Frequently Asked Questions about Intelligent Design

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What is Intelligent Design (ID)?

Intelligent Design is the study of patterns in nature that are best explained as the result of intelligence.

-- William A. Dembski

Design theory—also called design or the design argument—is the view that nature shows tangible signs of having been designed by a preexisting intelligence. It has been around, in one form or another, since the time of ancient Greece. The most famous version of the design argument can be found in the work of theologian William Paley, who in 1802 proposed his "watchmaker" thesis. His reasoning went like this:

In crossing a heath, suppose I pitched my foot against a stone, and were asked how the stone came to be there; I might possibly answer, that, for anything I knew to the contrary, it had lain there for ever. ... But suppose I had found a watch upon the ground, and it should be inquired how the watch happened to be in that place; I should hardly think the answer which I had before given [would be sufficient].[1]

To the contrary, the fine coordination of all its parts would force us to conclude that

… the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers, who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use. [2]

Paley argued that we can draw the same conclusion about many natural objects, such as the eye. Just as a watch's parts are all perfectly adapted for the purpose of telling time, the parts of an eye are all perfectly adapted for the purpose of seeing. In each case, Paley argued, we discern the marks of an intelligent designer.

Although Paley's basic notion was sound, and influenced thinkers for decades, Paley never provided a rigorous standard for detecting design in nature. Detecting design depended on such vague standards as being able to discern an object's "purpose." Moreover, Paley and other "natural theologians" tried to reason from the facts of nature to the existence of a wise and benevolent God.

All of these things made design an easy target for Charles Darwin when he proposed his theory of evolution. Whereas Paley saw a finely-balanced world attesting to a kind and just God, Darwin pointed to nature's imperfections and brutishness. Although Darwin had once been an admirer of Paley, Darwin's own observations and experiences—especially the cruel, lingering death of his 9-year-old daughter Annie in 1850—destroyed whatever belief he had in a just and moral universe.

Following the triumph of Darwin's theory, design theory was all but banished from biology. Since the 1980s, however, advances in biology have convinced a new generation of scholars that Darwin's theory was inadequate to account for the sheer complexity of living things. These scholars—chemists, biologists, mathematicians and philosophers of science—began to reconsider design theory. They formulated a new view of design that avoids the pitfalls of previous versions.

Called intelligent design (ID), to distinguish it from earlier versions of design theory (as well as from the naturalistic use of the term design), this new approach is more modest than its predecessors. Rather than trying to infer God's existence or character from the natural world, it simply claims "that intelligent causes

are necessary to explain the complex, information-rich structures of biology and that these causes are empirically detectable." [3]

ARN Recommends

For more information about the basic concept of intelligent design, see the following resources:

Intelligent Design: The Bridge Between Science and Theology. **William A. Dembski**

Mere Creation: Science, Faith, & Intelligent Design. **edited by William A. Dembski**

Rhetoric & Public Affairs **Special Issue on Intelligent Design. John Angus Cambell, ed.**

For those who are interested in the problem of pain and the role it played in Darwin's life and work, see:

Darwin's God: Evolution and the Problem of Evil. **Cornelius G. Hunter**

Notes

[1] William Paley, *Natural Theology; or, Evidences of the Existence and Attributes of the Deity,* 12th ed. (London: J. Faulder, 1809), p. 1.

[2] Paley, p. 3.

[3] William A. Dembski, *Intelligent Design* (Downer's Grove, Ill: InterVarsity, 1999), p. 106.

How Can You Tell if Something is Designed? Isn't that Pretty Subjective?

In the previous question, we noted that intelligent design is much more modest than earlier versions of design theory. But it's also more powerful. Instead of looking for such vague properties as "purpose" or "perfection"—which may be construed in a subjective sense—it looks for the presence of what it calls specified complexity, an unambiguously objective standard.

That term sounds like a mouthful, but it's something we can all recognize without effort. Let's take an example.

Imagine that a friend hands you a sheet of paper with part of Lincoln's Gettysburg address written on it:

FOURSCOREANDSEVENYEARSAGOOURFATHERSBROUGHTFORTHONTHISCONTINE-
NTANEWNATIONCONCEIVEDINLIBERTY …

Your friend tells you that he wrote the sentence by pulling Scrabble pieces out of a bag at random.

Would you believe him? Probably not. But why?

One reason is that the odds against it are just too high. There are so many other ways the results could have turned out—so many possible sequences of letters—that the probability of getting that particular sentence is almost nil.

But there's more to it than that. If our friend had shown us the letters below, we would probably believe his story.

ZOEFFNPBINNGQZAMZQPEGOXSYFMRTEXRNYGRRGNNFVGUMLMTYQXTXWORNBWIGB-
BCVHPUZMWLONHATQUGOTFJKZXFHP …

Why? Because of the kind of sequence we see. The first string fits a recognizable pattern: It's a sentence written in English, minus spaces and punctuation. The second string fits no such pattern.

Now we can understand specified complexity. When a design theorist says that a string of letters is specified, he's saying that it fits a recognizable pattern. And when he says it's complex, he's saying there are so many different ways the object could have turned out that the chance of getting any particular outcome by accident is hopelessly small.

Thus, we see design in our Gettysburg sentence because it is both specified and complex. We see no such design in the second string. Although it is complex, it fits no recognizable pattern. And if our friend had shown us a string of letters like "BLUE" we would have said that it was specified but not complex. It fits a pattern, but because the number of letter is so short, the likelihood of getting such a string is relatively high. Four slots don't give you as many possible letter combinations as 143, which is the length of our Gettysburg sentence.

So that's the basic notion of specified complexity. But let's elaborate the idea by looking at an example that doesn't involve letters.

Imagine that you're standing in a football stadium that's covered by a dome. The stadium is well lit, and as you look around, you discover three red bull's eyes. One is painted on the dome overhead and two are

painted on seats. Upon closer inspection, you find that the bull's eye on one of the seats has an arrow sticking in it, dead center.

As you're looking at the arrow, your Scrabble-playing friend enters the stadium. He shouts a greeting and hurries over to where you're standing.

"I see you found my handiwork," he says. "I did that just a few minutes ago. I turned off the lights, entered the stadium, spun around a couple of times and shot an arrow in the dark. When I turned lights back on, I discovered that the arrow had struck a bull's eye. In fact, I've shot several arrows that way, and every time I fired a shot, it hit a bull's eye."

What would you think about your friend's story? As with the Gettysburg sentence, you'd be very skeptical. The odds of hitting a bull's eye without aiming are so low that you doubt he could have done it even once, let alone several times in a row.

But as with the Gettysburg example, there's more to it than low probability. If your friend had told you that he'd never hit a target, and that his arrow had landed in a different spot every time, you'd probably believe him. Why? Because his shots fit no discernable pattern, as defined by the targets.

Now we're in a position to give a broader description of specified complexity: Specified complexity is displayed by any object or event that has an extremely low probability of occurring by chance, and matches a discernable pattern. According to contemporary design theory, the presence of highly specified complexity is an indicator of an intelligent cause.

ARN Recommends

For more information on complex specified information see:

The Design Inference: Eliminating Chance through Small Probabilities. **William A. Dembski**

Intelligent Design. **William A. Dembski**

How Does Intelligent Design Apply to Biology?

As we saw earlier, one of the central claims of intelligent design (ID) is that "intelligent causes are necessary to explain the complex, information-rich structures of biology."

The more we learn about living organisms, the more they look like products of design rather than products of chance and natural law. Ironically, many opponents of intelligent design concede this fact. Oxford biologist Richard Dawkins, for example, says "Biology is the study of complicated things that give the appearance of having been designed for a purpose." [1]

Similarly, in a recent issue of the biology journal Cell, Bruce Alberts, a leading cell biologist and president of the National Academy of Sciences, wrote:

We have always underestimated cells. … The entire cell can be viewed as a factory that contains an elaborate network of interlocking assembly lines, each of which is composed of a set of large protein machines. … Why do we call the large protein assemblies that underlie cell function protein machines? Precisely because, like machines invented by humans to deal efficiently with the macroscopic world, these protein assemblies contain highly coordinated moving parts. [2]

Of course, biologists such as Dawkins and Alberts believe that the apparent design of living things is an illusion—produced not by an intelligent source, but by chance and natural law. Dawkins specifically states that Paley's "watchmaker" is natural selection, which produces complex systems by accumulating favorable genetic changes over time.

The notion of complex specified information (CSI) provides a way to test this claim. To see how this might work, let's consider one of the processes involved in human vision. (If this seems too technical to follow, you can skip this section without missing the main point.)

When light strikes a rod cell, a visual cell that's located in the retina, the rod cell produces an electrical charge that runs down a nerve cell and into the brain. How does the light set off the electrical charge?

In the absence of light, a rod cell maintains an electrically neutral state by letting sodium ions flow freely in and out of the cell. (An ion is an atom or group of atoms that carries an electric charge.) It does this by means of certain proteins embedded in the cell membrane. One protein, called an ion channel, acts like a gate, regulating the inflow of sodium ions. Another protein acts as a pump, pushing the sodium ions back out of the cell.

The ion channel opens and closes in response to another biomolecule, called cGMP. For convenience, we'll call it the opener. When the opener attaches to the ion channel, the channel opens up and lets positively charged sodium ions flow into the cell. When the opener falls off, the channel shuts and the flow of ions stops.

Under normal circumstances, there are so many opener molecules in the cell that they are continually attaching to the channel and then falling off. As a result, the channel is continually opening and closing.

That changes when light enters the cell. The light strikes a biomolecule that we'll call the trigger (its real name is 11-cis-retinal). This causes the trigger to change its shape, setting off a cascade of chemical reactions in the cell.

The result of all these reactions is that the opener gets snipped in two, and is no longer able to attach to the ion channel. Sodium ions are no longer able to enter the cell, and as the pump pushes more of them out, an

electrical charge develops. When the charge gets strong enough, the cell fires off an electrical impulse. Then another cascade of reactions restores the trigger and opener molecules to their original state, allowing the ion channel to function again.

Is this system designed or was it produced by strictly natural processes?

Darwinists would say no: All biological systems were "created" by a stepwise accumulation of random genetic mutations that are preserved by natural selection—or survival of the fittest. Existing systems are merely modifications of earlier systems, which were modifications of even earlier systems and so on.

Design theorists, on the other hand, would say yes—if the system exhibits specified complexity.

Who's right? Both sides would agree that this system is complex. It has lots of parts, and all these parts have to work together.

The real question, then, is how specified the system is: How broad are the requirements for a working system?

One way to answer this question is to tinker with the system and see what happens. How well does the system function when you start knocking out proteins or other biomolecules? How well do the molecules function when you alter them? If it can take a lot of hits and still work, then it isn't very specified, and could plausibly have been produced by an undirected, stepwise process. But if it can handle only minute changes, then the system is highly specified—and extremely unlikely to have been produced by chance.

Some systems are so highly specified that they seem to tolerate no change at all. One such system is the bacterial flagellum, an outboard motor that bacteria use to navigate their environment. It requires about 50 proteins to build. If you knock out any of these proteins, the flagellum either won't be built or won't work. the flagellum doesn't work. The flagellum thus seems to display not only specified complexity, but irreducible complexity.

More fascinating is a study reported in the journal Science. A team of researchers wanted to discover how many genes were necessary for the simplest organism to survive and reproduce. If you think of an organism's genes as its parts list, the scientists wanted to know how small they could make the parts list and still have a living, reproducing organism.

They did this, in part, by tinkering with a bacterium called Mycoplasma genitalium, which is the simplest known organism (though the recently discovered Nanoarchaeum equitans looks like it may become the new champ in this category). The organism's genetic code is about 580,000 letters long and spells out 480 protein-producing genes plus 37 "species" of RNA. After "knocking out" various protein-coding genes, the scientists have estimated that 265 to 350 of this bacterium's genes are "essential" for the organism to live and reproduce under laboratory conditions—an extremely favorable environment that would not be found on the early earth.

Is this a designed system? It looks like it. But the main point is that specified complexity gives us a standard to guide our research.

ARN Recommends

For further study of intelligent design and biology see the following resources:

Darwin's Black Box The Biochemical Challenge to Evolution. **Michael J. Behe**

Irreducible Complexity: The Biochemical Challenge to Darwinian Theory. **Michael J. Behe**

Notes

[1] Richard Dawkins, *The Blind Watchmaker* (New York: W.W. Norton & Company,), p. 1.

[2] Bruce Alberts, “The Cell as a Collection of Protein Machines: Preparing the Next Generation of Molecular Biologists,” *Cell,* 92(February 8, 1998): 291.

Haven't Scientists Shown that Biological Systems Evolved Naturalistically?

You will often hear that contemporary evolutionary theory is supported by overwhelming evidence. But much of this evidence is unimpressive unless you're already convinced that naturalistic evolution must be true.

To understand the kind of evidence cited by naturalistic evolutionists, let's go back to the stadium example from the above question, "What is Specified Complexity?"

Imagine that you challenged your friend's account of how the arrows landed in the targets.

"No problem," replies your friend. "I can prove it to you."

He holds up a bow and asks, "What is this?"

"A bow?"

"Correct!"

He then leads you to the target with the arrow in it and asks, "Now, what is this?"

"A target?"

"Yes! With an arrow in it," he exclaims.

Finally, your friend leads you to a panel with some switches on it. He flips the switches back and forth, which turns the stadium lights off and on.

Your friend then summarizes his case: "I've shown you the bow. I've shown you the arrow in the target, and I've shown you that I can turn the stadium lights off and on. What more evidence do you need?"

The evidence your friend presents is certainly consistent with his story. The problem, however, is that it's also consistent with other explanations, including the more likely explanation that he entered the stadium, turned on the light, walked over to the target and jammed the arrow in the bull's eye.

Much of the evidence for naturalistic evolution is no more decisive than our friend's story.

For example, following the news in June 2000 that the human genome had been sequenced, Nobel laureate David Baltimore announced in a New York Times opinion piece that the discovery "confirms something obvious and expected, yet controversial: our genes look much like those of fruit flies, worms and even plants. … [t]he genome shows that we all descended from the same humble beginnings and that the connections are written in our genes. That should be, but won't be, the end of creationism."

Such "evidence" is not remotely decisive unless you've already decided that only naturalistic causes could have created such organisms as fruit flies, worms and humans. But that's precisely what is at issue.

In fact, there is systematic evidence against contemporary evolution theory. Researchers in such fields as paleontology, embryology, microbiology, biochemistry and genetics have uncovered systematic evidence that is deeply at odds with naturalistic evolution.

This FAQ will gradually be expanded to review some of that evidence. In the meantime, if you're interested in further study, check out books and videos referenced at the end of this section.

Additionally, if you have the technical background, it would pay to examine some of the original sources cited in these books. When you study the scientific literature, you'll find that there is a huge disconnect between that literature and the popularized "science" that you'll read in the press and basic biology texts.

ARN Recommends

For well-researched summaries of the evidence against naturalistic evolution, see the following resources:

Books

Icons of Evolution: Science or Myth? **Jonathan Wells**

Evolution: A Theory in Crisis. **Michael Denton**

Darwin on Trial. **Phillip Johnson**

Videos

Icons of Evolution. **Cold Water Media, 2002.**

A Critique of Darwinist Icons. **ARN, 2002.**

Unlocking the Mystery of Life. **Illustra Media, 2002.**

How do You Assess the Evidence For and Against Naturalistic Evolution? Isn't that Kind of Broad?

When we talk about naturalistic evolution, we're talking about the claim that the diversity of life is the result of undirected, natural processes. In principle, one could come up with any number of possible naturalistic explanations for that diversity. How do you assess all those possible explanations?

We don't really have to—at least not at this point in the FAQ. The question we're concerned about here is not whether we can rule out every conceivable naturalistic theory, but whether scientists have shown that biological systems evolved naturalistically. That limits the field to proposals that are alleged to be well supported by evidence. Proposals that are merely "possible," "plausible" or "suggestive" are irrelevant.

The main contender for a supposedly well supported theory, of course, is Darwin's theory of evolution.

Darwin's theory has been cogently summarized by the late Harvard paleontologist and science historian, Stephen Jay Gould. According to Gould, Darwin's theory consisted of three basic facts and one inference. The facts are: "First, that all organisms produce more offspring than can possibly survive; second, that all organisms within a species vary, one from the other; third, that at least some of this variation is inherited by offspring."[1]

From these facts, said Gould, we easily infer the process of natural selection. Those organisms that inherit the more favorable variations will be better adapted to their local environment. This makes them better able to pass these variations to the next generation. Over successive generations, the proportion of those with favorable variations will grow—until they comprise virtually the whole population

Contemporary Darwinism (also called neo-Darwinism) adds to Darwin's original theory the notion that the favorable variations arise from random genetic mutations.

In discussing the evidence for naturalistic evolution, this FAQ will focus mainly on neo-Darwinism, though other views will be discussed as appropriate.

Notes

[1] Stephen Jay Gould, "Introduction," in Carl Zimmer, *Evolution: The Triumph of an Idea* (New York: HarperCollins Publishers, 2001), p. xii.

Doesn't the Fossil Evidence Support Naturalistic Evolution?

According to contemporary evolutionary theory, which is predominantly neo-Darwinist, life diversifies gradually. As favorable mutations accumulate over generations, preserved by natural selection, they produce new limbs, tissues and organs. Given enough time, species may change so radically that they bear almost no resemblance to their ancestors, or each other. This kind of change is often depicted as a branching "tree of life."

Neo-Darwinists portray the fossil evidence as a bulwark of support for their theory. For example, the National Academy of Sciences educational guidebook, Teaching about Evolution and the Nature of Science states, "The progression of species found in the fossil record provides powerful evidence for evolution."[1]

As evidence, they offer various examples of evolutionary transitions: land mammals to whales, apes to humans, the development of the mammalian hearing structures from reptilian jawbones, and so on.

However, the scientific literature shows that the rock record, far from supporting neo-Darwinism, has always been something neo-Darwinists have had to explain away. What the evidence shows is not gradual change, but sudden appearance and stability: Most fossils species appear all at once, fully formed, and exhibit no directional change throughout their stay in the rocks.[2]

The same is true above the species level. Paleontologist Robert L. Carroll notes that "the most striking features of large-scale evolution are the extremely rapid divergence of lineages near the time of their origin, followed by long periods in which basic body plans and ways of life are retained. What is missing are the many intermediate forms hypothesized by Darwin..."[3]

This feature reaches an extreme in what paleontologists call "the Cambrian explosion," an event that began 530 million years ago. Over a period of only five to 10 million years, a flash of geological time, virtually every major animal group (phylum) seems to suddenly appear from nowhere—a grave challenge for neo-Darwinism.[4]

Notes

[1] National Academy of Sciences, *Teaching about Evolution and the Nature of Science* (Wash., D.C.: National Academy Press, 1998), p. 3.

[2] Stephen Jay Gould, "Evolution's Erratic Pace," *Natural History,* 86 (May 1977): 14.

[3] Robert L. Carroll, "Towards a new evolutionary synthesis," *Trends in Ecology and Evolution* 15 (2000): 27-32.

[4] Douglas H. Erwin, "Early introduction of major morphological innovations," *Acta Palaeontologica Polonica* 38 (1994): 281-294; Douglas Erwin, "Macroevolution is more than repeated rounds of microevolution," *Evolution & Development* 2 (2000): 78-84.

Can't We Actually see Evolution in Action?

Advocates of contemporary evolutionary theory argue that we can virtually witness evolution in action.

In the National Academy of Sciences educational guidebook, the authors state, "The creation of a new species from a pre-existing species generally requires thousands of years, so over a lifetime a single human usually can witness only a tiny part of the speciation process. Yet even that glimpse of evolution at work powerfully confirms our ideas about the history and mechanisms of evolution. For example, many closely related species have been identified that split from a common ancestor very recently in evolutionary terms. An example is provided by the North American lacewings Chrysoperla carnea and Chrysoperla downesi. The former lives in deciduous woodlands and is pale green in summer and brown in winter. The latter lives among evergreen conifers and is dark green all year round. The two species are genetically and morphologically very similar."[1]

Other examples cited in favor of contemporary evolutionary theory include drug resistance in bacteria, HIV and Plasmodium falciparum (a parasite that causes malaria), insecticide resistance in mosquitoes, changes in the average size of finch beaks and changes in the coloration of moths.

Critics, however, point out that the issue is not whether mutation and natural selection can produce minor changes; it's whether these mechanisms can create new tissues, organs, limbs or body plans.

Biologist Keith Stewart Thomson, of Oxford University, points out that "no one has satisfactorily demonstrated a mechanism at the population genetic level by which innumerable very small … changes could accumulate rapidly to produce large changes: a process for the origin of the magnificently improbable from the ineffably trivial" (emphasis in original).[2]

Thomson's remark calls to mind the Cambrian explosion, mentioned earlier. But another problem comes from genetics. A profound surprise for evolutionary biologists has been extent to which the genes controlling the layout of various body structures have remained virtually unchanged across vast stretches of time—and are shared by organisms with vastly different body plans.[3] Hence, the gene controlling the development of limbs in fruit flies is very similar to those controlling limb development in mice, tube-feet in sea urchins and spines in spiny worms. Yet these structures do not come from limbs in a common ancestor."

If one assumes that the controlling genes come from a common ancestor, this would mean that such genes originated before the structures they control.[4]

Notes

[1] National Academy of Sciences, *Teaching about Evolution and the Nature of Science* (Wash., D.C.: National Academy Press, 1998), pp. 17-18.

[2] Keith Stewart Thomson, "Macroevolution: The Morphological Problem," *American Zoologist* 32 (1992): 106-112. See also George L. Gabor Miklos, "Emergence of organizational complexities during metazoan evolution: perspectives from molecular biology, palaeontology and neo-Darwinism," *Mem. Ass. Australas. Palaeontols.* 15 (1993): 7-41.

[3] Neil H. Shubin and Charles R. Marshall, "Fossils, genes, and the origin of novelty," in *Deep Time* (The Paleontological Society, 2000), p. 325.

[4] One could argue that the genes controlled some unknown feature in the ancestral organism. But that is sheer speculation.

What about the Molecular Evidence?

Proponents of contemporary evolutionary theory assert that "the evidence for evolution from molecular biology is overwhelming and is growing quickly."[1]

In the publication, Science and Creationism: A View from the National Academy of Sciences, the authors explain: "As the ability to sequence the nucleotides [chemical 'letters'] making up DNA has improved, it also has become possible to use genes to reconstruct the evolutionary history of organisms. Because of mutations, the sequence of nucleotides in a gene gradually changes over time. The more closely related two organisms are, the less different their DNA will be. Because there are tens of thousands of genes in humans and other organisms, DNA contains a tremendous amount of information about the evolutionary history of each organism."[2]

The evolutionary histories constructed from various kinds of molecular information, it is said, closely match and corroborate those histories based on fossils and morphology (anatomical structure).

This claim is simply untrue. It is well known in scientific circles that molecular histories often conflict with those based on fossils. Indeed, in an article for Nature, one of the world's most prestigious science journals, science writer Trisha Gura surveys the long-running debate over whether "bones, molecules … or both" yield the most accurate evolutionary histories.

Gura reports, "Battles between molecules and morphology are being fought across the entire tree of life. Perhaps the most intense are in vertebrate systematics, where molecular biologists are challenging a tradition that relies on studies of fossil skeletons and the bones and soft tissue of living species."[3]

Molecular histories even contradict each other, with different molecules producing different evolutionary trees. Biologist Michael Lynch observes, "Clarification of the phylogenetic [i.e., evolutionary] relationships of the major animal phyla has been an elusive problem, with analyses based on different genes and even different analyses based on the same genes yielding a diversity of phylogenetic trees."[4]

Notes

[1] National Academy of Sciences, 1999, p. 20.

[2] Ibid., p. 18.

[3] Trisha Gura, "Bones, molecules...or both? *Nature* 406 (2000): 233.

[4] Michael Lynch, "The Age and Relationships of the Major Animal Phyla," *Evolution* 53 (1999): 323.

What about the Evidence from Embryology?

Darwin considered the evidence from embryology to be "by far the strongest single class of facts in favor of" his theory.[1]

The evidence was illustrated in a series of drawings by biologist Ernst Haeckel that depicted the growth of embryos from various classes of vertebrates (animals with backbones). The pictures show that the embryos start out looking virtually identical, but as they develop, their appearances diverge until they take the form of their particular class.

To Darwin, similarities in the early embryos indicated that they descended from a common ancestor. As new organs or structures evolved, these features were tacked onto the end of an organism's embryonic development. As a result, we can virtually see the organism's evolutionary history in each embryo's development..

"Haeckel's embryos" seem to provide such powerful support for Darwin's theory that some version of them can be found in almost every contemporary textbook dealing with evolution.[2]

For example, in the third edition of the college text, Molecular Biology of the Cell, the authors of which include a Nobel laureate and the president of the National Academy of Sciences, states that the embryos of different species "often resemble each other in their early stages and, as they develop, seem sometimes to replay the steps of evolution."[3]

However, Haeckel's drawings are wrong. Scientists have known for over a century that vertebrate embryos look very different right from the beginning. For example, although Haeckel depicted the embryos of humans, chickens, frogs, turtles and fish as looking very similar at what he calls the "first" stage of development, embryologist Adam Sedgwick remarked in 1894 that he could tell the difference between such closely allied species as chickens and ducks at a far earlier stage.[4]

The facts show that the embryos start out looking dissimilar, converge somewhat a few stages later (though not nearly as much as Haeckel depicted) and then diverge again.

Unfortunately, Haeckel's depictions are not mere errors. In 1997, a panel of international experts systematically compared Haeckel's drawings with actual photographs of embryos.[5] Summing up the panel's findings in an interview with Science, the study's principal author said of Haeckel's drawings, "It looks like it's turning out to be one of the most famous fakes in biology."[6]

Notes

[1] Charles Darwin, letter to Asa Gray, Sept. 10, 1860, in Francis Darwin (editor), *The Life and Letters of Charles Darwin,* Vol. II (New York: D. Appleton and Company, 1896), p 131.

[2] Stephen Jay Gould, "Abscheulich! Atrocious!" *Natural History* (March 2000): 42-49.

[3] Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts & James D. Watson, *Molecular Biology of the Cell,* Third Edition (NY: Garland Publishing, 1994), p. 33.

[4] Adam Sedgwick, "On the Law of Development commonly known as von Baer's Law; and on the Significance of Ancestral Rudiments in Embryonic Development," *Quarterly Journal of Microscopical Science,* 36 (1894): 35-52.

[5] M.K Richardson, J. Hanken, M.L. Gooneratne, C. Pieau, A. Raynaud, L. Selwood, and G.M. Wright, "There is no highly conserved embryonic stage in the vertebrates: implications for current theories of evolution and development," *Anatomy & Embryology* 196 (1997): 91-106.

[6] Elizabeth Pennisi, "Haeckel's Embryos: Fraud Rediscovered," *Science,* 277 (Sept. 5, 1997): 1435

What about the Evidence from Homology?

According to the contemporary definition, a homology is something like a "family resemblance." It's a similarity that indicates two or more organisms are related to each other—that they share a common ancestor.

The authors of Science and Creationism: A View from the National Academy of Sciences explain it like this: "[T]he skeletons of humans, mice, and bats are strikingly similar, despite the different ways of life of these animals and the diversity of environments in which they flourish. The correspondence of these animals, bone by bone, can be observed in every part of the body, including the limbs; yet a person writes, a mouse runs, and a bat flies with structures built of bones that are different in detail but similar in general structure and relation to each other."[1]

Scientists, they add, have concluded that such structures "are best explained by common descent."[2]

Homologies differ from similarities that are not acquired from a common ancestor. Thus, the eyes of humans and octopi are very similar, but scientists do not think their common ancestor had such an eye. Such similarities are called analogies.

But using the contemporary definition of homology as evidence for common ancestry is circular reasoning. How do you know that two organisms share a common ancestor? Because they have features that are homologous. But how do you know the structures are homologous? Because the two organisms share a common ancestor.

Leaving aside the problem of circularity, it is far from clear that similarities, as such, are best explained by common descent. If we knew there were a mechanism that could produce humans, mice and bats from a common ancestor, that claim would be plausible. But the mechanism is the very thing in question.

In the absence of a mechanism, the fact of similarity does not compel a Darwinian explanation. After all, we see similarities between different kinds of cars, but we don't conclude that one descended from another.

Moreover, biologists knew about homologous similarities well before Darwin published his theory, yet the great majority concluded that they resulted from a common design rather than common descent.[3]

Notes

[1] *National Academy of Sciences, Science and Creationism: A View from the National Academy of Sciences,* 2nd ed. (Wash., D.C.: National Academy Press, 1999), p. 14.

[2] Ibid.

[3] Alec L. Panchen, "Richard Owen and the Concept of Homology," pp. 21-62 in Brian K. Hall (ed.), *Homology* (San Diego: Academic Press, 1994).

But Doesn't Intelligent Design Refer to Something Supernatural?

From an ID perspective, the natural-vs.-supernatural distinction is irrelevant. The real contrast is not between natural laws and miracles, but between undirected natural causes and intelligent ones.

Mathematician and philosopher of science William Dembski puts it this way: "Whether an intelligent cause is located within or outside nature (i.e., is respectively natural or supernatural) is a separate question from whether an intelligent cause has operated."

Human actions are a case in point: "Just as humans do not perform miracles every time they act as intelligent agents, so there is no reason to assume that for a designer to act as an intelligent agent requires a violation of natural laws."

On the other hand, even if an object were miraculously created, it could still be studied. Take the flagellum, for example. No matter what its origins, a flagellum is a flagellum. We can take it apart, we can examine its components, we can modify it, we can figure out how it works. And we can do that whether it evolved over eons or popped into existence two seconds ago.

In the world of human technology, this is called reverse engineering. But the same process is also used in biology.

"That's basically what everybody at the bench is doing," said Scott Minnich, a microbiologist at the University of Idaho. "We don't have the blueprints in the true sense. We have the DNA code for a lot of organisms, but in terms of the assembly of these molecular machines, it's a matter of breaking them apart and trying to put them back together to figure out how they function."

This is also the kind of work that will be done with the human genome. Speaking to the New York Times in late June, when the human genome breakthrough was announced, Harold Varmus, former director of the National Institutes of Health commented, "The important thing is having pieces of DNA in your hand, and being able to figure out how they work by modifying and mutating them. That's where the game is now."

Fittingly, the metaphor he used to describe this process was examining a clock: "You can take the clock apart, lay the pieces out in front of you, and then try to understand what makes it tick by putting it back together again."

ARN Recommends

For further study on the important distinction between natural laws and naturalism see:

The Wedge of Truth. **Phillip E. Johnson**

Darwinism: Science or Naturalistic Philosophy. **Phillip E. Johnson**

Darwinism: Science or Naturalistic Philosophy; **Debate at Stanford University between William B. Provine and Phillip E. Johnson.**

Isn't Intelligent Design Another Name for Scientific Creationism?

The American Civil Liberties Union (ACLU), the National Center for Science Education (NCSE) and other organizations have tried to portray intelligent design as another variant of scientific creationism.

For example, when high school biology teacher Roger DeHart, of Burlington, Wash., tried to teach his students about intelligent design, the ACLU of Washington state accused him of "presenting the discredited and illegal theory of creationism." Similarly, they branded intelligent design as "a smoke screen for creationists who have lost in the courts."

Although intelligent design is compatible with many "creationist" perspectives, including scientific creationism, it is a distinct theoretical position. This can be seen by comparing the basic tenets of each view.

Legally, scientific creationism is defined by the following six tenets:

- The universe, energy and life were created from nothing.
- Mutations and natural selection cannot bring about the development of all living things from a single organism.
- "Created kinds" of plants and organism can vary only within fixed limits
- Humans and apes have different ancestries.
- Earth's geology can be explained by catastrophism, primarily a worldwide flood
- The earth is young—in the range of 10,000 years or so.[1]

Intelligent design, on the other hand, involves two basic assumptions:

- Intelligent causes exist.
- These causes can be empirically detected (by looking for specified complexity).

"This is a very modest, minimalist position," says mathematician and philosopher William Dembski. "It doesn't speculate about a Creator or his intentions."

In fact, there are only two general views that aren't compatible with intelligent design: 1) a radical naturalism that denies the existence of any non-human intelligence, theistic or otherwise and 2) conventional theistic evolution.

It may seem surprising that the second view, conventional theistic evolution, is incompatible with intelligent design, since it clearly embraces the existence of God. But the view we generally associate with "theistic evolution" denies that God's creative activity can be empirically detected. As Dembski points out:

Theistic evolution takes the Darwinian picture of the biological world and baptizes it, identifying this picture with the way God created life. When boiled down to its scientific content, however, theistic evolution is no different from atheistic evolution, treating only undirected natural processes in the origin and development of life.

Theistic evolution places theism and evolution in an odd tension. If God purposely created life through Darwinian means, then God's purpose was ostensibly to conceal his purpose in creation. Within theistic

evolution, God is a master of stealth who constantly eluded our best efforts to detect him empirically. Yes, the theistic evolutionist believes that the universe is designed. Yet insofar as there is design in the universe, it is design we recognize strictly through the eyes of faith. Accordingly the physical world in itself provides no evidence that life is designed.

Regarding the question of whether intelligent design is the same thing as scientific creationism, opponents of intelligent design have made much of a federal court case, Freiler v. Tangipahoa Parish Board of Education, in which the two positions were equated.

But according to David DeWolf, a law professor at the Gonzaga University School of Law, this finding came in a tangential statement in the judge's decision.

The central issue in the case, DeWolf said, was not intelligent design, but the question of whether a disclaimer about evolution mandated by the Tangipahoa school district constituted an establishment of religion.

"The judge was simply laying out the general landscape of creation theories. In one sentence, he said intelligent design is another name by which you may know creationism."

The judge struck down the disclaimer, and his decision was upheld by a panel of the 5th circuit court of appeals. But in the appellate opinion, intelligent design was never even mentioned.

"There's no finding in which you can say, 'Aha! See, the courts have found that intelligent design is just the same,'" DeWolf said. "If you cited that as your authority in a lawsuit, a judge would be pretty mad at you for having misled him into thinking that this proposition had been established."

ARN Recommends

For more information on the legal issues about teaching Intelligent Design in the public school classroom see:

Intelligent Design in the Public School Science Curricula: A Legal Guidebook
David K. DeWolf, Stephen C. Meyer, Mark E, DeForrest

Teaching the Origins Controversy: Science, Or Religion, Or Speech? **David K. DeWolf, Stephen C. Meyer, Mark Edward DeForrest.**

Law, Darwinism & Public Education: The Establishment Clause and the Challenge of Intelligent Design **Francis J. Beckwith**

Notes

[1] David K. DeWolf, Stephen C. Meyer and Mark Edward DeForrest, "Teaching the Origins Controversy: Science, Or Religion, Or Speech?" *Utah Law Review* 39(1): 94.

How Many Scientists Take This Stuff Seriously?

Intelligent design is still a minority position, but even many scholars who disagree with it are intrigued by the idea—and can't seem to get it out of their minds.

Elliot Sober, for example, is a distinguished philosopher of science at the University of Wisconsin, and was recently president of the Central Division of the American Philosophical Association. Although he is skeptical of intelligent design, he nonetheless spent much of his 1999 presidential address grappling with it. He also took the time, along with two of his graduate students, to write a long review of William Dembski's book, The Design Inference.

Others have also become intrigued. In Spring 2000, eminent philosophers and scientists—including two Nobel laureates—traveled from as far away as Switzerland and France to attend a conference at Baylor University, in Waco, Texas, where the main topic was intelligent design. Although many were skeptical of intelligent design, they clearly thought it warranted serious attention—and enjoyed the give-and-take with intelligent design theorists.

Biologist and philosopher of science Paul Nelson, who participated in the conference observed, "These world-class scientists came to the conference, had a great time, good interaction and, almost to a person, thought the conference was worth doing."

Despite opposition in the culture and in science, Nelson said, the intelligent design movement will continue to grow.

"It's not the kind of thing you change overnight," Nelson said. "But there's a steady, healthy growth of the intelligent design community, where we're bringing in a lot of people of diverse backgrounds and diverse viewpoints. The little plant of intelligent design continues to flourish."

Recommended reading material and videos, as well as other ID-related resources, are available on the Access Research Network website:

www.arn.org