

Untangling Evolution: Catholicism, Evolution and Intelligent Design

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When people speak about the Theory of Evolution, either to attack it or defend it, they can mean different things. So we must distinguish several layers in the theory of evolution. First, there is the idea of the Evolution of Species; that is, that the present species of plants and animals arose from other species by a gradual process of evolution, and that ultimately all of them came from a single original form of life. This is sometimes called the theory of “common descent”, since it says that everything descended from a common ancestor. Second, there is the idea that human beings evolved in the same way and are thus part of the same branching tree of life. However, in speaking of the Evolution of Man we must be careful to distinguish between those who would say that human beings are **nothing but** biological organisms, and therefore **entirely** the products of evolution, and those who would say that human beings have a nature both physical and spiritual and that only the human body evolved, not the human spiritual soul. And, third, we have the idea that the mechanism of evolution is natural selection acting on random genetic mutations. This is the heart of neo-Darwinism.

(I should say something about the term neo-Darwinism, because some people think it is a philosophical doctrine and this has brought confusion into the current debates. Darwin lived before anyone knew about genetics. He had the idea of variations and natural selection acting on them, but he did not know that the variations he was talking about were genetic in origin. When people in the 1920s and 30s combined Darwin’s theory of natural selection with modern genetics, neo-Darwinism was born. The term neo-Darwinism thus refers simply to Darwin’s theory in its modern form. It is the name of a scientific theory not a philosophical idea.)

So, to recapitulate, the idea of evolution includes the Evolution of Species, the Evolution of Man or at least of the human body, and the neo-Darwinian Mechanism of Evolution, namely natural selection acting on random genetic mutations.

One can find many shades of opinion on the subject of evolution, but basically there are two major battles going on simultaneously that involve evolution and religion. The first is the Creationism vs. Evolution battle. The second is the Intelligent Design vs. neo-Darwinism Battle.

The Creationists deny that evolution happened at all. Or at most they concede a very limited role to it. Some of them accept that “microevolution” might have happened --- such as the evolution of one kind of cat from another--- but not “macroevolution” --- such as the evolution of mammals from reptiles. This Creationism vs. Evolution fight has really very little intellectual interest in our day. In the view of most scientists, no matter what their religious stance --- whether they are atheists, or agnostics, or religious believers --- the evidence that evolution of species happened is simply overwhelming and growing stronger every day. Anyone who thinks that this scientific consensus is **ever** going to be overturned is naïve. There is simply an irreconcilable difference between the ideas of modern science and any religion that denies that the evolution of species happened. Fortunately, as Catholics we are not in this position of having a faith that conflicts with science.

The second battle, the one between the so-called “Intelligent Design movement” and neo-Darwinism, is much more interesting, and it involves Catholic scientists on both sides. The Intelligent Design movement accepts, or at least does not dispute, that evolution happened, but says that the neo-Darwinian explanation of it is insufficient. I will devote the last part of my talk to this controversy. Again, some clarification of terms is necessary. All Christians believe that there exists an Intelligent Designer, that is an intelligence that designed the universe, namely God. However, the Intelligent Design movement is not simply saying that. Rather, they are making the specific claim that a particular biological theory, namely that natural selection is the motive force of evolution, is inadequate as a biological theory. So one can believe in an intelligent designer without agreeing with the distinctive claims of the Intelligent Design Movement.

One might ask, why are all these evolution battles heating up so much in recent years? In the 1960s and 70s one did not hear much about anti-evolutionism in its various forms. What’s going on? The recent flare-up of these debates is due largely to the agitation of aggressive atheists on the one hand and fundamentalist Protestants on the other. Protestants of a fundamentalist stripe are committed to a certain kind of literalism in biblical interpretation, which stems logically, they think from the central Protestant principle of *Sola Scriptura*, i.e. the Scriptures as the sole authority in matters of faith. And so for them, accepting evolution is simply impossible; it would unravel their whole doctrinal system. On other side we have many people, like the biologist Richard Dawkins and the philosopher Daniel Dennett, waging unrelenting warfare against religion using Darwinism as weapon. And they are by no means attacking just the fundamentalists. They attack all religious belief. They say that evolution has “dethroned man”, to use the words of the late Stephen Jay Gould, by showing that we are merely highly evolved animals, differing in degree but not in kind from other animals. They also say that evolution has demolished the

ancient “Argument from Design” for the existence of God, by showing how things that to the naïve appear to be designed can arise by blind natural forces.

Catholics, of course, don’t agree with the philosophical assertions of Dawkins and Dennett and their ilk. Nor do we agree with the manner of biblical interpretation of the fundamentalist Protestants. So, what **has** the Catholic Church had to say about evolution?

As far as official teaching goes, i.e. pronouncements of the magisterium, the Church said virtually nothing for almost a hundred years after Darwin published his theory in 1859. However, some sense of the general attitude of Catholic scholars and theologians toward evolution in the early days of the theory can be gotten from looking at the old Catholic Encyclopedia, which was written in the first decade of the 20th century. Of course, this was not an official document of the Church’s magisterium, but it was one of the outstanding products of Catholic scholarship at that time, at least in the English-speaking world, and it carried a *nihil obstat* and an *imprimatur* certifying that it contained nothing contrary to Catholic doctrine. The article in that Encyclopedia entitled “Catholics and Evolution”, first summarized the theory of evolution as it stood at that time, and then said, “This is the gist of the theory of evolution as a scientific hypothesis. It is in perfect agreement with the Christian conception of the universe.” An impressive book of Catholic apologetics called *The Question Box* was published around the same time. In a question-and-answer format it responded to hundreds of common objections to the Catholic Faith. This book sold several million copies, and seems to have been given to students in Catholic high schools in those days --- I have my mother’s old copy, dating from her high-school days in the 1930s. In answer to the question on page 8, “May a Catholic believe in evolution?”, the book said, “As the Church has made no pronouncement upon evolution, Catholics are perfectly free to accept evolution, either as a scientific hypothesis or as a philosophical speculation.”

What both of these books were speaking of in the sentences I just quoted was the Evolution of Species, i.e. of plants and animals. As far as the Evolution of Man was concerned, they insisted (rightly, of course) that the human soul, being spiritual, cannot be reduced to matter or explained by any merely material process, such as evolution. Evolution of the human soul was therefore, they explained, contrary to Catholic faith. On the evolution of the human body, however, they did not come to a definite conclusion. The Encyclopedia admitted that it was “per se not improbable” that the human body had evolved, and noted that a version of this idea had “been propounded by St. Augustine”. However, both books thought the scientific evidence for human evolution was weak, and observed that most theologians had a negative view of the idea. Nevertheless, they admitted that there was no official Church teaching on the matter.

As far as the mechanism of evolution was concerned, little was said. The idea that evolution was a natural process did not seem to be problematic, as far as the Church was concerned. This is an area where the Church's deep philosophical traditions served her very well. Many opponents of evolution see Nature as being somehow in competition with God. So that the more we attribute to natural processes or natural causes, the less we can attribute to God, and *vice versa*. But the Church has never accepted this dichotomy. She has always understood that there are two levels of causality, which were called by the scholastic theologians "primary" and "secondary" causality. God, acting vertically, so to speak, is the direct cause of every event in the physical universe --- he is the "Primary Cause". At the same time, the events in the world have amongst themselves various horizontal causal relationships, as it were. This is called secondary causality. There is no contradiction or competition between the two; rather God's primary causality undergirds all secondary causality. As an analogy consider the play Hamlet. In that play Polonius dies because Hamlet stabs him through a curtain. However, it is also true to say that Polonius dies because Shakespeare wrote the play that way. So both the character Hamlet and the playwright Shakespeare are causes of Polonius dying in the play. However, they are causes on different levels. Events in the play do have causal relationships to each other; however, the play itself, and every event in the play, and every causal relationship among those events exist only **because** the playwright Shakespeare ordained that they would. Analogously, the fact that one physical event causes another in the natural world is ultimately because God has created a world in which such causal relationships exist. If fire burns wood, it is only because God creates a world in which there is fire and wood, and in which fire has the power to burn wood.

This basic insight about primary and secondary causality is related to another insight of traditional Catholic teaching, which is that God in His divine nature is outside the flow of time. He sees from all eternity the whole pattern of history, which unfolds according to His plan. The idea of His having to intervene repeatedly to take care of unforeseen problems or that He is, as it were, making it up as He goes along, is utterly alien to Catholic thought, which sees God as creating everything --- past, present, and future --- by a single all-encompassing act of His will. The Question Box used an analogy: "A billiard player wishes to send a hundred balls in different directions. Which will require greater skill --- to make a hundred strokes and send each ball separately to its goal, or, by hitting one ball, to send all the ninety-nine others in the directions which he has in view?" The old Catholic Encyclopedia put it this way: "If God produced the universe by a single creative act of His will, then its natural development by laws implanted in it by its Creator is to the greater glory of His divine power and wisdom. [The encyclopedia then goes on to quote Aquinas and Suarez:] St. Thomas says, 'the potency of the cause is greater the more remote the effects to which it extends'; and Suarez [says], 'God does not interfere directly with the natural order where secondary causes suffice to produce the intended effect.'" The

Church has always taught that there is a natural order that comes from God, and the greater the powers and potentialities that God has implanted in Nature, the more it shows forth His power and greatness.

To be sure, these old Catholic articles on evolution condemned radically atheist interpretations of evolution, which deny the existence of God or His providential governance of the world, as incompatible with Catholic belief. However, they sharply distinguished such philosophical extrapolations from evolution as a biological theory.

Were these articles atypical of Catholic thinking? I don't think so. For example, John Henry Newman, later Cardinal Newman, wrote in a letter to the Rev. David Brown in 1874, "I see nothing in the theory of evolution inconsistent with an Almighty Creator and Protector." In 1868, he said, "The theory of Darwin is not necessarily atheistic. It may simply suggest a larger idea of divine Providence and skill." Even earlier, in 1863, he wrote in one of his notebooks, "There is as much want of simplicity in the idea of creation of distinct species as in that of the creation of trees in full growth whose seed is in themselves, or of rocks with fossils in them. I mean that it is as strange that monkeys should be so like men with no historical connection between them as the notion that there should be no course of history by which fossil bones got into rocks." Note Newman wrote this only four years after Darwin published *On the Origin of Species*.

In 1908, G.K. Chesterton wrote in his marvelous little book, *Orthodoxy*, "If evolution simply means that a positive thing called an ape turned very slowly into a positive thing called a man, then it is stingless for the most orthodox. For a personal God might just as well do things slowly as quickly, especially if, like the Christian God, he were outside time."

The first official pronouncement of the Church on the subject of evolution did not come until 1950, when Pope Pius XII issued his great encyclical letter *Humani Generis*. The Pope specifically addressed the question of the evolution of man. His central point was that one must distinguish the origin of the human body and the origin of human spiritual soul. The evolution of the spiritual soul, of course, he rejected as inconsistent with Catholic faith. On the evolution of the human body, he took a very cautious stance (as was appropriate in such a weighty matter). He said that Catholic scholars could investigate it as a "hypothesis" as long as they did not jump to any conclusions rashly. Though he was obviously less convinced by the evidence than were most scientists of that time, it is clear that he thought the matter was to be decided by the evidence and that he was willing to let the chips fall where they may.

Another point that Pope Pius XII addressed was the question of monogenism versus polygenism; that is, whether all human beings were descended from a single original pair of humans (call them Adam and Eve) or many. He said that Catholic scholars had to adhere to monogenism. However, he did not absolutely close the door to polygenism. He said "it is in no way apparent" how polygenism can be reconciled with certain Catholic teachings, in particular on Original Sin. But his precise wording is significant. He did not assert that these ideas could not be reconciled, only that it not apparent how they could. Many Catholic theologians have been quick --- too quick in my view --- to toss monogenism overboard. They think that the theory of evolution requires polygenism. They would be right about that, if the emergence of true human beings with spiritual souls were simply a matter of biological speciation. However, it is clearly is more than that, and so I don't think that monogenism is in any way incompatible with modern evolutionary ideas. Anyway, this is somewhat of a fine point, so I will say no more about it unless someone asks me later.

The next notable Church statement on evolution did not come for nearly a half century later. In 1996, Pope John Paul II delivered an address about evolution to the Pontifical Academy of Sciences. Referring to the encyclical *Humani Generis*, he said, "Today, almost half a century after the appearance of that encyclical, some new findings lead us toward the recognition of evolution as more than a hypothesis. In fact, it is remarkable that this theory has had progressively greater influence on the spirit of researchers, following a series of discoveries in different scholarly disciplines. The convergence in the results of these independent studies --- which was neither planned nor sought --- constitutes in itself a significant argument in favor of the theory."

Of course, the Pope was not officially teaching that evolution is true. The Church will never teach that it is true or that it is false. It was simply the recognition by the Pope of an obvious fact, namely that there was a great deal of evidence for evolution and significantly more than there had been in 1950.

Pope John Paul II in the same message reiterated what he called "the essential point" made by Pope Pius XII, namely that "if the human body takes its origin from pre-existent living matter, [nevertheless] the spiritual soul is immediately created by God." (Immediately here, means directly.) This has always been the essential point for Catholics. Evolution is a theory of how atoms came to be assembled in certain ways to form biological organisms. However, we human beings are not just assemblages of atoms. We are also spiritual, in that we have rational intellects and free will, which cannot be explained merely in terms of the motions of atoms. That means that there is not just a difference of degree between us and other animals, but what Pope John Paul II in the same message called an "ontological discontinuity".

The next important statement was a document issued in 2004 by the International Theological Commission, which is a body that advises the Congregation of the Doctrine of the Faith, at that time headed by Cardinal Ratzinger. The document, called *Communion and Stewardship*, was approved for publication by Cardinal Ratzinger. It analyses some of the philosophical and theological issues surrounding evolution. It stresses the same points made by Pius XII and John Paul II, but it contains a lot more. In particular, it argues that the neo-Darwinian mechanism of evolution is not incompatible with the Catholic doctrine of divine Providence. I will come back to this very important point later.

One more historical fact should be noted. Evolution has been taught in Catholic schools for generations. And there has never been a movement among Catholics, as far as I know, to prevent the teaching of evolution in Catholic schools. [Randy Moore]

We see from all this, that the Catholic Church and the best Catholic thinkers have never been caught up in anti-evolutionism. As I noted, that has largely been a fundamentalist Protestant phenomenon. There does seem to have been an increase of anti-evolutionism in Catholic circles in recent years. I suspect that part of this may be due to a weakened understanding by some Catholics of their own theological and philosophical tradition. Perhaps this is another symptom of the general breakdown of catechesis in the last forty years.

DISCOMFORT WITH EVOLUTION

Now I will change the focus a little and look at the reasons many people reject or are uncomfortable with evolution. I am going to start with several reasons that are rather flimsy, and then take up the more difficult questions.

Reason # 1 is that evolution seems to some to disagree with the Biblical account of creation. "The Question Box" answered this argument well: "The Bible is not a textbook of science, and, therefore, cannot rightly be quoted either for or against evolution. As Pope Leo XIII says in his encyclical *Providentissimus Deus*: 'The sacred writers did not intend to teach men these things, that is to say, the essential nature of the things of the visible universe, ...'" One also should note that some of the Church fathers, including the greatest of them, St. Augustine, took many of the things in the book of Genesis in a figurative way. For instance, Augustine did not take the Six Days of creation literally as a temporal sequence. He considered that the whole universe was created in one instant. St. Thomas Aquinas followed Augustine's view on this. St. Thomas said that the idea of a temporally successive creation was more common and "superficially more in

accord with the letter” of Scripture, but that St. Augustine’s view was more in accordance with reason, and that therefore he (St. Thomas) preferred it.

Reason #2 is that evolution seems to some to take away from human dignity, by saying that we are descended from apes. However, it is not clear why being directly formed from the dust of the ground is more dignified. An ape is something higher than dirt, certainly. In fact, the Bible in many places emphasizes that we are creatures of dust, precisely to show us our lowliness. Our dignity comes not from our physical origin, but from our spiritual nature. Only in the account of man’s creation do we find it said that “God breathed into him, and he became a living soul”. That is, only on man did God confer a spiritual nature in some way resembling His own, so that only human beings are said by Scripture to be made in the image of God. As it happens, science agrees with the Bible that we came from dust. Billions of years ago, there were just particles and dust from which condensed all stars and planets and living things. Whether we came from dust very quickly as portrayed in Genesis or through a slow process as described by science, is really theologically irrelevant, as Chesterton observed. Our bodies are taken from the dust and they will return to dust.

Reason #3 is that evolution seems to some people to imply that there is only a difference of degree between man and animals. However, that conclusion would only follow if we deny what John Paul II called the “essential point”: that man has a soul as well as a body.

Reason #4 is that evolution is “naturalistic”. This is a big point with Phillip Johnson, for example, the author of “Darwin on Trial”. He seems to think, or fears that others will think, that explaining things naturally, rather than supernaturally, leaves God with less to do. This kind of concern has always puzzled me. People hardly ever raise this objection to the natural explanations of things given in astronomy, geology, physics, or chemistry. It is only in biology that they see a problem with naturalism. However, we have already seen the fallacy involved in this point of view, namely failing to distinguish between primary and secondary causality.

None of these objections should have any force for Catholics; and indeed historically have had very little.

So now let’s turn to some more serious objections.

The militantly atheistic zoologist Richard Dawkins has claimed that Darwinism has destroyed once and for all the so-called Argument from Design for the existence of God. Once upon a time, he says, people believed that the intricate structures of living things proved that they must be the

product of an intelligent designer. Now we realize that they are the product of the blind forces of nature, and specifically natural selection. Dawkins concedes that living things indeed have all the earmarks that we normally associate with design: complexity, functionality, interdependence of parts. However, this appearance of design we now know to be misleading. He therefore calls living things “designoids”, i.e. things that appear to be designed but are not. By showing that no designer of living things is necessary, Darwin made it possible, says Dawkins, to be for the first time “an intellectually fulfilled atheist.”

Now, let us suppose for a moment that Dawkins is right about designoids. Would that really mean that Darwin has destroyed the old Argument from Design? No, for several reasons.

First of all, we must note that the Argument from Design has two forms at least. There is what I shall call the Cosmic Design argument, which starts with the orderliness and lawfulness of the cosmos as a whole; and there is what I shall call the Biological Design Argument, which starts from the structure of living things. If one looks at the Scriptures and the writings of the early Christians and Church fathers, I think that one finds the Cosmic Design Argument to be the older and more fundamental one. The ancients were impressed most of all by the orderliness and lawfulness of the whole universe.

Consider, for example, this beautiful passage from Minucius Felix, a Latin apologist who wrote around 200 AD:

“If upon entering some home, you saw that everything there was well-tended, neat, and decorative, you would believe that some master was in charge of it and that he was himself much superior to those good things. So too in the home of this world, when you see providence, order, and law in the heavens and on earth, believe that there is a Lord and Author of the universe, more beautiful than the stars themselves and the various parts of the whole world.”

Psalm 148 refers to God giving to the Sun, the Moon, the stars, and the heavens, a “law that will not pass away”. The Lord speaks through the prophet Jeremiah, saying: “When I have no covenant with day and night, and have given no laws to heaven and earth, then will I reject the descendants of Jacob and of my servant David.” One could multiply examples, but these are enough to show the where the focus traditionally was: it was on the providence, order and law in the heavens and the earth, the laws for the Sun, Moon, stars, and heavens, the covenant with day and night and the laws to heaven and earth. It was the basic fact that the cosmos was orderly that pointed to its creation by a rational Mind. It was the lawfulness of the world that

pointed to a Lawgiver. Biological structure did not loom so large in these arguments. I think that the emphasis, and even fixation, on biology was a modern development.

Let us look at a passage from the English historian Macaulay, written in 1840, a couple of decades before Darwin published his great work: "A philosopher of the present day ... has before him the same evidences of design in the structure of the universe which the early Greeks had ... , for the discoveries of modern astronomers and anatomists have really added nothing to the force of that argument which a reflective mind finds in every beast, bird, insect, fish leaf, flower and shell."

Note something interesting here. Macaulay starts talking about the structure of the universe, and then mentions astronomers along with anatomists, but when he concludes with examples they are all taken from biology: the bodies of living things or parts of them: "beast, bird, insect, fish, leaf, flower, and shell." Somehow, along the way, the old Cosmic Design Argument seems to have been eclipsed in people's consciousness by biological arguments.

Now, the Cosmic Design Argument is not only older and more fundamental than the Biological one, it is also quite immune to any attack based on Darwinian evolution. Biological structure may evolve by a process of random variation and natural selection; however, one cannot explain the intricate structure found in the fundamental laws of nature in such a way. Very few physicists take seriously the idea that the fundamental laws of physics evolved. Indeed, that idea would be circular. For if the laws of physics **did** evolve by a natural process, then that process, to be natural, would have to be governed by natural laws of some kind.

It is true that we now have scientific explanations of most of the structures of things seen in physics and astronomy. For example, the structure of crystals and the structure of the solar system. However, those scientific explanations always appeal to some **more** encompassing and **more** beautiful orderliness that exists at a deeper level in nature. For example, Kepler discovered very beautiful mathematical patterns or laws in the motions of the planets around the sun. Newton explained those patterns, but only by positing even grander patterns in nature that we call Newton's universal laws of mechanics and gravity. The lovely patterns we find in crystals can also be explained; but we explain them as coming from even deeper symmetries and principles of order at the level of atomic physics, and deeper still from the level of quantum field theory. In physics, astronomy, and chemistry, order is not explained away, order is not found to arise from mere chaos. Quite the reverse, it is always found that order at one level is explained by greater order at a deeper level.

And so, as fundamental physics has progressed, we have more and more come to see that the laws of nature form a single, harmonious, and magnificent edifice of great subtlety, intricacy, and mathematical beauty. Indeed physicists think they have perhaps glimpsed the outlines of the truly fundamental laws of physics in something called superstring theory. A science reporter asked Edward Witten, a top physicist, why he believed that superstring theory was probably right even though there is still no experimental evidence for it. Witten in exasperation said, "I don't think I have succeeded in conveying to you its wonder, incredible consistency, remarkable elegance, and beauty." Now, Witten is an atheist, I think. Even atheists marvel at the grandeur and beauty of the laws of physics. I should note that the mathematical ideas involved in superstring theory are so deep that even after twenty years of intense study by hundreds of the world's most brilliant mathematicians and physicists, they feel that have barely scratched its surface. How great the mind that conceived such laws! The Cosmic Argument from Design is alive and well.

Here is what one of the greatest mathematicians and mathematical physicists of the twentieth century, Hermann Weyl said in a lecture at Yale university in 1931, and what he said then applies with much greater force today:

"Many people think that modern science is far removed from God. I find, on the contrary, that it is much more difficult today for the knowing person to approach God from history, from the spiritual side of the world, and from morals; for there we encounter the suffering and evil in the world, which it is difficult to bring into harmony with an all-merciful and all-mighty God. In this domain, we have evidently not yet succeeded in raising the veil with which our human nature covers the essence of things. But in our knowledge of physical nature we have penetrated so far that we can obtain a vision of the flawless harmony which is in conformity with sublime reason."

There is another point to be made in reply to Dawkins. Again supposing that Darwinian mechanisms are sufficient to explain the facts about evolution, the very fact that the universe is able to give rise to living things at all depends on the laws of nature and the structure of the universe having many special characteristics. Indeed, at least *prima facie* it seems that the laws of physics are in many ways designed to make life possible.

Let me give just a few examples. If the law of gravity depended on distance, not as the inverse square, as discovered by Newton, but as some other integer power, planets would not be able to orbit stars, and there would be no warm habitat for life. The fact that life is possible in our universe is also a result of the great richness of chemistry, which in turn is a result of the large number of chemical elements. There are almost one hundred naturally occurring chemical

elements, and no fewer than twenty-five of them are required to make a human body. Almost all of the chemical elements were forged in the interiors of stars or in stellar explosions called supernovas. The forging of the elements depended on certain quite delicate balances between the various forces of nature. For example, if the so-called strong nuclear force were a few percent weaker, practically none of the elements would have formed in any appreciable quantities. On the other hand, if the strong force were a few percent stronger stars like the Sun would have burned up their fuel so fast that life would not have had time to evolve. Again, if a certain energy level in the Carbon-12 nucleus were only a few percent higher or lower in energy, almost no carbon or any of the elements heavier than carbon would exist. If the electromagnetic force were stronger than it is, then the nuclei of many elements would be unstable. One could go on and on pointing out features of the laws of physics that seem to be arranged to make life possible. There are many examples of such so-called “anthropic coincidences”.

Some biologists, like Dawkins, focus so much on the kinds of structures that they study for a living that they are unaware of the deeper structures of physics on which everything else depends. Dawkins uses the old analogy of watches and a watchmaker. For him, the watches are the intricate structures of living things. Rather than God being the watchmaker, Dawkins says, it is the universe itself blindly following its own impersonal laws which fashions the watches. The universe is, he says, The Blind Watchmaker. That is the famous title of one of his books. Now, it would seem that a watchmaker is something even more impressive than a watch. And therefore one naturally asks, “Who made the blind watchmaker?”

RANDOMNESS

Let me now turn to another aspect of Darwinism that disturbs many people from a religious or philosophical standpoint. It is the fact that the Darwinian mechanism is natural selection acting on RANDOM genetic mutations. The word random spooks a lot of people. Random can mean “uncaused”, “unplanned”, “pointless”, “arbitrary”, “meaningless”, and so on. We talk about “random violence”. We say that something is random gibberish. Or we say, when someone is not considering his words, that he is just “speaking at random”. Recently, Cardinal Schoenborn, a man of high intellect, and the general editor of the wonderful Catechism of the Catholic Church, wrote an article in the New York Times in which he criticized neo-Darwinism for asserting that life arose from natural selection acting on random, “uncaused” and “unplanned” genetic variations. He said that to posit uncaused and unplanned events as the origin of life, and human life in particular, was to deny a divine plan and divine Providence and God’s governance of the universe. And the cardinal is certainly right that many people, like Dawkins, put such an atheistic

spin on Darwinism. They do go around saying that evolution is an unplanned and unguided process. Indeed, I have seen this stated in some high-school biology textbooks myself.

The fact is, however, that the word random as used in science does not necessarily imply unplanned and unguided, in spite of the fears of some people and the claims of others. If it did, then we who believe in divine Providence and that every event in the universe is encompassed in God's plan in some way, would be in trouble. We would have to reject not only Darwinian evolution, but much of modern physics, astronomy, chemistry and modern science in general. Why? Because the word random is a basic term used in every branch of science. Fortunately, though, we don't have to worry. The word random in science is **not** just a synonym for unguided and unplanned. In fact, the words unguided and unplanned are hardly ever used in science.

It is instructive to consult the standard Science Citation Index of the Institute for Scientific Information. If you do so, you will discover that there are only about 500 papers in all of the scientific literature in English that have the word "unplanned" in the title. Most of them have to do with unplanned medical operations or unplanned pregnancies. There are only about fifty papers with the word "unguided" in the title. Most of them have to do with guided missiles. These are not scientific terms. By contrast, there are over 50,000 scientific papers with the term "random" in the title. Random is a scientific term. It is used in discussing the motions of molecules in a gas, fluctuations in a quantum field, noise in an electronic device, statistical errors in a data set, and many, many other things, in addition to genetic mutations.

So what does "random" mean, as used in science, if not unplanned and unguided? Basically, it means **uncorrelated**.

Take a simple example. Suppose one tosses a coin many times. Because each toss is independent of all the other tosses, their outcomes are uncorrelated with each other. That is why knowing how previous tosses came out gives no information about the next one. So mathematicians say that the outcomes form a "random sequence".

Now let's consider a different example. When my family drives on the highway, my children like to observe the license plates of the cars and trucks that pass us and see what states they are from. We will see one from Delaware, then New Jersey, then Maryland, another from New Jersey, then Florida, etc. Now there are probabilities involved here, as in any random process --- as there are in coin tosses. One can say that driving on I95 through Delaware one is more likely to see a car from New Jersey than one from Kansas. Nevertheless, one cannot predict after seeing a sequence of license plates what state the next car will be from. So there is there is an element of

randomness. **Nevertheless**, each car is where it is, at that particular time and that particular place, for some reason. Each driver has a **plan** and an itinerary; each is **guided** by some map and schedule. Each driver's trip fits into the pattern of his life in some intelligible way. It is just that one driver's life is usually **uncorrelated** with the other drivers' lives.

Take another example. In a sonnet, there is a strict correlation among the final syllables of the different lines. But in a passage of prose, the sequence of final syllables will exhibit randomness. That does not mean that the words in a passage of prose are not chosen or planned. They may have been chosen with great care. It is just that the author did not choose them with an eye to rhyming them. That is, he does not choose to impose on the final syllables of his lines of prose any correlation, as he would have if he had set out to write poetry. In the same way, God, though He planned the universe with infinite care may not have chosen to impose upon the motions of the different molecules in a gas certain types of correlations.

The kind of randomness that we talk about in science could be called statistical randomness, to distinguish it from other, more philosophically loaded uses of the word random.

The idea of statistical randomness is obviously connected closely with the ideas of chance and probability. However, the connection is rather paradoxical and subtle. The randomness of a sequence of coin tosses prevents me from predicting the outcome of any particular toss; but at the same time it makes it possible for me to use probability theory to make useful predictions about what is likely to happen in a long sequence of tosses. I know for example that in a sequence of a million coin tosses the ratio of heads to tails is unlikely to deviate from 50-50 by much more than a tenth of a percent. The paradox here is that randomness is a **lack** of systematic relationship, whereas probabilities can be thought of as a **kind** of systematic relationship. That is why the concept of randomness is so useful in explaining things in science. Just as knowing that a sequence of coin tosses is random allows the mathematician to make statements about the averages of large numbers of tosses, knowing that the molecules in a gas are moving randomly allows the physicist to calculate numerous properties of a gas made up of many molecules. When large numbers are involved, "chance" can lead to a kind of necessity.

It is a fact that statistical randomness, chance, and probability play a role in nature. Nature itself takes probabilities into account. Why do certain animals spawn vast numbers of offspring? To compensate for the fact that the chance of any one of them surviving is low. Why are so many sperm sent off in search of the egg? Because the chances of any one sperm accomplishing its task are exceedingly small. Nature plays the odds, and it couldn't do so unless there were odds to be played.

It is not clear why God should not make use of statistically random processes and probabilities to achieve his ends in evolution also. If God can so arrange things that many larvae are produced so that a few of them shall win through to adulthood, why should he not arrange that many genetic mutations should occur so that some of them shall win through to produce new and interesting creatures?

One may use an analogy. If a man wants to see a royal flush dealt in poker he could make sure of it in different ways. He could take one deck and "stack it", i.e. introduce the right correlations among the cards in the deck, so that the royal flush is dealt. Or he could take a million shuffled decks --- i.e. randomized decks --- and deal a hand from each one of them. Then the chances would be overwhelming that a royal flush will be dealt in at least one of them. In making plants and animals, did God stack the molecular and genetic decks, or did he shuffle them and use large numbers? Being God, he could have done it either way.

Now one might object that God does not play the odds, after all He knows everything past present and future. He knows from all eternity what is in the cards. And that is of course true. Nevertheless, the cards he deals, so to speak may very well appear to any statistical analysis to be random. God knows where every molecule in the gas is going to go. But the physicist is quite entitled to call those motions random.

The Bible itself speaks of chance. Ecclesiastes says, "I returned and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favor to men of skill, but time and chance happeneth to them all." Ecclesiastes is not saying that then things are outside the control of God's providence, but simply that there is not a perfect correlation between being strong and winning or between having bread and being wise.

One final note on this point is that the excellent document by the International Theological Commission published with Cardinal Ratzinger's approval in 2004, makes very clear that there is nothing incompatible between speaking of random genetic mutations in the context of Darwinian evolutionary theory and Catholic teaching on divine Providence.

INTELLIGENT DESIGN

Finally, I will say a few words about the so-called Intelligent Design movement. The leading thinkers in this movement are Michael Behe and William Dembski, both of whom I know

personally and respect. Behe is a Catholic and Dembski is a Protestant. The Intelligent Design people do not object to the use of chance and probability to explain events in nature. Far from it. In Dembski's famous "explanatory filter", one first has to rule out explanations of an event based on chance or on natural law before one can arrive at the conclusion that intelligent design is involved. Nor do they say that natural selection is inherently incompatible with theism or Christian belief. Even Phillip Johnson, the godfather of the ID movement, admits that God could certainly have used natural selection to produce animals and plants, if He had wished to do things that way. The ID theorists simply don't think that natural selection succeeds in explaining all biological facts we see. They argue that living things are too complex to be explained in that way.

Let's go back to a poker analogy. Suppose a group of people were playing poker and Joe dealt himself a royal flush. A suspicion might arise that Joe cheated. However, the mere fact that the cards turned up that way would not prove (or even show it to be probable) that Joe cheated. After all, every day millions of people play poker around the world and royal flushes are bound to turn up by the laws of probability. However, suppose that every time Joe dealt he got very good hands: flushes, and fours of a kind, and straights, and full houses. If this went on for enough hands, it would become harder and harder to believe that Joe's good fortune was just the result of randomly shuffled decks. **On purely statistical grounds** it would become harder and harder to deny that someone, Joe or his confederate, was somehow consciously and deliberately manipulating the deck to produce a certain outcome.

That is what the dispute between the Intelligent Design people and the neo-Darwinists boils down to. The Darwinists say that the history of life is consistent with the genetic mutations that gave rise to it having been statistically random. The ID people, on the other hand, say that living things are **so** complex that one can show by **purely statistical arguments** that someone has been consciously and deliberately rigging the game so that life would appear. Who is right? For myself, I cannot see how anyone can know at this point. It is clearly a matter to be decided by mathematical calculation; and nobody is in a position to carry out the required calculations. It does not take great mathematical sophistication to calculate the probabilities in poker. In evolutionary biology, however, it is fantastically hard. For one thing no one knows in detail the precise sequence of steps at the genetic level that were required to produce various living things.

Unfortunately, the biological community is very dogmatic and intolerant of any questioning on this subject. They act as though only fools could question the sufficiency of natural selection. Well, here is how Werner Heisenberg described the views of Wolfgang Pauli, one of the giants of twentieth century physics: "Pauli is skeptical of the Darwinian opinion, extremely widespread in modern biology, whereby the evolution of species on earth is supposed to have come about

solely according to the laws of physics and chemistry, through chance mutations and their subsequent effects. He feels that this scheme is too narrow..."

On the other hand, the Intelligent Design people are overplaying **their** hand. They make arguments that are supposed to show that natural selection **cannot** explain certain biological structures. They speak of what they call "irreducible complexity". Certain biological structures are irreducible, they say, in the sense that all the parts of the complicated structure must be in place for it to function at all. So such a structure cannot have evolved one small step at a time, as Darwinism requires, but must have arisen in one incredibly unlikely step. If irreducibly complex structures exist in biology, it would indeed go a long way to establishing the ID people's case. But the hard thing is to show that a structure is irreducibly complex.

Consider a Roman arch. In a Roman arch every stone must be in place for the arch to stand up. So it is hard to imagine building such an arch one stone at a time. However, it can be done if one hits on the right method. One could build a wall one stone at a time, and then take stones away one stone at a time leaving an arch! So, as in a magic trick, sometimes a thing seems undoable, but turns out to be easy once the trick is explained. How do we know that some of the structures that the ID people point to as "irreducibly complex" really are? We don't.

Finally, should Intelligent Design be taught in biology classes as an alternative biological theory? I don't think so. What should be taught is the fact that biological theory is not complete as it stands, and that it has not yet been proven that natural selection and other known mechanisms are sufficient to explain all biological complexity, and that there have been and continue to be reasonable scientists who doubt it. That is all that should be said. The inference of an intelligent designer who lies outside of nature crosses over into philosophy and natural theology. I do not think it is safe or wise to authorize biologists **in their courses and textbooks**, vested therefore with all the authority and prestige that attaches to science in our day, to make declarations about philosophical and theological issues.

The so-called design hypothesis of the ID movement, while perfectly reasonable, is not a scientific hypothesis in the traditional sense. Traditionally, natural science investigates the natural order of the world. Those things that go beyond the natural order --- and as Catholics we certainly believe that some things do go beyond the natural order --- go beyond the purview of natural science.

In conclusion, the Catholic Church has never had a quarrel with evolution or the Darwinian theory of natural selection acting on random genetic mutations per se. These theories pose no danger to

traditional Catholic belief or orthodoxy. Catholics are therefore free to follow the evidence wherever it may lead. That is what the Church has wisely taught and continues to teach.

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