

Macrodelusion?

A Brief Look at Challenges to the Theory of Macroevolution

By Brian Frantz

Table of Contents

List of Visuals.....	ii
Preface.....	iii
The Theory of Macroevolution	1
Background.....	1
Essentials.....	2
The Opposing Theory: Intelligent Design.....	4
Background & Essentials.....	4
Summary of Selected Arguments.....	6
Bias.....	6
Irreducible Complexity	7
Punctuated Equilibrium and the Cambrian Explosion	10
The First Life	12
Conclusion.....	14
Appendix A: Bibliographies of Sources.....	15
List of Works Cited.....	15
List of Works Consulted.....	17

List of Visuals

Figure 1: Phylogenetic Tree of All Life.....	3
Figure 2: Blood Coagulation Cascade	9
Figure 3: Tree of Life by Period	10
Figure 4: DNA and RNA.....	13

Preface

In addition to taking classes and working, I had a number of goals for myself this summer. One of these was to explore the facts regarding evolution. I was raised in a Christian home and went to Christian schools which taught that evolution was mostly an attempt by atheists to explain away God. However, my faith is rather questionable if it contradicts the natural laws I believe God created, so I wanted to find out just which side the facts were on.

In researching this report I found that, not surprisingly, this topic covers so many complicated areas that I will never fully comprehend it. I discovered that some of my beliefs regarding the age of the earth and the evidence in the fossil record did not agree with established facts. I also learned that there is more to evolutionary science than I had first thought, yet there are nevertheless some significant holes in the theory of macroevolution.

My purpose, beyond learning myself, was to share my findings and hopefully give my readers a fair overview of some of the contested areas in the debate between evolutionists and their main challengers: intelligent design theorists. In the interest of keeping this accessible to someone with only a basic scientific background, I tried to avoid getting too deep into scientific minutia and instead share only the essentials and summarize what I've read on the subject. I end with a description of what seems to be the most reasonable conclusion based on my research. I hope that this report will give my readers a greater appreciation for the significance of the debate and the arguments (and people) involved.

Macrodelusion?

A Brief Look at Challenges to the Theory of Macroevolution

The Theory of Macroevolution

Today, the prevailing explanation for the origin of species is the theory of evolution. It is taught in most schools and Universities and has influenced numerous other fields. Despite its prevalence, however, many people don't really understand what the term *evolution* actually refers to. In this section, we will try to explore just what evolution is and where the facts end and the theory begins.

Background

Before the theory of natural selection was first proposed, there was very little consensus among scientists regarding a natural explanation for how species developed. One theory which resembled evolution but is now known to be false was that the physical effects of a creature's behavior – such as a giraffe stretching its neck – could be passed to their offspring, resulting in generational developments. Another idea, meant to explain the buried fossils in layers of earth, was that the earth had endured a series of cataclysms which were each followed by a mysterious or supernatural creation event. In short, science could explain how a lot of natural processes worked, but it could say very little about how they came to be.

In 1831, naturalist Charles Darwin embarked on a worldwide scientific voyage aboard the British ship the HMS *Beagle*. He made his most significant observations on the Galapagos Islands, where he noticed that the creatures on the various isles differed in ways that seemed to correspond with their environment. It took him a while to understand the importance of this discovery, but after much study and theorizing, Darwin eventually constructed a detailed theory of evolution through natural selection. He published his work in the earthshaking *On the Origin of Species* in 1859 and forever changed the way scientists would think about natural origins.

Darwin's theories were a bit ahead of their time. He could theorize about how species could change over time based on their environment, but couldn't explain how these changes would be sustained through many generations. The answer to this mystery was discovered thanks in large part to the meticulous plant breeding experiments of Austrian Monk Gregor Mendel. He found that there was a mechanism for preserving traits in a plant even if they did not appear in that particular generation, and determined that visible traits were dominant, while those which didn't show up until some later generation were recessive. He had discovered what we now know to be genetics, and in so doing found what Darwin was looking for: a mechanism for passing traits to subsequent generations (1: VIII).

Another fundamental requirement for evolution to occur is the passage of vast amounts of time. Until the 20th century, geologists could only guess the ages of rocks by considering where they were found relative to other rocks and fossils (whose ages were also the result of relative dating). However, in the 1950's, an absolute method for dating rocks emerged from the discovery of radioactivity (2: "Radiometric Dating"). Through a method called radiometric dating, scientists can now calculate when a rock was formed - usually with only about a 2% margin of error. There are a number of radioactive isotopes commonly found in rocks which are known to decay at specific rates. As these parent isotopes decay, they produce daughter material. By measuring how much daughter material there is, scientists can calculate how many years it would have taken to produce it. There are other complications, such as determining how much daughter material had been there in the first place, but by using multiple dating methods, scientists are confident that their measurements are accurate (3).

There have been many other advances relevant to the study of origins, but these are some of the most important. Now that we have some understanding of where the modern theory of evolution came from, let's examine the theory itself more closely.

Essentials

The concept of natural selection is fundamental to the theory of evolution and should be common sense to most people. Just as no two humans are exactly alike, all living beings exhibit some variation. Some of these variations can have a positive or negative effect on that creature or plant's ability to survive. If one generation of a certain species has members with a dominant gene that is particularly beneficial in their environment, these members will have a higher likelihood of surviving and passing that gene on to more offspring. In time, that dominant gene will become more and more prevalent in the population of the species, until eventually the entire species shares this advantageous trait. This gradual process is widely regarded to be a fact as it can be observed even today as we see bacteria and pest species become more resistant to antibiotics and pesticides (4: "Microevolution").

Modern evolutionists (a general term I will use from now on to refer to proponents of macroevolution) suggest that this process, combined with random mutations over vast periods of time, can also explain the introduction of new species, families, phyla, etc. These types of evolution are differentiated by the terms *microevolution*, referring to the observable fact of genetic modifications within a species, and *macroevolution*, referring to the theory that the increasing complexity of life in the fossil record can be explained by evolutionary processes.

Macroevolution is fundamentally harder to prove because it requires so much time for the supposed mutations to occur, many of them simultaneously. It's not something we can observe in action, so we have to theorize about how the blanks between supposedly successive species could have been filled in. The idea of common descent is of paramount importance in arguing for macroevolution and appears to be supported by the fossil record. Fossils from the Cambrian period (544-500 million years ago) are

much less developed than forms of life in later periods, demonstrating a general progression in complexity as time goes on (5). From these observations and the assumption that evolutionary processes could explain the development of new species, evolutionists have pieced together a “tree of life” (Figure 1: Phylogenetic Tree of All Life | 6: phylo.html) which they claim connects all of today’s species with earlier ancestors.

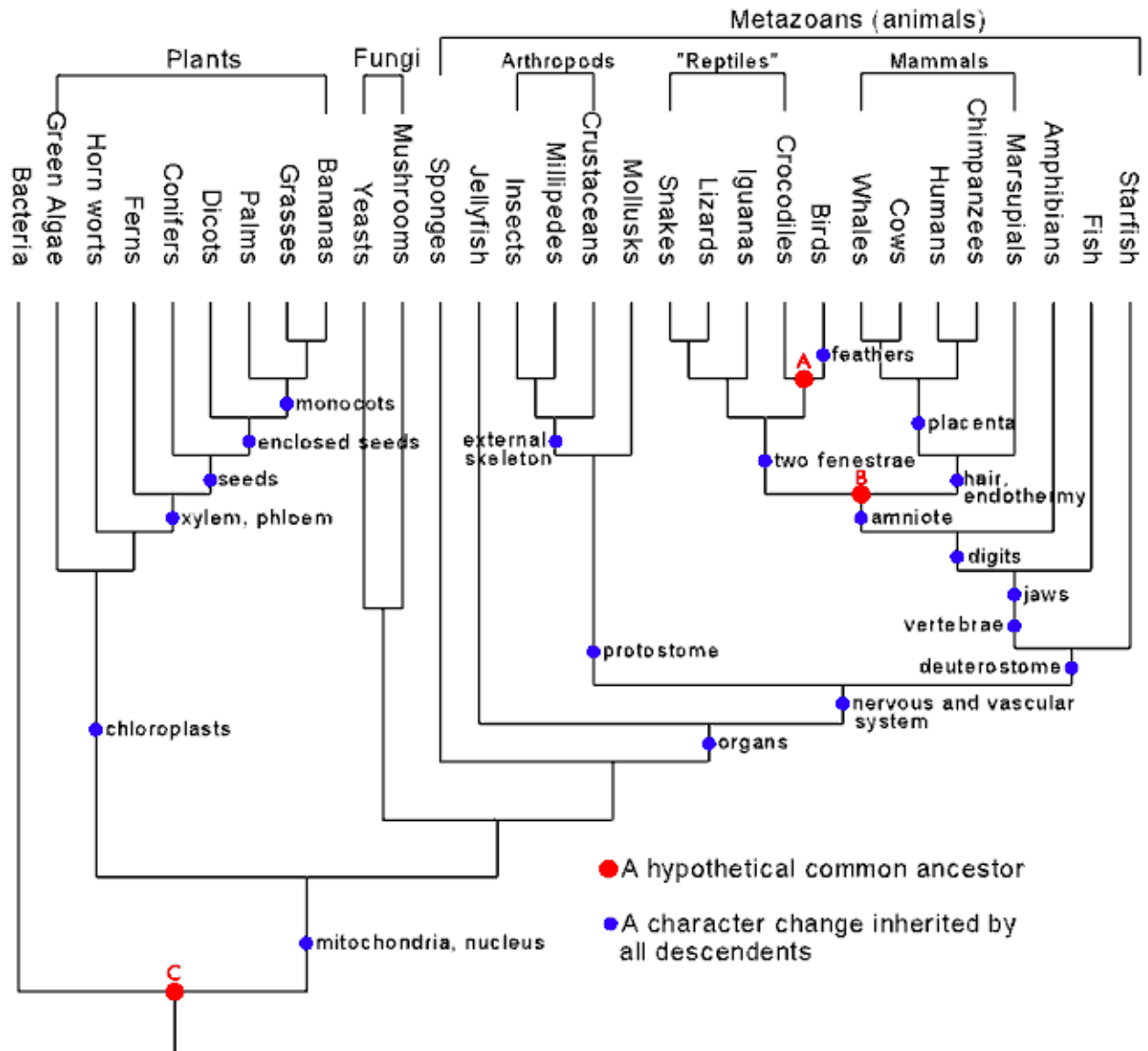


Figure 1: Phylogenetic Tree of All Life

Unlike microevolution, however, macroevolution appears to occur in jumps. The fossil record, although apparently providing solid evidence of life generally increasing in complexity as time goes on, has not done such a good job of corroborating the idea that these developments have occurred gradually. And despite the theoretically plausible tree of life, there is little actual evidence in the fossil record that the more complex species actually came from the simpler ones. What evolutionists have been searching for are transitional specimens that illustrate the incremental development of, for

example, fish into land-dwelling reptiles. A few skeletons have been found which seem to provide these examples, but they are rare and not always terribly convincing.

Harvard evolutionary biologist Ernst Mayr pointed out that the most likely way for macroevolution to occur is when a small population of a species becomes geographically-isolated and thus reproductively separated from the rest. In this situation, evolution can occur more quickly since there will be less interference by breeding with less evolved members. At some point, this more advanced successor species would likely spread to the original population and continue to thrive until it becomes established. This latter phase would be relatively rapid since all the actual evolving would have already occurred in the smaller and geographically-isolated population.

Noting this, evolutionists Niles Eldredge and Stephen Jay Gould proposed the theory of punctuated equilibrium to explain the lack of transitional fossils. The theory essentially states that species tend to go vast lengths of time without any significant evolutionary changes (equilibrium), but that during this time, the isolated groups described by Mayr evolve in small populations that leave a relatively insignificant and localized imprint in the fossil record. Thus, the vast majority of fossils will reflect the equilibrium state until the new species finally emerges from its isolation and spreads over the earth. At this point, a new period of equilibrium begins (7: 10-11).

The term “evolution,” then, is broad and generally refers to both microevolution and macroevolution. The former is rarely challenged by informed scientists due to the quantity of supporting evidence. But the latter remains highly controversial, and we will now find out why.

The Opposing Theory: Intelligent Design

The theory of macroevolution is particularly controversial because not only is it much harder to prove than microevolution, it also tramples on the religious beliefs of many who believe God created life as we know it. If we really share an ancestor with chimps, than how can we accept the idea that God created us in His own image? Yet in addition to ideological objections, there are a number of informed intellectuals who question the plausibility of macroevolution. The most outspoken of these critics generally promote the theory of intelligent design as the more reasonable alternative.

Background & Essentials

According to the Discovery Institute, the leading Intelligent Design (ID) think tank, “the theory of intelligent design holds that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection” (8).

The modern intelligent design movement is quite young, having just picked up steam in the last decade. While its rapid growth in recent years is due in part to scientific advances and new arguments, it is also a culmination of decades of skepticism regarding macroevolution. Thomas Woodward, history of science professor at Trinity University of Florida, has researched the origins of the ID movement and summarizes as follows:

“One thing became clear from that review of the historical facts. Contrary to widespread allegations, ID was not driven by a conservative Christian religious agenda. In fact, the Ad Hoc Origins Committee (a forerunner to ID), far from being a gaggle of fundamentalists, was a very diverse group that was drawn together first by their skepticism of Darwinian doctrine but also by a general dissatisfaction with the approach of scientific creationism with its constructing of scientific arguments to support a literal reading of Genesis. Most of the members of the Ad Hoc group were not Genesis literalists, and some in fact were openly agnostic.”
(9:21)

As Woodward explains, ID was a response to both Darwinist and Creationist explanations for the diversity of species on earth. Yes, ID and Creationism have a lot in common in that they both ultimately attribute creation to a higher intelligent being. But unlike many Creationists, ID scientists don't automatically apply a theological litmus test to the findings of science. Many of its supporters do have religious beliefs which undoubtedly make them more open to the possibility of a supernatural designer, but the movement's arguments are focused on what science tells us.

Good science invites challenges and reasoned debate about unproven theories. Unfortunately, since ID commits the heresy of suggesting the existence of the divine, it has had to face not just scientific questions (as any theory should), but also mischaracterizations and impassioned hostility.

The book *Why Darwin Matters* by Dr. Michael Shermer provides numerous examples of this attitude. In it, Shermer suggests that religious people tend to be uneducated (7:36), boils the ID argument down to “X looks designed, I can't think of how X could have been designed naturally, therefore X must have been designed supernaturally” (7:52), and claims that “Intelligent Design advocates conveniently ignore three billion years of evidence of life's gradual evolution” (7:86). After spending a single chapter responding to books worth of ID arguments, he concludes that the best science ID has to offer is “lots of miracles, a handful of equations, and ten straw examples set against thousands of compelling lines of inquiry” (7:87). He also lumps ID theorists together with creationists, suggesting that ID theorists should be called Intelligent Design creationists to drive home the point that “science is what scientists do, and Intelligent Design Creationists are not doing science. They are doing religion” (7:88).

Actually studying what ID scientists have to say, however, paints a different picture. Contrary to what many evolutionists claim, one can reasonably conclude the following

after reading the works of ID theorists (many of them in peer-reviewed journals or books) (10):

- Many of the most vocal supporters of ID do in fact hold doctorates in relevant fields (such as biology and biochemistry).
- They accept proven concepts such as microevolution and radiometric dating.
- They use science, not religious teachings, as the justification for their arguments.
- They use the facts of nature as the litmus test for the theory, not philosophical beliefs.

Just because ID ultimately involves something nonscientific (a supernatural designer), that doesn't mean its objections to macroevolution are unscientific or even that the theory itself cannot have scientific justification. Evolutionist Robert T. Pennock wrote the following after responding to an ID argument: "one may, of course, retain religious faith in a designer who transcends natural processes, but there is no way to dust for his fingerprints" (11: "Mystery Science Theater"). To someone who understands the concept of a supernatural designer, this is nonsense. The fingerprints of a designer are precisely what we observe in nature. Science, then, being the study of the natural world, is the means by which we *can* dust for these fingerprints. Science cannot explain how a supernatural being might have intervened in natural processes, but if such intervention did take place, it could certainly describe the effects.

Since the essential arguments of ID are generally responses to macroevolution, they will be addressed individually in the next section.

Summary of Selected Arguments

Although the arguments for and against macroevolution frequently involve incredibly complex theoretical and technical details, the following section will attempt to sum up several of the main points of controversy in a way that is both accessible to the amateur reader and intellectually honest in its simplification.

Bias

An accusation hurled from both sides of the macroevolution debate is that the other side is biased and lets ideology guide their interpretation of the facts. This is a well-known criticism of ID as we observed earlier. Evolutionists point to ID's concept of a supernatural designer and see a mixing of religion and science. They are right to point out the potential relevance of these presuppositions, for belief in God certainly may, and often does, diminish one's objectivity or influence their motives. However, so can unbelief in God.

At the 1993 annual meeting of the American Association for the Advancement of Science, famous evolutionary philosopher Michael Ruse told his fellow naturalists that "one should be sensitive to what I think history shows, namely, that evolution, [...] akin to

religion, involves making certain a priori or metaphysical assumptions, which at some level cannot be proven empirically” (12: last paragraph). Evolutionist scientist Richard Lewontin, in explaining the danger of allowing for the miraculous in science, said:

“Our willingness to accept scientific claims that are against common sense is the key to an understanding of the real struggle between science and the supernatural. [...] It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door” (13: 31).

The fact that many evolutionists adhere to a naturalistic assumption is not inherently bad. In many ways, it makes them good scientists since science cannot directly observe the supernatural. However, if there does exist a supernatural, this presupposition could blind them to the true explanation for natural phenomena and lead them to make incorrect conclusions. As mentioned earlier, science can't tell us if a supernatural designer exists, but it could provide evidence by observing its handiwork.

Bias clearly exists in both the evolutionist and ID camps. The goal for anyone analyzing their arguments is to cut through the bias and judge the arguments by their scientific merit. Reading critically and verifying the author's sources is crucial in this, as is setting aside any preconceived notions of the author's intentions.

Irreducible Complexity

In his *Origin of Species*, Charles Darwin devotes one section to a discussion of how the eye and other complicated organs could have evolved through a sequence of improvements. In it he makes an important concession: “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.” Darwin goes on to explain how he doubts such an organ exists and cautions anyone against too quickly coming to this conclusion. He gives several examples of organs simultaneously achieving a number of functions and describes how they could have been specialized and improved by natural selection to produce more complex organs in subsequent species (16 :213-214).

Even today, many years after Darwin, the evolutionary explanation for how the eye could have evolved is based upon imagined intermediate steps between the various light-sensitive organs in nature. They don't know how it happened; they can just visualize a possible sequence. So the evolution of the eye is not a proven concept. Nevertheless, it's not organs such as these that biochemist Michael Behe uses to explain his concept of *irreducible complexity*. Behe's 1996 book *Darwin's Black Box: The Biochemical Challenge to Evolution* was and still is one of the driving forces behind the

growing ID movement. And, naturally, it has been met with firm resistance by evolutionists.

In his book and in subsequent debates and articles (some published in peer-reviewed journals such as *Protein Science*), Behe explains how decades of research into molecular biology have found molecular machines that would be effectively nonfunctional if a single component (protein) was missing. Such machines are irreducibly complex, which he defines as “a single system 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” (15: 39). This is different from the complexity of organs Darwin was familiar with, such as the eye which may be theoretically modified to make it simpler yet still somewhat functional.

Behe focuses on a number of irreducibly complex systems to prove his point, but along the way he makes simple analogies to help the average reader follow his points. One of these is the mousetrap. Behe explains that if you remove any part of the mousetrap, it ceases to function and thus there is little reason for natural selection to have put together the first four pieces. Critics have loved to take this analogy apart, some drawing cartoons showing a possible “evolution” of a mousetrap from simpler forms (16), and others proposing mousetraps with fewer parts (which require intelligent modification to make certain parts serve multiple purposes). Ultimately, whether a mousetrap is a truly irreducibly complex machine is not the main point; it was never more than a simplified analogy meant to help the reader get the gist of the actual points which are technically detailed. Still, this hasn’t kept critics from using supposed refutations (even suggesting that using a floor as the base makes it simpler) to show the problems with irreducible complexity (17).

One of the systems Behe describes as irreducibly complex that has been hotly contested by evolutionists is the blood clotting process. A beneficial blood clot is the result of a complex sequence of events involving twenty different proteins that trigger each other in a specific order (Figure 2 | 20).

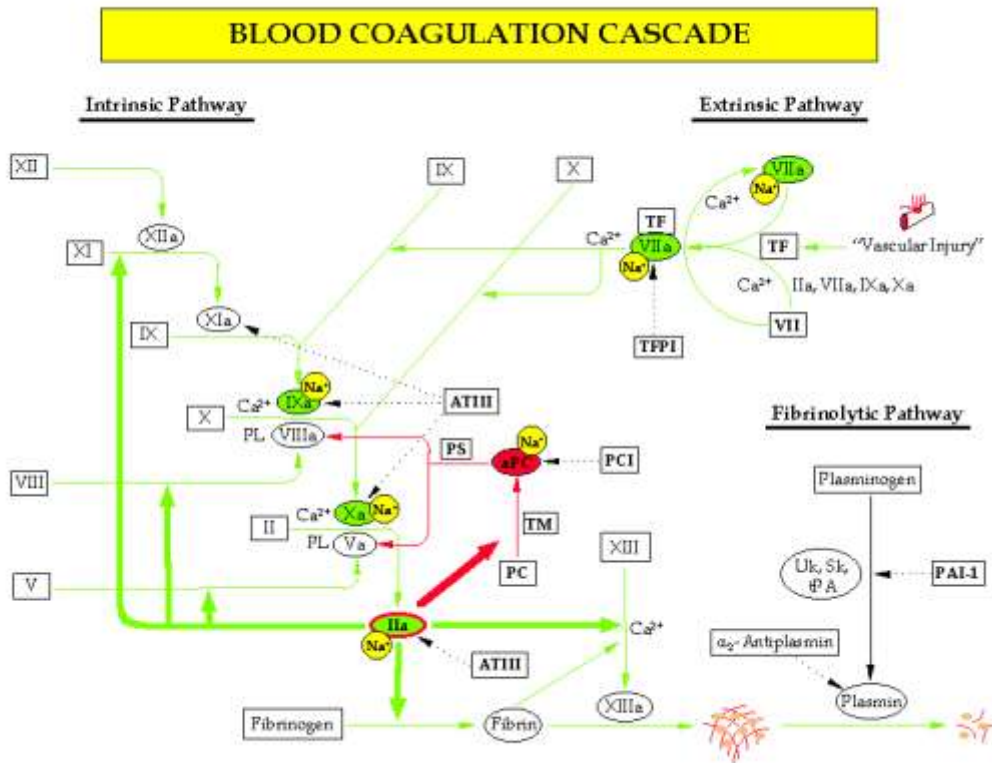


Figure 2: Blood Coagulation Cascade

Behe proposes that natural selection could not have built this sequence because any simpler precursor would have been dangerous and even fatal to the animal. Blood clotting expert and biochemistry professor Russell Doolittle rebutted this claim by citing a study in mice which found that the removal of two proteins in this sequence yielded mice which were “for all practical purposes [...] normal” (18: 28-29). Behe responded to this, pointing out that these mice were far from normal. Instead, according to the authors of the report, they exhibited the same problems as mice which lacked the clot-forming protein fibrinogen. In other words, they hemorrhage, their blood doesn’t clot, and they die when pregnant. Other scientists have contested Behe’s blood clotting example in somewhat different ways (Kenneth Miller and Keith Robison, for example), but their criticisms are generally hypothetical and do not seem to be based on a greater understanding of the blood clotting process (9: 78-79, 19).

There are many other areas of contention regarding Behe’s irreducible complexity concept and studying the debates can be quite fascinating. Addressing them all is beyond the scope of this report, but there is one fundamental point to be made before concluding. The building blocks of these molecular machines are proteins which themselves are highly complex and “each formed the same way, as a twisting chain of usually at least one hundred – and often up to a thousand or more – amino acids that are ordered in a careful sequence” (9: 82). This sequence of amino acids (of which

there are twenty) must be correct, and the protein must be folded into its unique shape. Before we can even discuss the likelihood that the proteins for blood clotting ordered themselves, we have to explain how they got there in the first place. The likelihood that an unneeded gene (the blueprint for protein and RNA creation) could have had its sequence of amino acids shuffled in the right way before being folded into the right shape is unknown by scientists, but studies are showing that it is probably very remote (9: 82). This is just one of many potential problems with macroevolution that irreducible complexity exposes, and the debate is far from over.

Punctuated Equilibrium and the Cambrian Explosion

We’ve already introduced the theory of punctuated equilibrium and how evolutionists use it to explain the jumps that are visible in the fossil record. ID theorists do take issue with punctuated equilibrium and point out a number of unexplained assumptions that make it less than probable. Although geologists have uncovered what appears to be the occasional transitional fossil, it is nevertheless true that even these demonstrate significant advances from one form to another of species supposed to be evolutionarily related. But ID’s more compelling argument has to do with the relatively sudden appearance of very different species in the so-called Cambrian Explosion (Figure 3 | 21).

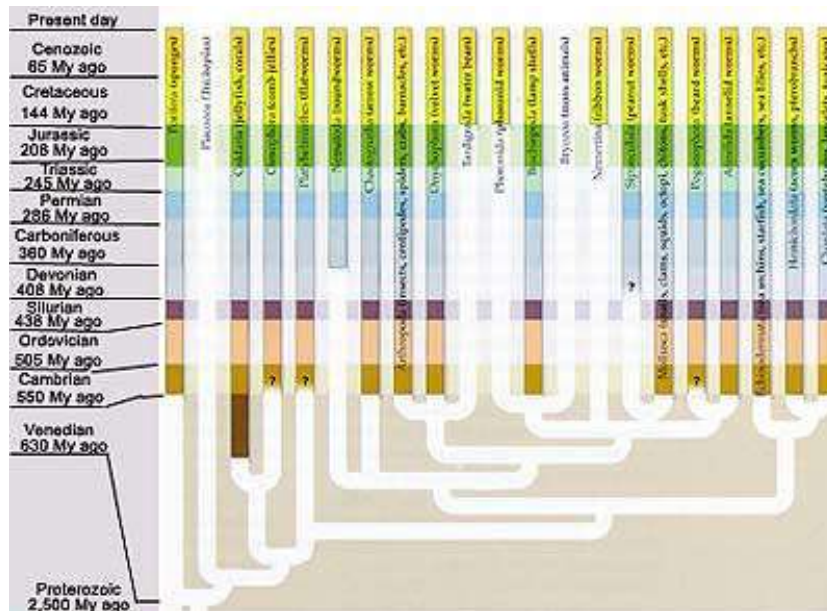


Figure 3: Tree of Life by Period. Columns represent surviving phyla. Note the sudden appearance of phyla in the Cambrian.

“The Cambrian Period marks an important point in the history of life on earth; it is the time when most of the major groups of animals first appear in the fossil record. This event is sometimes called the “Cambrian Explosion,” because of the relatively short time over which this diversity of forms appears” (22).

In the Cambrian period we see a very diverse and plentiful assortment of life forms, whereas prior to this time the only traces of life were prokaryotes (bacteria) and eukaryotes (the type of cell found in plants and animals). Just how big of an “explosion” the Cambrian was becomes increasingly evident as more specimens from the period are uncovered. The 1909 Burgess Shale discovery, along with others in Greenland and China, have uncovered a number of phyla (distinct animal body plan) unlike any others found previously. For example, scientists identified 20 completely different arthropod phyla in addition to the four that were already known. Rather than the Cambrian showing a few new life forms from which others were to develop, we instead see many wildly distinct life forms all appear in relatively short succession (23: 29-37).

This paints a very different picture than the accepted tree of life, which generally forms an upside-down cone shape, with few variations at the bottom and many at the top. Co-author of the theory of punctuated equilibrium Stephen Gould summarized the situation as follows:

Nearly 2.5 billion years of prokaryotic cells and nothing else – two-thirds of life’s history in stasis at the lowest level of recorded complexity. Another 700 million years of the larger and much more intricate eukaryotic cells, but no aggregation to multicellular animal life. Then in the 100-million-year wink of a geological eye, three outstandingly different faunas – from Ediacara, to Tommotian, to Burgess. Since then, more than 500 million years of wonderful stories, triumphs and tragedies, but not a single new phylum, or basic anatomical design, added to the Burgess complement. [...] Why did life remain at stage one for two-thirds of its history if complexity offers such benefits? Why did the origin of multicellular life proceed as a short pulse through three radically different faunas, rather than a slow and continuous rise of complexity? (24: 59-66).

Mikhail Fedonkin, head of a laboratory that studies Precambrian organisms in Moscow, suggests that a global drop in temperature, along with the oxygenation of the atmosphere by photosynthesizing cyanobacteria, made heavy metals more available which helped enzymes develop faster (7: 143). An interesting theory that could explain why the Cambrian was more conducive to the development of one of the building blocks of higher life forms, but one that is still very hypothetical and hardly puts the whole issue to rest.

The Cambrian Explosion remains one of the mysteries of macroevolution. When evolutionist Kenneth Miller, in his book *Finding Darwin’s God*, responded to ID criticisms of macroevolution in light of the fossil record, he conveniently avoided the gap before the Cambrian and instead focused on specific fossils which, if anything, illustrate later transitions (9: 109-110). Future geological discoveries may fill in the gaps, but so far science has been unable to satisfactorily explain why so many different phyla appeared in the Cambrian, and never again.

The First Life

If the explosion of new and entirely distinct life forms in the Cambrian isn't enough of a mystery, what if one goes much further back to the first development of life? There was an abundance of life (bacteria and individual organic cells) well before the Cambrian. How this very early life developed is something we will probably never know for sure. But that doesn't mean we can't consider what would have had to happen and conclude something about whether unguided natural processes could have produced it.

Lest we dismiss this early prokaryotic and eukaryotic life as simple, it's worth noting the description by Arizona State University professor Paul Davies in his book *The Origin of Life*:

"The living cell is the most complex system known to man. Its host of specialized molecules, many found nowhere else but within living material, are themselves enormously complex. They execute a dance of exquisite fidelity, orchestrated with breathtaking precision." (25)

Scientists have done a great deal of research to try to determine how life may have originated on the early earth, and much of this has to do with understanding the composition of the earth's early atmosphere. In 1953, Stanley Miller of the University of Chicago was able to produce amino acids by combining heat, electricity and what was then believed to be the earth's early atmosphere (hydrogen, water, methane and ammonia). After that, scientists decided the early atmosphere must have been comprised mostly of carbon dioxide, nitrogen and water from volcanic outgassing (23: 15-16). Experiments with these gases mostly failed Miller's experiment. Yet a recent study claims that the early atmosphere was indeed hydrogen-rich (due to it escaping the atmosphere at a slower rate than previously thought), and therefore more like the environment in Miller's experiment (26). If this is true, it would seem to show that some of the basic components of life could indeed have been made naturally.

Does this mean that life could have developed on its own through heat and electrical bursts (like lightning), Frankenstein-style? Not so fast. For one thing, where did this electrical energy come from? Could conventional lightning have occurred in an atmosphere rich in hydrogen and lacking oxygen? But more importantly, even if amino acids were produced by some natural process, does this really get us that much closer to life? In his scientifically-detailed book, *The Naked Emperor: Darwinism Exposed*, British doctor Antony Latham describes what science is still far from explaining.

Scientists get excited about the possibility of amino acids being generated because proteins, the building blocks of life, are comprised of chains of them. The proteins in living organisms are created by DNA (*deoxyribonucleic acid* - two strands of molecules coiled into a helix), RNA (*ribonucleic acid* - similar but simpler molecule) and ribosomes (protein assembling factories), the first two of which are illustrated in Figure 4 (27). In very simple terms, the DNA contains the design for the protein, which is carried by messenger RNA to a ribosome, which builds the protein out of amino acids

delivered by transfer RNA. The messenger RNA controls the ribosome's production so that it stops at the right time, and *voilà*, you have protein.

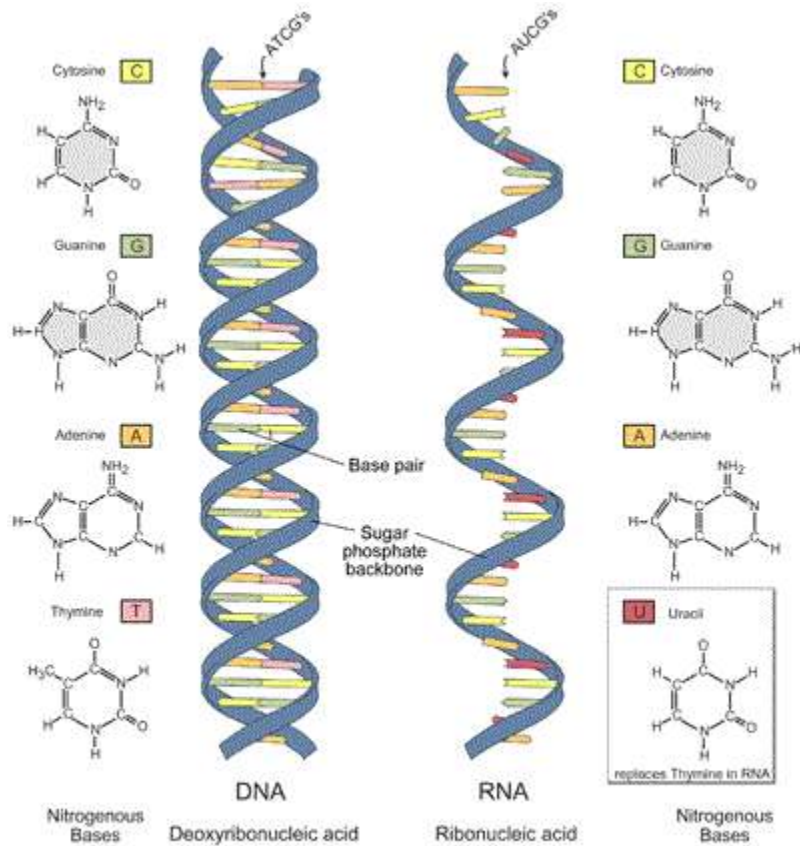


Image adapted from: National Human Genome Research Institute.

Figure 4: DNA and RNA.

To get around this complexity, scientists have suggested that at one time in earth's history, there was only RNA. DNA, after all, is formed from synthesized RNA. But this hardly reduces the complexity of the system; if anything, it simply makes RNA fill more roles. Scientists also point out that some of the base molecules of RNA and DNA have been produced in labs in a way which could have conceivably occurred in nature. But, as with the amino acids, the existence of these units separate from their highly complex arrangement in RNA and DNA is hardly an explanation for how RNA and DNA could have developed unaided. The process that produces these (and simpler) forms of nucleic acid is itself extremely complex. Additionally, the intermediate steps leading to these acids are of dubious advantage, which would be necessary for them to be naturally selected. Because of these difficulties, some scientists have shifted the problem to potential "precursor replication systems," whose existence is entirely hypothetical (23: 17-20).

There are numerous other important questions, such as where the information for the DNA came from in the first place, and what determined it to be meaningful before there

was a larger system to put the proteins to use. Scientists continue to search for new pieces to the puzzle, but as we've seen, so far have only been able to show that the most basic components of life could have hypothetically been produced by natural processes. The incredible complexity of something as fundamental to life as DNA and protein production leads ID theorists to one conclusion: a designer had to have been involved.

Conclusion

The mind-boggling complexity and beauty of our world has long been used as evidence of a creator. In recent years, however, the advances of science have unveiled details about the history of life that lead some to the conclusion that it developed by natural processes only, without the help of some supernatural designer. Not surprisingly, many have rejected this view on religious grounds since it seems to eliminate the need for God in the creation story. Yet as we've seen, the potential for biased interpretation is not exclusive to theists. Many scientists have a naturalistic worldview and thus philosophically favor a godless explanation for life.

Despite these biases, science has moved forward, uncovering new details about life. Scientists of both theistic and atheistic persuasions have delved into these details, using them to support their view. In this paper, we've explored just a few highly debated topics which involve highly credentialed scientists on both sides.

It appears that, although evolution is clearly a powerful force for change within species, the much larger application of this process to explain the development of life throughout history remains questionable at best. In fact, much of the tree of life appears to be based more on imagined intermediate steps than actual hard evidence. Yes, scientists have uncovered some samples of what appear to be transitional species. Yes, scientists have produced amino acids with what may have been earth's early atmosphere. But these achievements, the significance of which may have even been exaggerated, don't even begin to explain how the incredibly complex building blocks of life could have been constructed through mere natural selection and chance.

The controversy is hardly coming to an end and, due in part to science's inability to prove or disprove God, probably never will. But hopefully this report has succeeded in summarizing the essential arguments in the macroevolution vs. intelligent design debate and has given enough of a basis to form some tentative conclusions on the matter, keeping in mind that new discoveries may shift the balance of the argument at any time.

Appendix A: Bibliographies of Sources

List of Works Cited

1. "Evolution." *Microsoft Encarta Online Encyclopedia 2007*. 9 June 2007
<<http://encarta.msn.com>>
2. MacRae, Andrew. "Radiometric Dating and the Geological Time Scale." *TalkOrigins.org*. 11 June 2007 <<http://www.talkorigins.org/faqs/dating.html>>
3. Wiens, Dr. Roger. "Radiometric Dating: A Christian Perspective." *American Scientific Affiliation*. 11 June 2007
<<http://www.asa3.org/aSA/resources/Wiens.html>>
4. "Evolution." *Backyardnature.net*. 24 March 2007. 11 June 2007.
<<http://www.backyardnature.net/evolving.htm>>
5. "Geological History." *Fossilmuseum.net*. 11 June 2007.
<<http://www.fossilmuseum.net/GeologicalHistory.htm>>
6. Theobald, Douglas. "29+ Evidences for Macroevolution: The Scientific Case for Common Descent." *The TalkOrigins Archive*. Vers. 2.87. 2006. 3 June, 2007.
<<http://www.talkorigins.org/faqs/comdesc/>>
7. Shermer, Michael. *Why Darwin Matters: The Case Against Intelligent Design*. New York: Times Books, 2006.
8. "Frequently Asked Questions" *Discovery Institute*. 17 June 2007.
<<http://www.discovery.org/csc/>>
9. Woodward, Thomas. *Darwin Strikes Back: Defending the Science of Intelligent Design*. Grand Rapids: Baker Books, 2006.
10. "Peer-Reviewed & Peer-Edited Scientific Publications Supporting the Theory of Intelligent Design" *Discovery Institute*. 05 June 2007. 16 June 2007.
<<http://www.discovery.org/csc/>>
11. "Intelligent Design?" *Natural History Magazine*. April 2002. 15 June 2007.
<<http://nhmag.com/darwinanddesign.html>>
12. Ruse, Michael. Speech transcript. *Access Research Network*. 13 February 1993.
<<http://www.arn.org/docs/orpages/or151/mr93tran.htm>>
13. Lewontin, Richard C. "Billions and Billions of Demons." *The New York Review of Books*. 9 January 1997.

14. Darwin, Charles and Joseph Carroll, ed. *On the Origin of Species by Means of Natural Selection*. Peterborough, ON: Broadview Press, 2003.
15. Behe, Michael. *Darwin's Black Box: The Biochemical Challenge to Evolution*. New York: Free Press, 1996.
16. McDonald, John. "A Reducibly Complex Mousetrap." *University of Delaware*. 24 March 2002. 17 June 2007. <<http://udel.edu/~mcdonald/mousetrap.html>>
17. Robison, Keith. "Darwin's Black Box: Irreducible Complexity or Irreproducible Irreducibility?" *The TalkOrigins Archive*. 11 December 1996. 17 June 2007. <<http://www.talkorigins.org/faqs/behe/review.html>>
18. Doolittle, Russell. "A Delicate Balance." *Boston Review*. Feb/March 1997.
19. Behe, Michael. "In Defense of the Irreducibility of the Blood Clotting Cascade..." *Discovery Institute*. 31 July 2000. 17 June 2007. <<http://www.arn.org/docs/behe>>
20. "Serine Proteases: Introduction and Overview." *Washington University Department of Biochemistry*. 2000. 17 June 2007. <<http://biochem.wustl.edu/~protease/>>
21. *Darwinism Refuted*. Originally found in *The Book of Life*, Stephen Jay Gould, ed. <<http://www.darwinismrefuted.com/20questions02.html>>
22. "The Cambrian Period." *University of California Museum of Paleontology*. 17 June 2007. <<http://www.ucmp.berkeley.edu/cambrian/camb.html>>
23. Latham, Antony. *The Naked Emperor: Darwinism Exposed*. London: Janus Publishing Company, 2005.
24. Gould, Stephen Jay. *Wonderful Life*. New York: Vintage, 1990.
25. Davies, Paul. *The Origin of Life*. Allen Lane: Penguin, 1998.
26. "CU Study Shows Early Earth Atmosphere Hydrogen-Rich, Favorable to Life." *University of Colorado at Boulder*. 6 April 2005. 19 June 2007. <<http://www.colorado.edu/news/releases/2005/156.html>>
27. "RNA and Protein Synthesis." *University of Central Arkansas*. 19 June 2007. <<http://faculty.uca.edu/~johnc/rnaprot1440.htm>>

List of Works Consulted

1. Geisler, Norman and Frank Turek. *I Don't Have Enough Faith to be an Atheist*. Wheaton: Crossway Books, 2004.
2. *Uncommon Descent*. The Intelligent Design Weblog of William Dembski, Denyse O'Leary and Friends. 16 June 2007. <<http://www.uncommondescent.com>>