

Not by chance

From bacterial propulsion systems to human DNA, evidence of intelligent design is everywhere

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In December 2004 New Mexico Public Television scheduled, advertised and then, under pressure, canceled a documentary explaining the scientific case for a theory of biological origins known as intelligent design.

In the same month, a renowned British philosopher, Antony Flew, made worldwide news when he repudiated a lifelong commitment to atheism, citing among other factors, evidence of intelligent design in the DNA molecule.

Also in December, the ACLU filed suit to prevent a Dover, Penn. school district from informing its students about the theory of intelligent design.

In February, The Wall Street Journal reported that an evolutionary biologist with two doctorates had been punished for publishing a peer-reviewed scientific article making a case for this same theory.

More recently, the Pope, the President of the United States and the Dalai Lama have each weigh in on the subject.

But what is this theory of intelligent design? And why does it arouse such passion and inspire such apparently determined efforts to suppress it?

According to a spate of recent media reports, intelligent design is a new "faith-based" alternative to evolution—an alternative based entirely on religion rather than scientific evidence.

As the story goes, intelligent design is just creationism repackaged by religious fundamentalists in order to circumvent a 1987 Supreme Court prohibition against teaching creationism in the public schools.

Over the last year, many major U.S. newspapers, magazines and broadcast outlets have run stories repeating this same trope.

But is it accurate?

As one of the architects of the theory of intelligent design, and the director

a research center that supports the work of scientists developing the theory, I know that it isn't.

The modern theory of intelligent design was not developed in response to a legal setback for creationists in 1987. Instead, it was first formulated in the late 1970s and early 1980s by a group of scientists-Charles Thaxton, Walter Bradley, Roger Olson, and Dean Kenyon-who were trying to account for an enduring mystery of modern biology: the origin of the digital information encoded along the spine of the DNA molecule.

In the book *The Mystery of Life's Origin*, Thaxton and his colleagues first developed the idea that the information-bearing properties of DNA provided strong evidence of a prior but unspecified designing intelligence. *Mystery* was published in 1984 by a prestigious New York publisher-three years before the *Edwards v. Aguillard* decision.

Even as early the 1960s and 70s, physicists had begun to reconsider the design hypothesis. Many were impressed by the discovery that the laws and constants of physics are improbably "finely-tuned" to make life possible. As British astrophysicist Fred Hoyle put it, the fine-tuning of numerous physical parameters in the universe suggested that "a superintellect had monkeyed with physics" for our benefit.

Nevertheless, only the most committed conspiracy theorist could see in these intellectual developments a concealed legal strategy or an attempt to smuggle religion into the classroom.

But what exactly is the theory of intelligent design?

Contrary to media reports, intelligent design is not a religious-based idea, but instead an evidence-based scientific theory about life's origins-one that challenges strictly materialistic views of evolution. According to Darwinian biologists such as Oxford's Richard Dawkins, living systems "give the appearance of having been designed for a purpose." But, for modern Darwinists, that appearance of design is entirely illusory.

Why? According to neo-Darwinism, wholly undirected processes such as natural selection and random mutations are fully capable of producing the intricate designed-like structures in living systems. In their view, natural selection can mimic the powers of a designing intelligence without itself being directed by an intelligence.

In contrast, the theory of intelligent design holds that there are tell-tale features of living systems and the universe that are best explained by an intelligent cause. The theory does not challenge the idea of evolution defined as change over time, or even common ancestry, but it does dispute Darwin's idea that the cause of biological change is wholly blind and undirected.

Either life arose as the result of purely undirected material processes or a guiding intelligence played a role. Design theorists favor the latter option and argue that living organisms look designed because they really were

designed.

But why do we say this? What tell-tale signs of intelligence do we see in living organisms?

Over the last 25 years, scientists have discovered an exquisite world of nanotechnology within living cells. Inside these tiny labyrinthine enclosures, scientists have found functioning turbines, miniature pumps, sliding clamps, complex circuits, rotary engines, and machines for copying, reading and editing digital information--hardly the simple "globules of plasm" envisioned by Darwin's contemporaries.

Moreover, most of these circuits and machines depend on the coordinated function of many separate parts. For example, scientists have discovered that bacterial cells are propelled by miniature rotary engines called flagellar motors that rotate at speeds up to 100,000 rpm. These engines look for all the world as if they were designed by the Mazda corporation, with many distinct mechanical parts (made of proteins) including rotors, stators, O-rings, bushings, U-joints, and drive shafts.

Is this appearance of design merely illusory? Could natural selection have produced this appearance in a neo-Darwinian fashion one tiny incremental mutation at a time? Biochemist Michael Behe argues 'no.' He points out that the flagellar motor depends upon the coordinated function of 30 protein parts. Yet the absence of any one of these parts results in the complete loss of motor function. Remove one of the necessary proteins (as scientists can do experimentally) and the rotary motor simply doesn't work. The motor is, in Behe's terminology, "irreducibly complex."

This creates a problem for the Darwinian mechanism. Natural selection preserves or "selects" functional advantages. If a random mutation helps an organism survive, it can be preserved and passed on to the next generation. Yet, the flagellar motor has no function until after all of its 30 parts have been assembled. The 29 and 28-part versions of this motor do not work. Thus, natural selection can "select" or preserve the motor once it has arisen as a functioning whole, but it can do nothing to help build the motor in the first place.

This leaves the origin of molecular machines like the flagellar motor unexplained by the mechanism--natural selection--that Darwin specifically proposed to replace the design hypothesis.

Is there a better alternative? Based upon our uniform and repeated experience, we know of only one type of cause that produces irreducibly complex systems, namely, intelligence. Indeed, whenever we encounter irreducibly complex systems--such as an integrated circuit or an internal combustion engine--and we know how they arose, invariably a designing engineer played a role.

Thus, Behe concludes--based on our knowledge of what it takes to build functionally-integrated complex systems--that intelligent design best explains the origin of molecular machines within cells. Molecular machines appear designed because they were designed.

The strength of Behe's design argument can be judged in part by the response of his critics. After nearly ten years, they have mustered only a vague just-so story about the flagellar motor arising from a simpler subsystem of the motor -a tiny syringe-that is sometimes found in bacteria without the other parts of the flagellar motor present. Unfortunately, for advocates of this theory recent genetic studies show that the syringe arose after the flagellar motor-that if anything the syringe evolved from the motor, not the motor from the syringe.

But consider an even more fundamental argument for design. In 1953 when Watson and Crick elucidated the structure of the DNA molecule, they made a startling discovery. The structure of DNA allows it to store information in the form of a four-character digital code. Strings of precisely sequenced chemicals called nucleotide bases store and transmit the assembly instructions--the information--for building the crucial protein molecules and machines the cell needs to survive.

Francis Crick later developed this idea with his famous "sequence hypothesis" according to which the chemical constituents in DNA function like letters in a written language or symbols in a computer code. Just as English letters may convey a particular message depending on their arrangement, so too do certain sequences of chemical bases along the spine of a DNA molecule convey precise instructions for building proteins. The arrangement of the chemical characters determines the function of the sequence as a whole. Thus, the DNA molecule has the same property of "sequence specificity" that characterizes codes and language. As Richard Dawkins has acknowledged, "the machine code of the genes is uncannily computer-like." As Bill Gates has noted, "DNA is like a computer program, but far, far more advanced than any software we've ever created."

After the early 1960s, further discoveries made clear that the digital information in DNA and RNA is only part of a complex information processing system-an advanced form of nanotechnology that both mirrors and exceeds our own in its complexity, design logic and information storage density.

Where did the digital information in the cell come from? And how did the cell's complex information processing system arise? Today these questions lie at the heart of origin-of-life research. Clearly, the informational features of the cell at least appear designed. And to date no theory of undirected chemical evolution has explained the origin of the digital information needed to build the first living cell. Why? There is simply too much information in the cell to be explained by chance alone. And the information in DNA has also been shown to defy explanation by reference to the laws of chemistry. Saying otherwise would be like saying that a newspaper headline might arise as the result of the chemical attraction between ink and paper. Clearly "something else" is at work.

Yet, the scientists arguing for intelligent design do not do so merely because natural processes-chance, laws or the combination of the two-have failed to explain the origin of the information and information processing systems in cells. Instead, they also argue for design because we know from experience that systems possessing these features invariably

arise from intelligent causes. The information on computer screen can be traced back to a user or programmer. The information in a newspaper ultimately came from a writer--from a mental, rather than a strictly material, cause. As the pioneering information theorist Henry Quastler observed, "information habitually arises from conscious activity."

This connection between information and prior intelligence enables us to detect or infer intelligent activity even from unobservable sources in the distant past. Archeologists infer ancient scribes from hieroglyphic inscriptions. SETI's search for extraterrestrial intelligence presupposes that information imbedded in electromagnetic signals from space would indicate an intelligent source. As yet, radio astronomers have not found information-bearing signals from distant star systems. But closer to home, molecular biologists have discovered information in the cell, suggesting--by the same logic that underwrites the SETI program and ordinary scientific reasoning about other informational artifacts--an intelligent source for the information in DNA.

DNA functions like a software program. We know from experience that software comes from programmers. We know generally that information--whether inscribed in hieroglyphics, written in a book or encoded in a radio signal--always arises from an intelligent source. So the discovery of information in the DNA molecule, provides strong grounds for inferring that intelligence played a role in the origin of DNA, even if we weren't there to observe the system coming into existence.

Thus, contrary to media reports, the theory of intelligent design is not based upon ignorance or religion but instead upon recent scientific discoveries and upon standard methods of scientific reasoning in which our uniform experience of cause and effect guides our inferences about what happened in the past.

Of course, many will still dismiss intelligent design as nothing but warmed over creationism or as a "religious masquerading as science." But intelligent design, unlike creationism, is not based upon the Bible. Design is an inference from biological data, not a deduction from religious authority.

Even so, the theory of intelligent design may provide support for theistic belief. But that is not grounds for dismissing it. To say otherwise confuses the evidence for a theory and its possible implications. Many scientists initially rejected the Big Bang theory because it seemed to challenge the idea of an eternally self-existent universe and pointed to the need for a transcendent cause of matter, space and time. But scientists eventually accepted the theory despite such apparently unpleasant implications because the evidence strongly supported it. Today a similar metaphysical prejudice confronts the theory of intelligent design. Nevertheless, it too must be evaluated on the basis of the evidence not our philosophical preferences or concerns about its possible religious implications. Antony Flew, the long-time atheistic philosopher who has come to accept the case for design, insists correctly that we must "follow the evidence wherever it leads."

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Culture. He received his Ph.D. in the philosophy of science from Cambridge University. He recently co-edited the book Darwinism, Design and Public Education.

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