AN OVERVIEW OF INTELLIGENT DESIGN THEORY

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A young-earth creationist once told me that he took the Genesis account of the creation as literal historical fact: the universe is about 6000 years old and was created in about 4000 B.C. I asked him about evidences of a much older earth and universe: radiometric dating, geological dating, astronometric dating. In his opinion, there are flaws in all of these techniques which render them unreliable. In fact, he thought there was a vast conspiracy in the scientific community hiding the fact that earth and its surrounds were created by God.

I hope this article is not perceived like that. My intent is to add to the conversation about evolution's implications and possible limitations. Observation leads me to accept evolution in the physical world; I accept theology on faith. I believe that these two positions are compatible. Intelligent design (ID) theory of late adds context to this belief. Since many of the observations of the ID community draw heavily on engineering and computer science, my background in engineering permits me an interesting perspective from which to review material coming from ID.

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Perhaps the biggest reason I want to add to this conversation is what I see happening to the public view of science. As I discussed in my previous paper (*Perspective*, Volume 6 Number 2), the American public tell pollsters in overwhelming majorities that they believe in some form of creation. On the other hand, some vocal scientists, including many associated with the National Academy of Sciences, the National Science Teachers Association, and other organizations, claim that there is no need for recourse to divine intervention, since current scientific understanding explains life apart from extra-natural intervention. Some claim that the religious view and the scientific view are irreconcilable. While many outstanding scientists hold more reserved views, shrill voices, including many of those setting the school agenda, would supplant faith with science.

This push to secularize public conversation has significant cultural effects. Those, like my creationist friend above, not trained in scientific content, can come to distrust all scientific enquiry, which has profound implications for our future. The way the evolution debate is currently framed also puts scientists of faith in an uncomfortable position. One has either to make an uneasy peace with the issue, resolving not to worry about it and supposing that one day we'll all understand; or one can retreat further and further into allegorical interpretations of religious dogma.

Here is my hope for ID: Science is not organized to address metaphysical questions, and metaphysics does not address itself to all the scientific phenomena. I wonder whether ID may have a potential to allow science

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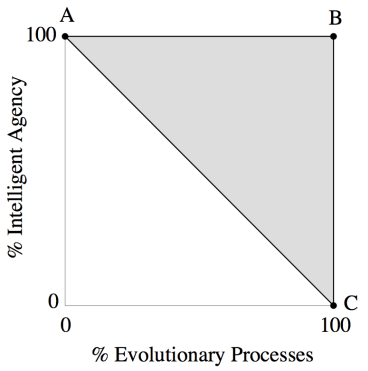
and religion to happily coexist, removing a major conflict from the culture wars. I see no threat to scientific understanding of evolution in ID; I think perhaps ID may hold keys to an intellectually fulfilling theism.

At present, ID is constantly being tagged as anti-evolution and anti-science. It is certainly anti-something, so let's be clear now about what that something is. To begin with, simply for the sake of argument, think of both intelligent agency and evolutionary processes not as antithetical propositions, but as axes on this chart.



You could think of any spot on this chart as representing how much, say, the history of the biosphere depends on each cause (intelligence and evolution). It should be obvious that the extremes are points A and C. Point A is the point that special creationists occupy. They claim that God created everything like it is today and that no evolution has ever happened.

Moving away from A, we have what we could generically call evolutionists. An evolutionist could be anyone who accepts that species change with time. You could, for instance, be a theistic evolutionist, somewhere near line AB. Darwinian evolution holds that mechanisms of evolution are blind natural processes, not intelligence. Darwinian evolution has been shown over and over again to occur in nature. But, as I mentioned in my previous paper, it is possible to be a Darwinian evolutionist and not inhabit point C.

For reasons he felt compelling, Sir Francis Crick (co-discoverer of the structure of DNA) thought that space aliens seeded the early earth with genetic material that later evolved to give us the life we have now.[1] Note from this example that, at least on our earth, some portion of credit is given to intelligent agency and some to evolutionary processes—and that they don't overlap, i.e. once the aliens dumped the seeds of life, they left and had no further input. This situation would constitute a point somewhere on line AC of the chart, where the effect of both causes gives a sum of 100 percent.

But intelligence and evolution can overlap. Selective breeding programs demonstrate this, where intelligent agents direct evolution by selecting

traits for which to breed. It is quite possible to be a Darwinian evolutionist, and be somewhere in region ABC. Intelligent design theory fits here as well, and (in my view) more fully informs Darwinism.

But, some Darwinists do inhabit point C. I have begun thinking of them as über-Darwinists. They claim that point C is the only scientifically acceptable spot on the entire chart; if you reach outside its confines, you lapse into non-science. This is an ideological position, not a scientific one. Science relies on empirical observation, not notions of what must be, to ground itself in reality.

It is point C, and only point C, that researchers in ID examine closely, and reject. They claim that intelligent action in our biosphere can be empirically detected and that scientists should admit that there is at least a possibility that intelligent agency has played some role in the arrival and development of life in this planet.

This general admission by the scientific community would go a long way toward reconciling the supposedly irreconcilable endeavors of science and religion. Evolution would no longer be viewed as a threat to faith. In my opinion, this admission would do no more harm to science than admitting the universe had a beginning, with the Big Bang. Originally, some resisted this notion, thinking that it lent credence to creationists. Acknowledging observations that appear to indicate a beginning of the universe has not caused the end of enlightenment. Neither, in my opinion, would admitting that blind natural processes cannot fully account for all of life. Perhaps life is not reducible to space/time, matter/energy, and physical law. If not, then intelligence may offer a possible way to reconcile observable facts with theory.

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Science, Stochastic Functions, and Everything

First, let's define physical law. As *Wikipedia* states it, "physical law… is a scientific generalization based on empirical observations of physical behavior." Examples of physical law include gravitational attraction, chemical affinity, and Heisenberg's uncertainty principal. No one knows the underlying reasons that these laws exist, but they have been verified over many years of experimental observation. In many ways our universe is quite predictable. But, as Heisenberg pointed out, not everything can be predicted.[2]

Scientists are in the business of classifying and modeling physical law. The tools they use to model reality are mathematical, and the most general way of modeling physical law mathematically is through the use of stochastic functions. Stochastic functions can be thought of as having two parts: a deterministic part, and a probabilistic part. A deterministic function has only one output for a given set of inputs. It is single-valued.

Deterministic functions are entirely predictable. If you do *this*, then *that* will happen.

By contrast, probabilistic functions are statistical in nature. Given certain inputs, the output is uncertain. You can make some general statements about the nature of the output, but not anything specific. You could think of this as random chance.

As a concrete example, think of someone shooting a gun at a target. In the ideal case, this would be a deterministic process. Aim at the bullseye, pull the trigger, hit the bullseye. To make the process probabilistic, you could attach a timing device to the gun that could pull the trigger, and then throw the gun up in the air. As the gun tumbles through space, the timer pulls the trigger, and the bullet lands within a mile or two of the target. In real life, shooting a gun at a target lies between these two extremes. Aim the gun at the bullseye, pull the trigger, hit somewhere near the bullseye. If you shot a bunch of times, you'd get some distribution around the bullseye. This last example can be modeled using stochastic functions. The deterministic part would account for the fact that you're aiming at the target. The probabilistic part could represent what you don't know about the process, i.e., the shaking of your hands, wind, vibration of the gun's barrel, etc.

Of course, the example above includes an intelligent agent, the shooter, as part of the mix. What about if there is no such agent to direct a given process? Darwin proposed natural selection as a blind process that could appear to direct the evolution of novel life forms of increasing complexity.[3] Could this be shown to be true?

Stochastic processes or functions are the only tools available to science in modeling reality. A given process may be skewed more toward determinism, and another may be more skewed toward randomness, but science can only work with empirical observation, repeatability, and stochastic modeling. It would not be scientific to claim, for instance, that pixies help the flowers grow, since this has never been observed. It is not a scientific statement to say that God created the world. It simply isn't. This is a matter of faith.

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But speaking of faith, there are some in the scientific community that are guilty of sins of equal magnitude. For instance, some claim that since evolution has been observed to happen, then evolution can explain all of life, which is an inductive fallacy. Stated more precisely, it is taken as an article of faith that blind, unguided stochastic processes alone are sufficient to explain all of life. This is a position of metaphysics, and not one of scientific observation. It is a statement of what must be, not an empirical observation. What experiment could you possibly do to prove this?

But could you disprove it? Is it possible to show that stochastic processes alone are insufficient to explain life? This is exactly what proponents of intelligent design claim they can do. It is the point of this article to explore their reasons for making such a claim. In doing so, it is important to realize that proponents of ID do not deny evolution. They recognize it as a real stochastic process that actually occurs. In fact, they go so far as to say that all of life may well have evolved from a single common ancestor. Proponents of ID only claim that stochastic processes cannot explain the arrival of this first life form, and the complexity it exhibits.

How Close Does Occam's Razor Shave?

Many critics of ID say that since unguided evolution can already explain all of life, there is no need for recourse to some unspecified intelligent agent. But the proposition that evolution can indeed explain all of life is only now coming under the critical examination any scientific theory needs. It has always simply been assumed to be true. This is the major contribution of Lehigh University molecular biologist Michael Behe. In his book *Darwin's Black Box,* Behe points out that in the 150 plus years since Darwin, not one paper has been published in scientific journals that describes, in a causally specific way, even one evolutionary pathway that leads to a more complex species.[4] Some counter that to do so would be an enormously difficult problem. It would involve identifying what mutations would lead to what changes in embryonic development, which would lead to what physical changes. But, that's rather the point, isn't it? If our understanding of specific evolutionary pathways is so primitive, then how can we hope to claim that evolution explains everything?

Is there a way to explicitly demonstrate that unguided evolution is insufficient to explain the full diversity we see in the biosphere? If so, any criticisms of ID concerning Occam's razor or the God of the Gaps would miss the mark. If stochastic processes can be shown to be insufficient, then one is not invoking a god to explain gaps in our understanding. Rather one is citing well-understood principles to negate the fantastical claims of some Darwinists. Occam's razor only shaves intelligent input out of the picture if the picture can be explained apart from intelligent input. Behe tries to show that natural processes alone are insufficient to explain certain features of organisms. But in my opinion, his arguments fail to persuade. They are too vaguely notional to gain any theoretical traction.

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Richard Dawkins is the Charles Simonyi Professor of the Public Understanding of Science, Oxford University, England. He is a staunch Darwinist, and harsh critic of ID. But, he at least admits there is a problem with the origin of life, noting that the self-replicating molecules that we know (for example, DNA) require sophisticated molecular machinery, inside the cell environment, to function. He spends an entire chapter

in his book *The Blind Watchmaker* waving his hands about how big a miracle we should be allowed to swallow and still claim that evolution is based solely on natural mechanisms.[5] But he gives no justification for his numbers. This is a critical issue, as Dawkins admits. Too critical to resort to fuzzy math. But how could you possibly get a handle on this issue, sure enough to make some real analytical predictions? Curiously, one way to do this surfaced with the growth of computer modeling of evolution.

Silicon Life Forms

Genetic algorithms work almost like magic.

Genetic algorithms (GAs) work almost like magic. These are computational methods proposed by (among others) biologists to model the evolutionary process of random mutation coupled with selection. GAs are stochastic, or as French biologist Jacques Monod puts it, chance coupled with necessity.[6]

Once set in motion, computer codes employing GAs can arrive at sophisticated and innovative designs without further input from a user. To do so, a user first models a proto-design by assigning variables as "genes" to control specific aspects of the design. The user then starts the program, and the GA loops through the following process: make a random change in one of the variables (genes) describing the design; test the new (mutated) design for fitness using some deterministic fitness function; if the new design is more fit than the old one, then replace the old design with the new one; repeat until things don't change much any more. Thus, heritable traits undergo random mutations, and are guided toward an optimum not by an intelligent agent, but by blind natural processes. Fitness is the only criterion for determining whether a given mutation is kept or discarded. This is exactly the evolutionary process.

As an example, consider the eye. Creationists like to claim that the eye could not have evolved, because it is too complex and finely tuned to its function. Therefore, it must have been designed by an intelligent agent. What good is half an eye? But researchers have modeled the evolution of an eye with GAs. The proto-design consisted merely of a light-sensitive spot covered by a transparent layer of skin, both of which are common in nature. Variables (genes) were assigned that governed the shape of the light-sensitive layer, the thickness of the skin, and the location of the skin relative to the light-sensitive layer. Originally, the light-sensitive layer was flat, and the skin was adjacent to the layer, and of uniform thickness. The fitness function was a mathematical expression determining the acuity of the eye at any stage of development.

When the GA was started on this model, the first beneficial mutations tended to lead to a depression in the originally flat eye. This depression improved acuity because it provided some directional information (the

higher walls around the depression cast a shadow for light of low incidence angles). The depression soon grew to be a pronounced cup, the top of which eventually closed mostly over to form an aperture (like an iris), and the skin moved away from the light-sensitive layer, and changed thickness so as to form a lens. Thus, after a few thousand generations of random mutation with selection, a common biological structure (a light-sensitive spot) evolved into a sophisticated lens-bearing camera eye. No input from a user was needed. The development was guided by purely blind stochastic processes. This is Richard Dawkins' notion of the Blind Watchmaker.[7]

There are many other examples of GAs that evolve a simple design into one that is much more sophisticated and often surprising. GAs are the computational thumb on Darwin's nose, showing creationists that things really can evolve from simple to complex without a designer meddling in the process.

While all of this was happening in the scientific world, engineers also became very interested in GAs for use as aids in the design process. But how powerful are GAs in developing novelty? Are they universal problem solvers? Might there be limits to what GAs can pull out of the hat? How simple can the proto-design be, and still allow sophisticated designs to result? In order to answer these questions it was necessary to develop a theoretical framework that would yield to analysis. Numbers were needed. Predictions had to be made and tested.

The Lottery Problem

As it turns out, one of the ways to get at these questions is the relatively new field of Information Theory. Those doing research into the usefulness of GAs started to find some very interesting things that have direct bearing on Darwinian (undirected) evolution as well. The man who saw the connection, and who brought more rigor to the theorems proposed by those studying GAs is William Dembski, who holds a research professorship at Baylor University. Dembski is the current guru of the ID movement.

In his *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence*, Dembski argues first, that chance (probability) alone can't explain informationally complex biological structures; second, that necessity (determinism) alone can't either; and third, that neither can the conjunction of chance and necessity (stochastic processes).[8] Hence Darwinism can't explain informationally complex biological structures. The emphasis here is not on the complexity of the structure, but on the complexity of the information a structure entails.

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In order to understand Dembski's argument, you need to have a basic handle on what information is. Information theory treats information as

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a statistical quantity, based on probabilities. It is critical to understand that information is a ruling out of contingencies. I'll come back to this later in the paper, but here's an example. If you knew that I had flipped a fair coin once, and I told you it landed a heads or a tails, I haven't given you any information. I haven't ruled out any possibilities. The coin must land either heads or tails. But if I told you that the toss landed heads (and not tails), then I have conveyed some information. If it's a fair coin, the probability of landing heads, rather than tails, is 50%, or 0.5. The lower the probability of a given event, the more information is conveyed by stating that the event occurred; or alternatively, the more complex the information is. You can convert between complexity (C) and probability (P) as follows:

$$C = -\text{Log}_2 (P)$$

The probability of flipping a head with a coin of only two sides is 1 in 2, or 1/2. Therefore, in telling you I've flipped a heads, I've conveyed one bit of information, i.e., $-\text{Log}_2 (1/2) = 1$.

So, the complexity of information contained in a string of characters is based on its length. By randomly flipping a coin once, I will obtain a heads or a tails. What if, instead, I flipped the coin 100 times. Let's say I got the following sequence of ones and zeros, corresponding to heads and tails, respectively:

01000001010101001000110111010100010000100000000110111011010010110011111011110100010111011001000.

The probability of getting any one string of 100 ones and zeros is 1 in 2^{100}, or 2^{-100} (approximately 1.27×10^{-30}, which is an astonishingly small number). Therefore, the information content is $C = -\text{Log}_2(2^{-100}) = 100$ bits.

By stating that I got this particular sequence, and not any other of the 1.27×10^{30} sequences I could have gotten, I convey significant information. But even though the information is fairly complex, it's still just gibberish. It's a random sequence of ones and zeros. But consider the following sequence:

01000110110000001010011001011011011000000001001000011010001010110011111001001101010111100110111101100.

What if I claimed that I got this sequence by randomly tossing a coin? Would you believe me?

It probably depends on your experience. For instance, if you are a computer scientist, you might note that, although at first glance it looks random, this particular set of ones and zeros is in fact a sequence of binary numbers, starting with the single digit numbers (0, 1), then the double

digits (00, 01, 10, 11), then the triple digits (000, 001, 010, 011, 100, 101, 110, 111), and so on until 100 characters are reached.

So, now would you believe me if I said I got that sequence by chance? Probably not. But why not? This is a critical point. What makes the first sequence a believable random sampling, and the second one not? The key is that the second sequence is specifiable independent of the event itself. It means something in a different and detachable context. If scientists at the Search for Extraterrestrial Intelligence (SETI) were to find this sequence embedded in the radio data they were analyzing, they would be forced to conclude that someone was trying to communicate with them. And the longer the sequence is, while still meaning something specifiable, the stronger the evidence.

What makes the first sequence a believable random sampling, and the second one not?

Take another example. If I randomly picked three letters from a hat, and got the sequence T-H-E, that is specifiable as a word in English. It is different from randomly picking the sequence Q-Z-F in that, while the probabilities of picking these two sequences are identical (i.e. the complexity of the information in both is the same), "qzf" is not a word in any language. The latter sequence exemplifies simple information, while the former exemplifies specified information.

But still, the information content in the word "the" is not very complex. On the other hand, if I claimed to have randomly picked the sequence F-O-U-R-S-C-O-R-E-A-N-D-S-E-V-E-N-Y-E-A-R-S-A-G-O-O-U-R-F-A-T-H-E-R-S-B-R-O-U-G-H-T-F-O-R-T-H…, and so on for three paragraphs, you would be wise to suspect that I was fibbing. Not because the information content is complex (any long string of random letters exhibits complex information), but because the string of letters exhibits specified complexity. When specified information is also complex, it is called complex specified information, or specified complexity. Dembski claims that specified complexity is a reliable empirical indicator of intelligent agency (design).[9]

Why? Because once information gets complex enough, like the paragraphs of text alluded to above, then the set of all strings of that length that mean something specifiable is exceedingly small compared to the set of all *possible* strings of that length.

As an example, let's assume that we're talking about a string of just two letters. In the English language, there are 26 letters, so there are 26^2 (or 676) possible combinations of two letters. According to the San Jose Scrabble® Club No. 21, there are 96 acceptable two-letter words in the English language.[10] So, the set of all two-letter combinations specifiable as English words is about 14% of the set of all possible combinations. The chances of hitting a real two-letter word at random are not too bad. If we jump up to three-letter words, the chances drop to about 5.5%. If the length of the string gets any larger, chances of hitting an English word

or phrase dwindle quickly. To the point that if you hit that very small target, then you can bet you didn't shoot your gun at random.

But how much information are we talking about? How long does the string have to be before we can say that it couldn't have happened by chance? Certainly there's a small (but real) possibility that even a long specified string might occur truly at random. The classic example is a bunch of monkeys banging away at typewriters. Eventually, one would produce the Gettysburg Address. Large number theory states that in an infinite random string, any finite string is not only guaranteed to occur, but to occur infinitely many times. But from a probability standpoint, how long would it take you to exactly duplicate the Gettysburg Address? That depends on how many monkeys, and how fast they can type.

How long does a string need to be such that in all likelihood, it could never be duplicated by pure chance in the history of our universe?

Alternatively, how long does a string need to be such that in all likelihood, it could never be duplicated by pure chance in the history of our universe? There is a limit. The universe has only been around for a few billion years, and there are only so many monkeys in it. This is the question Richard Dawkins was attempting to address,[11] as I mentioned before. How big a miracle can a scientist be expected to swallow? But whereas Dawkins just vaguely waved his hand, Dembski realized it's possible to get meaningful numbers.[12] There is no scientifically accepted bound for what is possible, so Dembski decided to wildly inflate the computational resources of the universe. He calculates that if every atom in the universe (approximated by physicists to be about 10^{80}) were a quantum computer generating random strings of a given length at clock speeds based on the Planck time (that's each atom spitting out about 10^{45} strings per second), a specified event of probability 10^{-150} (that's 1 divided by the quantity 10^{80} times 10^{45} times 10^{25}) could not be reached by pure chance in a *billion* times the age of the universe (about 10^{25} seconds).[13] So, a probability of 10^{-150} can be considered a very conservative universal probability bound. Or, since this corresponds roughly to an informational content of 500 bits (because $-\text{Log}_2(10^{-150}) = 498.3$), then 500 bits can be thought of as a universal complexity bound. From a probability standpoint, it remains unlikely that an event of specified complexity of length 500 bits could have happened by chance given all the computational resources of the universe.

For comparison, a string of DNA (with its alphabet of four characters) would only have to have a length of 250 base pairs to reach this complexity ($500 = -\text{Log}_2(4^{-250})$). The human genome consists of about 3 billion base pairs, and even the simplest bacteria have genomes on the order of 500,000 base pairs. The genetic code is called a code because it is exactly like a language, with its own meaning and syntax, so the genome of any living thing exhibits vast amounts of specified complexity. Bullets shot

at random simply can't find a target that small. It would be a miracle too big for any self-respecting scientist to swallow.

Mount Improbable and Its Immediate Surrounds

But scientists don't claim that the target was hit at random, they claim that the bullet was guided by deterministic (but blind) law acting on random variations; i.e. by stochastic processes. After all, this is how genetic algorithms work their magic.

Here, finally, we come the crux of the matter. Dembski shows decisively that specified complexity cannot be generated by stochastic processes.[14] This is because the two components of stochastic processes cannot generate complex specified information. We've just seen that because of the sheer probabilities involved in the universal complexity bound, chance alone cannot generate specified complexity without invoking miracle. That leaves chance coupled with necessity, which is exactly what Darwinists propose as the generator of biological complexity.

However, deterministic functions (necessity) cannot in fact generate information. Remember that information must be a ruling out of possibilities. In order for that to happen, contingency must exist. Deterministic functions by their very nature lack contingency. There is only one live option with a deterministic function. If you provide a set of input data, you get a certain output.

Deterministic algorithms can optimize information based on a particular fitness function. But in order to optimize it for fitness, it must possess some minimal fitness to start out with. There is no way to use deterministic algorithms to get from some random sequence of letters, say H-T-F-E-C-Y-O-Y-S-N-X-A-H-A-E-E-L-L-Y-B-W-V-O-X-U-Z-W-F-D-U-L-Q-I-R-O-R-G-P-M-B-U-N-Q-V-J-B-Z-J-F-S-S-H-Q-R-D-U-B-Z-T-L-O-Y-B-I-N-V-M-S-I-C-T-G-L-T-U-P-U-P-S-R-C-U-G-U-Q-U-K-W-D-V-H-A-B-H-R-D-T-O-W-R-O-U-H-S-W-M, to something that means something specifiable, without providing hints. Which is cheating.

In stochastic processes, all the creative power is held in the chance (probabilistic) portion. The necessity (deterministic) portion can convert existing specified complexity into other forms of specified complexity (for instance, this document is stored in some binary format on my hard drive), but it cannot increase the specified informational content. And since chance cannot generate specified complexity, neither can the conjunction of chance and necessity proposed by Darwinists.

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Recall the example of the eye that was evolved, using genetic algorithms, from a light sensitive spot. Although a lens-bearing camera eye is morphologically more complex than a simple light-sensitive spot, the eye evolved by the GA was not informationally more complex. The existing gene variables just took on different values. The user input a fully-

functioning eye of poor acuity, and the GA output a fully-functioning eye of optimized acuity, but of the *same* informational complexity.

In order to generate specified complexity, a third fundamental quantity must be added to the mix: intelligence.

In order to generate specified complexity, a third fundamental quantity must be added to the mix: intelligence. When the causal history of an event or artifact exhibiting specified complexity is known, there has never been a case where the event or artifact was not generated by intelligence. Darwinists claim that biological information is the single exception.

Dembski bases his theory about biological information on work that has been done by others on the theory behind genetic algorithms.[15] These theorists have developed a group of theorems assembled into what are called the No-Free-Lunch theorems, stating that when it comes to generating new specified complexity, genetic algorithms are no better than blind search. Stochastic processes cannot produce specified complexity beyond the universal complexity bound. Once a GA gets a functioning design to work with, it can optimize it in sometimes surprising ways, but it cannot generate specified complexity from scratch. The No-Free-Lunch theorems are uncontroversial when applied to GAs, but the moment Dembski says that GAs were proposed as computational analogues to biological systems, and that the No-Free-Lunch theorems must apply to them as well, many Darwinists object. Darwinism seems like such a naturally promising organizing principle.

Richard Dawkins states, in his *Climbing Mount Improbable,* that even the evolution of very complex things can be broken down into small increments. He compares this to climbing a mountain, step by step. Genetic algorithms and (more generally) evolutionary processes simply detect the slope of that mountain, and ascend generation by generation.[16] The problem is that for large design spaces (greater than the universal complexity bound) the regions of detectable slopes are vanishingly small compared to the vast, flat surrounding plains. Arriving in the neighborhood of one of these peaks itself constitutes a specification. You'd have to know where the peaks are in order to get in the vicinity of detectable slopes so that evolution could even begin to work. Without intelligence, there's no way to get there, and you're back to blind search (which would take longer than the universe has been around).

Returning to the argument about the eye, the proto-design used by the researchers ended up being a very convenient choice. With an initially flat starting point, increases in acuity can be readily detected, and passed on to future generations. But what if the researchers had seeded the genes of the original design randomly? The proto-eye would have looked like a wad of tin foil, and small changes would have lead to no detectable selective advantage. The GA would have wandered aimlessly with no convergence. This in fact happens to GAs if you don't set them up carefully to begin with. Once you're in a region of detectable

gradients, things go fine. It's getting there in the first place that poses the difficulty. Engineers overcome this difficulty by employing their own intelligence to land on the foothills of the mountain. Darwinism allows no such luxury.

So evolution works once things are set up nicely, but getting life set up in the first place poses an insurmountable problem for Darwinism. And although it can make things more complex in form, it cannot add informational complexity. Intelligence is the only thing we have experience with that can create specified complexity.

Evolution works once things are set up nicely, but getting life set up in the first place poses a problem.

In the end, the engineers that were interested in genetic algorithms found that although they are useful design tools, they are not universal problem solvers, and they are not replacements for intelligence. When set up properly, genetic algorithms can arrive at innovative solutions, but they can't just create something out of nothing. This is especially significant because computers (due to their speed) can run through more generations, in a relatively short time, than all the generations of the earth.

Like any good scientific theory, the argument for ID is falsifiable. Dembski makes a statement, based on theoretical observations, and then invites anyone to provide a counterexample—to prove him wrong. His challenge is for anyone to produce an example of specified complexity that was demonstrably arrived at via natural processes alone. Some have proposed alleged examples, but none has withstood scrutiny. There is no known instance of the generation of specified complexity by natural processes without the influence of intelligent input. Granted, people have only been trying for a few years.

Conclusion

Informed proponents of intelligent design have no problem with the idea of evolution. But Dembski seems to go further than anyone before him in demonstrating, on theoretical grounds, that while evolutionary processes can and do allow the natural world to adapt to a changing environment, and while novel and sometimes surprising adaptations do occur, Darwinian evolution lacks the creative power to generate specified complexity. While evolution has been shown to operate in nature, it can't explain the whole picture. It would take much longer than the universe has been around for blind natural processes to account for the information content in even the simplest organisms. Evolution, like genetic algorithms, can optimize specified complexity once it is present, but in all our experience, specified complexity has only been generated by intelligent agents. Like the laws of thermodynamics, the No Free Lunch theorems simply state that you can't get something from nothing.

Based on these arguments, it seems reasonable to admit that there is at least a possibility that intelligence may have been involved in the origin

It may be that intelligence is an irreducible feature of reality.

of life. It may be that intelligence is an irreducible feature of reality; a primitive quantity that cannot be reduced to space/time, matter/energy and physical law. In this case, there is no alternative to saying either (a) we simply don't know how life happened (remember physicists admit this about the Big Bang), or (b) intelligence could, in principle, explain life. Neither of these is being admitted today.

I believe that if the scientific community were to make either one of these admissions, then the lay public would be much more trusting and supportive of its efforts. It might foster an atmosphere where faith is no longer viewed as a liability in educated circles. In this brave new world, we might find that scientific enquiry itself might leap forward with greater vigor and originality. It would certainly open the minds of some.

Notes

1 *Wikipedia,* s.v. "Francis Crick: Directed panspermia," http://en.wikipedia.org/wiki/Francis_Crick#Directed_panspermia (accessed November 12, 2007).

2 *Wikipedia,* s.v. "Uncertainty principle," http://en.wikipedia.org/wiki/Uncertainty_principle (accessed November 12, 2007).

3 *Wikipedia,* s.v. "Natural Selection," http://en.wikipedia.org/wiki/Natural_selection (accessed November 12, 2007).

4 Michael J. Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 2006).

5 Richard Dawkins, *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe Without Design* (New York: W. W. Norton & Company, Inc., 1996), 139-166.

6 Jacques Monod, *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology* (New York, Alfred A. Knopf, 1971).

7 Dawkins, ibid.

8 William Dembski, *No Free Lunch: Why Specified Complixity Cannot Be Purchased without Intelligence* (Oxford, Rowman & Littlefield Publishers, Inc., 2002).

9 ibid, p. 163

10 San Jose Scrabble Club No. 21, http://www.yak.net/kablooey/scrabble.html.

11 Dawkins, ibid.

12 Dembski, ibid., 45-55.

13 Ibid., 21-22.

14 Ibid., 125-173.

15 Ibid., 196.

16 Richard Dawkins, *Climbing Mount Improbable* (New York: W. W. Norton & Company, Inc., 1996).