Intelligent Design: Session 3: Biological Systems

Start with DVD footage - 'Unlocking the Mystery of Life' – Section from 10:20 to 21:55.

Let us look again at the predictions referred to at the close of the last session:

Table I Some Predictions Made by the Naturalistic (Evolutionary) Origin-of-life Scenario

1. Chemical evidence for the prebiotic soup will be found in the geological record.
2. Placid chemical and physical conditions existed on the early earth for long periods of time.
3. Chemical pathways leading to the formation of biomolecules will be found.
4. Chemical pathways that produce biomolecules would have been capable of operating under the conditions of the early earth.
5. Life emerged gradually over a long period of time.
6. Life originated only once.
7. Life in its minimal form is simple.

Table II Some Predictions Made by the RTB Biblical Origin-of-life Scenario

1. Life appeared early in Earth's history.
2. Life appeared under harsh conditions.
3. Life miraculously persisted under harsh conditions.
4. Life arose quickly.

Recent Scientific Discoveries in Origin-of-life Research

Comparing the predictions made by the two origin-of-life scenarios with the record of nature provides the best means of assessing the validity of the two competing models. Some of the most recent breakthrough discoveries in origin-of-life research specifically address predictions made by the two models.

Timing of Life's Appearance

Origin-of-life researchers have recently uncovered unequivocal evidence that life first appeared early in Earth history, shortly after the formation of the first rocks. The oldest rocks yet discovered on Earth date at around 3.9 billion years old. Prior to this time, the earth existed largely in a molten state unsuitable for life.

Researchers have identified carbonaceous deposits—deposits made up of carbon compounds such as kerogen tars, graphite and apatite—from the earth's oldest rocks, dated at 3.86 billion years old. The chemical signature of these carbonaceous deposits indicates that they were produced as the by-product of *biological* activity.

Conditions at the Time of Life's Appearance

Life first appeared and spent its early existence under unimaginably harsh conditions. In scientific terms, it should not have originated, let alone persisted. From the time of Earth's formation (at 4.55 billion years ago) until around 3.9 billion years ago, the planet experienced frequent impacts.

Some of the objects (asteroids, comets, and planetesimals) striking the earth were approximately 100 km in diameter.

Many of these events still would have vaporized the earth's oceans, leading to a wholesale destruction of life. Between 3.9 and 3.5 billion years ago, multiple origin-of-life events must have taken place with the maximum time window between impact events, and hence for the origin of life, being 10 million years.

Soup or No Soup?

To date, origin-of-life researchers have failed to recover any geochemical remnants of prebiotic molecules—organic molecules produced by nonbiological processes.

All the carbonaceous deposits recovered from the oldest rocks are, without exception, the by-product of biological activity. The "absence of evidence" for a prebiotic soup must be taken as "evidence of absence."

If a prebiotic soup was not present on the early earth, the existing conditions would not support the formation of prebiotic molecules.

Conversely, if it is discovered that the conditions of early Earth were not conducive to the formation of prebiotic molecules, a prebiotic soup would not be found within the geological record.

Fitting with the lack of evidence for a prebiotic soup is the growing recognition that the early earth's conditions would not have supported the synthesis of prebiotic molecules.

Viability of Chemical Pathways to Life

The prebiotic soup predicted by the textbook evolutionary model did not exist on early Earth.

Even more problematic for the naturalistic origin-of-life scenario is the recognition that the conditions of the hypothetical primordial soup and of the early earth would have inhibited most, if not all, potential prebiotic chemical routes.

New evidence indicates that the transition metals and rare earth elements in the early earth's oceans would have promoted the decomposition of what many scientists believe were key intermediate chemical compounds taking part in the most widely accepted evolutionary origin-of-life scenarios.

The hypothetical primordial soup would have undoubtedly been a complex chemical mixture comprised of a large number of chemical species.

Given the likelihood of widespread chemical interference in the hypothetical primordial soup, the success of origin-of-life researchers in preparing biochemical compounds is a false success. Origin-of-life investigators typically study potential prebiotic pathways under unrealistic, controlled, chemically pristine conditions.

Simplicity or Complexity of First Life?

New evidence indicates that life in its minimal form is chemically complex even if morphologically simple. The smallest bacterial genomes (In biology the **genome** of an organism is the whole hereditary information of an organism that is encoded in the DNA (or, for some viruses, RNA) capable of independent survival include between 1500-1900 gene products.

These bacteria are believed to be the oldest organisms on Earth and quite likely reflect the complexity of first life on Earth and the minimum complexity of independent life. The smallest known genome, that of *Mycoplasma genitalium,* is comprised of 470 gene products.

However, *M. genitalium* is not an appropriate model for the origin of life, for it depends on host biochemistry to survive and, therefore, cannot exist independently. Nonetheless, *M. genitalium* is a good model for determining the bare minimum requirements for life.

Biophysicist Hubert Yockey has calculated the probability of forming a single gene product (one that is functionally equivalent to the ubiquitous protein cyctochrome C) as one chance in 10^{75}.

Given this probability, Yockey calculated that if the hypothetical primordial soup contained about 10^{44} amino acids, a hundred billion trillion years would yield a 95% chance for random formation of a functional protein only 110 amino acids in length (a single gene product).

The universe is about 14 billion years old. This means that less than one trillionth of the time has passed that would be needed to make even one of the 250-350 gene products necessary for minimal life, or one of the 1500 gene products necessary for independent life.

Biblical Description Agrees with Scientific Discoveries

Comparing the predictions of the biblical origin-of-life model with the most recent discoveries coming from origin-of-life research reveals remarkable agreement. Life originated early and quickly in Earth's history under hostile conditions. Moreover, life as it first appeared, in its minimal form, possesses enormous complexity.

None of the predictions that come from the naturalistic model are satisfied by the most recent scientific results. From a naturalistic perspective, supra-astronomical probabilities argue against the required simultaneous assembly of the molecular components needed for life to function in its most minimal form.

Perhaps most devastating of all is the absence of a primordial soup on early Earth. All origin-of-life models that appeal exclusively to natural processes have as their chief requirement a primordial soup. Even if a primordial soup existed, however, the chemical processes supposedly taking place in the soup seem incapable of producing life.

Functionality:

Organisms display the hallmarks of intelligently engineered high-tech systems-information storage and transfer, functioning codes, sorting and delivery systems, self-regulation and feedback loops, signal-transduction circuitry-and every where, complex arrangements of mutually interdependent and well-fitted parts that work in concert to perform a function.

In a widely cited speech, nobel laureate David Baltimore remarked, "Modern biology is a science of information." Many other biologists have likewise identified information as biology's central problem.

For matter to be alive, it must be suitably structured. a living organism is not a mere lump of matter. Life is special, and what makes life special is the arrangement of its matter into very specific forms. In other words,.. what makes life special is 'information'. Where did the information necessary for life come from?

This question cannot be avoided, Life has not always existed.

There was a time in the history of the universe when all matter was lifeless. And then life appeared-on earth and. perhaps elsewhere.

The appearance of life constitutes a revolution in the history of matter. A vast gulf separates the organic from the inorganic world, and that gulf is properly characterized in terms of information.

Antibiotic resistance in bacteria and insecticide resistance in insects can be readily accounted for in terms of the Darwinian mechanism. But can that mechanism or any other purely natural mechanism account for how we got bacteria and insects in the first place?

And if not, what is it about the information exhibited by such systems that conclusively tells us they could not have been formed by purely natural means? To say that something formed by purely natural means is to say that it resulted from necessity, chance or a combination of these.

To show that some biological system is designed therefore requires, at a minimum, showing that it could not reasonably have formed by these means. This in turn requires ruling out necessity, chance and their combination as sufficient to account for the biological system in question, This is not to say that natural forces were uninvolved.

For instance, just as a rusted old automobile shows the effects of both design (engineering) and natural forces (weathering and corrosion), so too biological systems can exhibit the effects of design and natural forces.

Creative Innovation:

Darwinianism is a theory about process. A certain type of process took organisms of type A and transformed them into organisms of type B. The Darwinian process occurs in discrete steps (the finest level of resolution of those steps being the generation of one organism from another in reproduction). Darwinism is committed to a sequence of manageable steps that gradually transforms A into B.

In consequence, there has to be some sequence such that a = A1 transforms into A2, which in turn transforms into A3,. . . which then transforms into An = B, where each transition from one step to the next can readily be accounted for in terms of natural selection and random variation.

Thus, for instance, in a Darwinian explanation of the bacterial flagellum, we know that bacteria lacking a flagellum (and also lacking any genes coding for a flagellum) had to evolve into bacteria with a flagellum (and thus possessing a novel genetic complement for the flagellum).

If Darwinism is correct, some step-by-step Darwinian process had to take us from the former type of bacteria to the latter.

Intelligent design, in contrast to Darwinism, is not a theory about process but about **creative** innovation. Now creative innovation is not a process. Creative innovation can occur in a process, but even then it is a process where each step constitutes an individual creative act (a micro-innovation, as it were).

In our experience with intelligences, creative innovation is a unifying conceptual act that ties together disparate elements into a purposeful whole. The act can occur over time in a process, or it can occur in one fell swoop. But in either case, creative innovation is not reducible to a causal chain where one step "causes" the next.

The demand for details is a demand for causal specificity: that is, it is about finding the precise causal antecedents that account for and thus predict (whether deterministically or probabilistically) an event, object or structure.

But intelligences are free. In the act of creation they violate expectations. They create as they choose to create. There's nothing that required Mozart to compose his Jupiter Symphony or Bell to invent the telephone or Shakespeare to write King Lear.

And there's no way to have predicted these creative innovations. Consequently, the demand for causal details applies secondarily, not primarily, to creative innovation and therefore to intelligent design.

In the theory of intelligent design, the demand for causal details comes up in the antecedent (i.e. initial/required) circumstances that condition (but do not determine, explain or account for) creative innovation. Antecedent circumstances set the stage for creative innovation.

Technologies, for instance, evolve by building on previous technologies. But they evolve in the first instance by inventors having ideas. Where do those ideas come from? Antecedent circumstances are not much help here. No set of antecedent circumstances can account for a creative innovation.

Antecedent circumstances, however, need definitely to be considered for their effect on constraining the innovations that are produced. Beethoven, for instance, could not have written music for the piano until after the piano was invented.

ID will focus in coming years on tracing the antecedent circumstances that lead up to and thereby condition the design of biological systems and then in tracing the impact of those systems throughout the biological world.

The demand for details therefore remains a live issue for intelligent design. But it is not the primary issue. The primary issue is to determine whether there is design (i.e., creative innovation by an intelligence) in the first place. And for that you need specified complexity.

Bottom line; Darwinism has a burden of proof that intelligent design does not have.

Darwinism is a theory of process and therefore needs to provide convincing evidence that the processes it describes are able to bear the weight placed on them. That weight is considerable--indeed, no less than the whole of biological complexity and diversity.

Intelligent design by contrast has a different burden. As a theory of creative innovation, its burden is to show where creative innovations first emerge and then to trace their causal antecedents and consequences. Darwinism and intelligent design therefore face fundamentally different tasks.

What, then, would such features beyond the reach of Darwinian evolution look like? Certainly they would need to be highly improbable with respect to Darwinian evolution, for otherwise Darwinian evolution could readily account for them.

But sheer improbability is not enough inasmuch as highly improbable things happen by chance all the time. As a consequence, for such features to reside beyond the reach of Darwinian evolution, they also need to be suitably patterned, or specified.

But for something to be highly improbable and specified means that it exhibits specified complexity; and specified complexity is a reliable empirical marker of actual design.

Thus we see that as soon as the possibility of a scientific alternative to Darwinism is' raised, logic leads us inescapably to a theory of intelligent design with' specified complexity at its center.

Either all features of biological systems result from hereditary transmission, incidental change and natural selection, or there are some features that exhibit specified complexity and therefore also result from design.

It follows that Darwinism is not the only game in town. For Darwinism to be the only game in town would require materialism to be inescapably true. But materialism is not the conclusion of a valid scientific inference or an inescapable truth of reason. Rather, it is an ideology that increasingly suffocates scientific inquiry.

Thus on the basis of causal adequacy, intelligent design is a better scientific explanation than Darwinism for the irreducible complexity of biochemical systems.

How plausible is the idea that a molecular motor (such as the bacterial flagellum) came about by naturalistic means? Today's leading scientists have created a crude molecular motor:

Human engineers have produced a tiny molecular motor that, by comparison, points to superior design in nature's motors. Scientists have synthesized a motor that rotates objects bound to it when irradiated with UV radiation. Even though this work could be considered "science at its very best," the motor's operation is crude and cumbersome. This motor stands in sharp contrast to the incredibly complex,

efficient, and elegant rotary motors (like the bacterial flagellum and F_1-F_0 ATPase) found inside the cell.

Therefore, it makes little sense to regard the molecular motors inside the cell as the product of blind, undirected, random processes, when they are far superior to anything that some of the best chemists in the world can produce.

- *Rienk Eelkema et al., "Molecular Machines: Nanomotor Rotates Microscale Objects," Nature 440 (2006): 163.*

In his book *Evolution: A Theory in Crisis*, Denton argues at length that the neo-Darwinian synthesis is a failed scientific paradigm. It bears noting that Denton is an agnostic in matters of religious faith, thus in criticizing Darwinism he has no religious axe to grind.

The problems facing Darwinism are there, and they are glaring: the origin of life, the origin of the genetic code, the origin of multicellular life, the origin of sexuality, the gaps in the fossil record, the biological big bang that occurred in the Cambrian era, the development of complex organ systems, and the development of irreducibly complex molecular machines are just a few of the more serious difficulties that confront every theory of evolution that posits only purposeless, material processes.

What keeps Darwinism alive? Why is it so difficult to debate its merits fairly? In so pluralistic a society as ours, why don't alternative views about life's origin and development have a legitimate place in academic discourse?

Biological Convergence throughout Life's History is another major stumbling block for any theory of evolution:

> *Scientists have discovered that ecological and functional features of life's history have been replicable. According to evolutionary paleontologist Stephen Jay Gould, if one were to rewind the tape of life and replay it, the outcome would be different each time. The concept of historical contingency maintains that evolution will not produce the same outcome repeatedly, since its mechanism relies on a sequence of chance events. Numerous studies indicate that indeed throughout life's history there have been repeated, independent origins of specific complex anatomical, physiological, and behavioral systems. New research based on analysis of the fossil record indicates that this pattern extends beyond particular instances to the entirety of life's history. The recognition that repeated functional and ecological manifestations characterize the flow of life's history challenges the veracity of evolution, but finds ready explanation if an Intelligent Desinger repeatedly used the same good designs throughout life's history.*

- *Geerat J. Vermeij, "Historical Contingency and the Purported Uniqueness of Evolutionary Innovations," Proceedings of the National Academy of Sciences, USA*103 (2006): 1804-09.

The hypothesis that all life forms are related through "common ancestry" can be tested by constructing hypothetical "family trees" (called "phylogenetic trees"). In the field of systematics, evolutionists construct phylogenetic trees by comparing the similarities of characteristics of organisms, such as genes or DNA sequences.

If common descent is true, the trees should show neat lines of ancestry and inheritance that are consistent with common descent.

Such comparisons often do not form a "tree" (see "bush" is flash presentation). This "bush" phenomenon is not uncommon as one evolutionist said,
"competing … proposals [of] the prevailing phylogenies of the mammalian orders would reduce [the mammalian tree] to an unresolved bush..."

This occurs because when different characteristics of organisms are compared, one finds they commonly predict different trees. This should not be the case if common ancestry is true.

Furthermore, such analyses assume similarities are the result of common descent rather than "common design" (compare the limbs –also in the presentation version- as evidence for "common design"). These assumptions and discrepancies show that evidence for common ancestry is weak.

Evolution predicts there were intermediate stages in the evolution of life where one form turned into another. These "transitional forms" however, are not found for the vast majority of the time in the fossil record.

Charles Darwin said in The Origin of Species:
...The number of intermediate varieties, which have formerly existed on the earth, [must] be truly enormous. Why then is not every geological formation and every stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and gravest objection which can be urged against my theory."

Out of tens of thousands of species known from the fossil record, only a few are claimed to be any of Darwin's "intermediate links."

However, a close analysis of these few fossils (commonly cited ones are Archaeopteryx [a bird], Ambulocetus [a land mammal], and Acanthostega [an amphibian]) reveal that they do not shed any light on the origin of the important features of their respective groups and are often incomplete.

For this reason, famous paleontologist, the late Stephen J. Gould, wrote:
"The absence of fossil evidence for intermediary stages between major transitions in organic design, indeed our inability, even in our imagination, to construct functional intermediates in many cases, has been a persistent and nagging problem for gradualistic accounts of evolution."

(Fossils are the hardened remains of organisms. The "fossil record" is the collective types of fossils that have been discovered by paleontologists.)

Gould proposed a theory called "Punctuated Equilibrium," implying that "transitional forms" were unlikely to be fossilized because transitions occurred rapidly in populations that were small.

However punctuated equilibrium does not fit with the workings of genetics, for too much biological complexity must be built in too few generations of life.

Darwin's notion of long periods of time allowing for complex changes of biology is not allowed under Punctuated Equilibrium. The lack of transitional forms remains unaccounted for and is a strong line of evidence against Darwin's theory.

The Cambrian Explosion (the main problem that led to Gould proposing his 'Punctuated Equilibrium model) is a major stumbling block for Darwinian evolution – there is now new genetic evidence for this event:

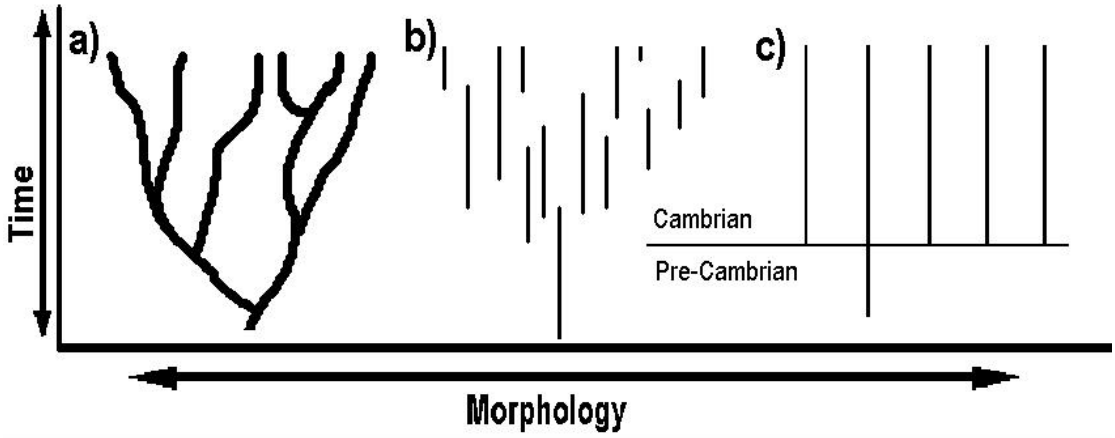
> *A new study provides evidence that the Cambrian explosion-biology's big bang-was a real event as described by the fossil record. Around 540 million years ago, approximately 50 to 80% of all*

animal phyla to ever exist appeared explosively over a short period of time (less than 5 million years in duration).

In an effort to understand evolutionary relationships during the period, researchers compared the gene sequences of a large group of metazoans. They concluded that the relationships remain "unresolved," meaning that the Cambrian explosion is indeed a real event, and not illusory as some evolutionary biologists claim.

The Cambrian explosion stands as one of the biggest enigmas facing the evolutionary paradigm. On the other hand, biology's big bang serves as a powerful fingerprint for an Intelligent Designer's intervention in life's history.

- *Antonis Rokas, Dirk Krüger, and Sean B. Carroll, "Animal Evolution and the Molecular Signature of Radiations Compressed in Time," Science 310 (2005): 1933-38.*



This diagram illustrates the lack of transitional forms in the fossil record. The vertical axis represents time, and the horizontal axis represents "morphology" (body structure of an organism).

Darwin's theory (a) predicted that fossil transitions between different body types would be found. When transitions were not found, evolutionists proposed hypothetical model (b), punctuated equilibrium, where the transitional forms were not fossilized. Model (C) represents the actual fossil record with regards to the origin of the major types (phyla) of animals. Many types of organisms suddenly appear in the "Cambrian" period, looking more like sudden creation or design than evolution.

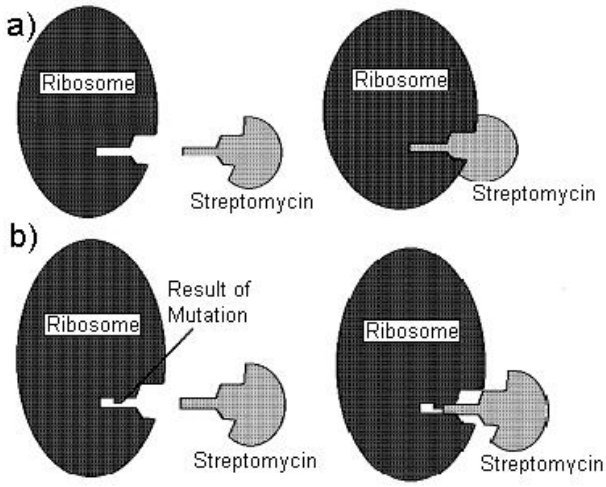
Evolutionary theory claims random mutations can build complicated structures. Yet mutations are almost always harmful. As Nobel Prize winner H.J. Muller concedes, *"[i]t is entirely in line with the accidental nature of natural mutations that extensive tests have agreed in showing the vast majority of them to be detrimental to the organisms in its job of surviving and reproducing, just as changes accidentally introduced into any artificial mechanism are predominantly harmful to its useful operation."*

French evolutionist Pierre-Paul Grasse noted, *"[n]o matter how numerous they may be, mutations do not produce any kind of evolution."*

One oft-cited example of a rare "beneficial" mutation is antibiotic resistance in bacteria. Yet antibiotic resistance does not create new information in the genome (see right). This sort of evolution is microevolution because it involves only minor change "within a species" and does not add information. Antibiotic resistance is different from macroevolution and does not explain how new

biological structures arise. Interestingly, resistant bacteria face a net "fitness cost" and are weakened by the very mutation that made them drug-resistant.

Antibiotic resistance usually involves the origin of no new information into the genome. In part a, streptomycin, an antibiotic drug, attaches to a matching site on bacterial ribosomes to interfere with proteinsynthesis. In part b, a mutation in the matching site of the ribosome prevents the streptomycin molecule from attaching, making the bacterial cell resistance to the streptomycin. This simple point mutation causes only a minor structural change and does not explain how new complex biological structures can arise. Antibiotic resistance does provide support for macroevolution.



End of Session 3: Next → Session 4 – Answering the critics.