accept that nature appears to be designed. Richard Dawkins states in his book *The Blind Watchmaker* that: "Biology is the study of complicated things that give the appearance of having been designed for a purpose"[21] and "Natural selection is the blind watchmaker, blind because it does not see ahead, does not plan consequences, has no purpose in view. Yet the living results of natural selection overwhelmingly impress us with the appearance of design as if by a master watchmaker, [they] impress us with the illusion of design and planning".[22] Dembski, on the other hand, proposed what he believes to be a scientific method for detecting intelligent design. This he claims is not new to science. For example the work of forensic scientists is to distinguish chance events from criminal activity. Cryptographers distinguish between random signals and those that carry encoded messages, and scientists in their search for extraterrestrial life have their radio telescopes constantly on the lookout in an attempt to detect intelligent messages from outer space. Dembski claims that intelligent design is actually *empirically detectable*. In other words there are well-defined methods that, on the basis of observational data, are capable of reliably distinguishing intelligent causes from undirected natural causes.

Dembski's method of detecting intelligent design takes the form of a *three stage explanatory filter*.[23] If an event or observation passes through all three layers of the filter then we are justified in asserting the event involved intelligent design. In a nutshell the explanatory filter asks three questions in the following order: Does a natural law explain it? Does chance explain it? Does design explain it?

To see how this filter works in practice, consider the case of a man who was brought before the courts in the US for fraudulent liability claims against restaurants.[24] He claimed that he had been dining in a restaurant when he slipped on mint jelly that had been spilt on the floor. In the fall he had dropped the glass he was carrying and cut his hand and forearms. He sued the restaurant for being negligent in not having cleaned up the mint jelly, won the case and was awarded some tens of thousands of dollars for the injury and trauma caused by the accident. Probably no one would have thought any more about it if it were not for the fact that the same man slipped on mint jelly in another half a dozen or so restaurants over the next year. On each occasion he was carrying a glass and cut his hands and arms, then sued the restaurant and was awarded a generous payout. Now you start to get a little suspicious, especially if you're an insurance company. A guy slips on mint jelly and injures himself. Bad luck, we pay him his claim. The guy slips on the same flavoured jelly twice. Unlikely but possible, and we pay him out but it starts to look suspicious. But the same guy, same flavoured jelly, half a dozen times? I don't think so! This guy is a fraud and has found a way to make some quick dollars by defrauding insurance companies. The thing that gets me about this true case is: Why didn't he at least change the jelly flavour? And why the mint?

Anyway, back to Dembski's three stage explanatory filter. When we have an event such as I have just explained we have a decision to make. Are we going to attribute it to natural law, chance or design? We start by taking the event and we first ask if this is a HP (high probability) event. The chance of slipping six times on mint jelly while dining in restaurants is not a high probability event. It fails to be explained by natural law. We now proceed to the next level of the explanatory filter. Is the event an IP (intermediate probability) event? In other words, is this the sort of event that doesn't often occur but which might occur by chance? Like winning the lotto. The chances are not great but it does happen and we are not that surprised to hear that someone has just scooped the big one. We just wish it was us. Could we explain the mint jelly man in this way? The court thought not. Maybe two times he might have got away with it, but not six. So we proceed to the next level of the explanatory filter. The

next level of the filter involves SP (small probability) events. Small probability events do not in themselves require intelligent design. Extremely unlikely events occur all the time. Suppose a coin is flipped 1000 times and the result recorded each time. There are 2^{1000} or approximately 10^{300} equally probable outcomes. The outcome obtained has an extremely low probability of occurring but it did happen. What would be really clever is for the outcome to be predicted before the event actually happened. This is what Dembski calls specification or fabrication. So, at the third level of the filter we ask if there is any reason why the mint jelly man might have fabricated this SP event. If yes, Design.

Or, alternatively, had he by some very remote chance been very unfortunate and had no motive for slipping on mint jelly so frequently. If yes, Chance. Obviously one must conclude that he designed the event. He discovered a way to make seemingly easy money and the court ruled that he had fabricated or designed the whole event.

The strength of Dembski's contribution to the design argument is that it provides a analytical method for detecting design. The success of this approach will depend upon whether biologists are able to apply this method to living systems and demonstrate empirically the existence of intelligent design. Modern science has generally defined itself in completely naturalistic terms with no call on outside help to explain anything. If successful, the empirical detectability of intelligent causes may render intelligent design a fully scientific theory. This is certainly the hope of the Intelligent Design movement.

Criticisms of the Design Argument

Despite the attraction of the design argument, it is impossible to ignore potential problems. Indeed it would be hazardous to do so. Although Behe has been championed by many for reviving the design argument, some are concerned that he has set it up for future destruction. The concern is that Behe has a two-tiered view of design, where those things that can be explained by natural processes such as natural selection, have evolved and things that cannot be explained are evidence for intelligent design and by inference, a creator. For example, Behe suggests that the argument for design of haemoglobin is weak because given myoglobin as a starting point the change to haemoglobin is a small one and in his opinion likely to have occurred by evolutionary processes.[25] However, the blood clotting mechanism shows evidence of design because all of the components are needed for the mechanism to work and have no function on their own and therefore the system is irreducibly complex.[26] This obviously creates some confusion and the obvious question,

"Is only the clotting of blood fearfully and wonderfully made, but not haemoglobin itself?" Thus Behe's irreducible complexity is often accused of being simply a God of the gaps theory. In other words God is used to explain things that science doesn't yet have an explanation for. In the review of *Darwin's Black Box*, published in *Nature*, Coyne says "If the history of science shows us anything, it is that we get nowhere by labelling our ignorance 'God'".[27] Even Christians get nervous about God of the gaps theories because they have been caught out in the past. Science progresses so rapidly that what appears as gaps today are filled in by scientific knowledge tomorrow and God is pushed further and further back. Science requires experimental data and theories to be falsifiable. It is not good enough in science to simply say 'science doesn't have the answers so God must have done it'.

While Behe's idea of irreducible complexity has appeal at the molecular level of life, problems arise when we consider life at the level of entire functional organisms. Many of the amazing and beautifully complex biochemical systems at which we marvel also make a functioning predator or parasite. As we look at nature and realise that the whole system is built on a system of death and decay we are tempted to ask 'What sort of God would create that?' According to Romans 1:20, God's character is revealed in nature, but what does a predator like a lion teach us about God? Darwin asked the same questions and concluded that there was just "too much misery in the world" to accept design: "I cannot persuade myself that a beneficent and omnipotent God would have designedly created the *Ichneu-monidae* [wasps that capture caterpillars and paralyse them for their larvae to parasitise and eventually kill] with the express intention of their feeding within the living bodies of caterpillars, or that a cat should play with mice".[28]

Dembski's response to this criticism of Intelligent Design is that design does not have to be perfect. We recognise computer software or operating systems such as Windows as being designed but most people find them to be less than perfect. From a scientific perspective Dembski argues that just because nature doesn't appear to us to be perfect doesn't mean that design cannot be detected. At any rate, theology tells us that evil has entered this world and what we see now is not what God initially intended, so we should expect to see a creation that shows evidence of a good designer but also evidence of it having been perverted by evil.

CONCLUSION

The design argument is not new. What is original in the work of Behe and Dembski is the analytical approach they take to design. The reader probably should be aware

that Dembski describes Intelligent Design as theologically minimalist, ie, by this he means that Intelligent Design in no way hinges on the Genesis account of creation, nor any particular age interpretation of Genesis. To quote Dembski "... Intelligent Design presupposes neither a creator nor miracles… It detects intelligence without speculating about the nature of the intelligence … It is the empirical detectability of intelligent design or order that renders Intelligent Design a fully scientific theory, and distinguishes it from the design arguments of philosophers, or what has traditionally been called natural theology".[29] While some will be uncomfortable with this approach, the fact that Intelligent Design has not been defined in terms of chronology, age, or theology, has enabled people from various positions on the origins debate to engage in the development of the Intelligent Design movement. Even people of quite divergent beliefs such as Jews, Muslims, Hare Krishnas and agnostics have joined the movement because they see it as an honest attempt to search for answers to origin issues without the severe restrictions of scientific naturalism. If the Intelligent Design movement accomplishes nothing other than bringing together Christian professionals, and others who have problems with accepted naturalistic evolutionary theory, we can expect success, and a greater understanding of the creation process.

So what do the recent developments in the design argument teach us? For many observers a beautiful sunset, a rocky mountain stream or the flight of a bird will be evidence enough that God exists. Speaking for ourselves, our study of biology continues to inspire awe at the amazing complexity and beauty of life. We concur with the writer of Romans, that God is adequately revealed in nature. But while Christians may be convinced that design in nature points to a Creator-God, the general scientific community has not been persuaded. Perhaps the more scientific approach of the recent Intelligent Design theorists such as Behe and Dembski, will encourage evolutionary scientists to look beyond purely naturalistic mechanisms to explain the complexity and meaning of life. If evolutionary scientists are convinced that naturalism is limited in its explanatory power and that there is evidence for an intelligence behind the universe then perhaps they will be open to considering that this intelligence is the God of the universe who wants a deep and personal relationship with his crowning creative masterpiece – human beings.

DISCUSSION QUESTIONS

1. What differences/similarities do you see between Paley's watchmaker style argument and Behe's irreducible complexity?
2. How do you think that Behe's ideas are more supportive of theistic evolution (God began

life millions of years ago with the ability to evolve, thus 'natural' processes have produced what we see today) or of progressive creation (God has been involved in progressive creative events over millions of years) rather than recent creation (God created a perfect world about 6000 years ago)?

3. How do you consider Behe's irreducible complexity to be a 'God of the gaps' argument?

4. Finding evidence for intelligent design in biochemical systems seems like good evidence for the existence of a Creator. But these systems at times produce parasites, predators, and the whole earth system of death and decay. How do you explain such problems with design at the ecological level of life?

5. Are the arguments of the recent Intelligent Design movement more likely to convince people of the existence of God than Paley's watchmaker style arguments? Comment.

6. With the advance of science and its ability to offer an explanation for the natural world in what sense might Romans 1:20 be less applicable to the modern mind?

HELPFUL INTERNET SITES

Christianity Today
www.christianityonline.com_

Geoscience Research Institute (SDA Church)
www.grisda.org_

Probe Ministries
www.probe.org_

Origins
www.origins.org_

Talk Origins Archive
www.talkorigins.org_

Access Research Network
www.arn.org_

The American Scientific Affiliation
www.calvin.edu

Canadian Scientific Affiliation
www.csca.ca_

Discovery Institute
www.discovery.org_

Leadership University
www.leaderu.com_

*Search these sites using the keywords: intelligent design, Behe or Dembski

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21. Dawkins, R (1985), *Op cit,* p1.
22. *Ibid*, p21.
23. Dembski, W A (ed) (1998) *Mere Creation: Science, Faith and Intelligent Design*. Intervarsity Press, Illinois. p98–108.
24. This illustration of the explanatory filter was used by Paul Nelson in a presentation at the Conference on Science and Faith, Andrews University. Dembski uses a case of electoral fraud to illustrate the filter in *Mere Creation: Science, Faith and Intelligent Design*.
25. Behe, M J (1996), *Op cit,* p207.
26. *Ibid*, p204.
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29. Dembski, W A (ed) (1998), *Op cit,* p17.