

Science Does Not Need God. Or Does It?

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I would essentially like to share with you two convictions in this presentation: (1) that the Intelligent Design (ID) movement, while evoking a God of power and might, a designer God, actually belittles God, makes her/him too small and paltry; (2) that our scientific understanding of the universe, untainted by religious considerations, provides for those who believe in God a marvelous opportunity to reflect upon their beliefs. Please note carefully that I distinguish, and will continue to do so in this presentation, that science and religion are totally separate human pursuits. Science is completely neutral with respect to theistic or atheistic implications which may be drawn from scientific results.

The current situation in the evolution debate is better understood if we review a few significant episodes in the history of the debate. In 1669 Niels Stensen, a Danish scientist and Catholic priest, discovered in the mountains of Tuscany, Italy the fossil of a whale's tooth almost identical to that of a whale caught off of the coast of Leghorn, Italy. He intuited that Tuscany must have been inundated in geological times by an ocean. He published a fundamental work on such themes and is credited thereby for having founded three branches of geological sciences: paleontology, crystallography and historical geology. He identified three different geological strata and for the first time proposed a temporal sequence for the formation of the earth's crust. For the first time also the Biblical flood was considered as the source of the inundations. From then on the mistaken attempt to employ the Bible as a source of scientific knowledge will unduly complicate the debate over evolution.

In the late 18th and early 19th centuries Jean-Baptiste Lamarck introduced the evolution of species and claimed that there was no clear distinction biologically between closely allied species. Until the time of Lamarck evolutionary biologists spoke of a "chain of nature," a linear progression in the evolution of species. He introduced the concept of an "evolutionary tree" and also that of natural selection. Both the geological findings of Stensen and the evolutionary biology of Lamarck required times much longer than those deduced from the

Bible, billions of years instead of thousands of years.

Despite what is commonly thought, it was not Charles Darwin who caused problems for the theologians with the implications that might be drawn from the theory of evolution. About one hundred years before Darwin the *College de Sorbonne* in Paris (a kind of French Holy Office or Inquisition) condemned the great French naturalist, Georges Buffon, for having proposed, from both the cooling rate and the sequence of geological strata, that it took billion of years to form the crust of the earth. Darwin's great contribution to the growing scientific evidence for evolution was not so much evolution as such but rather the adaptation of living organisms to the environment, only one of the two great pillars of evolutionary theory: internal mutations in an organism and natural selection. Controversy from religious believers immediately showed its foreboding head. The mistaken thinking was essentially that if we human beings are descended from the apes, then we are only apes. On the contrary, Genesis says that "God created the plants and animals according to their species," i.e. he created each individual species. Furthermore, religious thinkers, not Darwin himself, thought mistakenly that evolution was dominated by chance and, therefore, not under God's dominion. It is not dominated by chance as we shall soon see.

The great British intellectual and Roman Catholic Cardinal, John Henry Newman, stated in 1868: "The theory of Darwin, true or not, is not necessarily atheistic; on the contrary, it may simply be suggesting a larger idea of Divine Providence and Skill." What a marvelous intuition and one which we shall see fits very well the implications to be drawn from our scientific knowledge of an evolutionary universe. Newman supported St. George Jackson Mivart, a Catholic biologist and one of the first to confirm the natural selection ideas of Darwin. Despite his support Mivart was excommunicated by the Cardinal Archbishop of Westminster, Herbert Vaughan.

This brief survey of some historical incidents shows the ups and downs of the view of the Churches, and especially of the Catholic Church, with respect to Darwinian evolution. However, one half century after Darwin research on evolution by Catholic scholars was a veritable mine field. Many saw coming another "Galileo Affair." Nonetheless, in 1996 in a message to the Pontifical Academy of Sciences Pope John Paul II declared that: "New scientific knowledge has led us to the conclusion that the theory of evolution is no longer a mere hypothesis." The new scientific knowledge has also led to what is now called neo-Darwinian evolution, for the most part in continuity with Darwin but obviously progressing beyond his science.

The most recent episode in the relationship of the Catholic Church to science, a tragic one as I see it, is the affirmation by Cardinal Christoph Schönborn in his article in the New York Times, 7 July 2005, that neo-Darwinian evolution is not compatible with Catholic doctrine and he opts for Intelligent Design. To my estimation the Cardinal is in error on at least five fundamental issues, among others: (1) the scientific theory of evolution, as all scientific theories, is completely neutral with respect to religious thinking; (2) the message of John Paul II, which I have just referred to and which is dismissed by the Cardinal as “rather vague and unimportant,” is a fundamental Church teaching which significantly advances the evolution debate; (3) neo-Darwinian evolution is not in the words of the Cardinal: “an unguided, unplanned process of random variation and natural selection;” (4) the apparent directionality seen by science in the evolutionary process does not require a designer; (5) Intelligent Design is not science despite the Cardinal’s statement that “neo-Darwinism and the multiverse hypothesis in cosmology [were] invented to avoid the overwhelming evidence for purpose and design **found in modern science** [emphasis by me].

I would like now to address some of these issues by demonstrating with a series of slides the best modern scientific view of the universe in evolution: physical, chemical and biological. As a Christian believer I would then like to draw some implications from the science presented. The following text represents the essentials of that presentation.

Let us take a sweeping view of a reasonable scientific picture of things. By reasonable I mean that, while we do not have all the answers, the following picture can stand up to any scientific critique. If we look today in infrared light at the center of Orion we see boiling gas and dust. If we look even closer up we see incandescent regions buried in that gas and with the Hubble Space Telescope we see the fine separation of blue gas and red gas in the midst of a rather chaotic structure. The fact is that stars are being born in this gas. And where the hottest, most massive and, therefore, brightest stars are already born, they are irradiating the gas, and it is giving off hydrogen alpha radiation. In this way we can identify star birth regions. The region of star birth in Orion is just a little part of our Milky Way, which, like most other spiral galaxies, measures 100,000 light years across and it contains about a hundred billion stars. It has several beautiful spiral arms and the sun is located in one of the outer arms, about two-thirds of the distance from the nucleus of our galaxy.

How is a star born? It happens by the laws of physics. A cloud of gas and dust, containing about 100 to 1,000 times the mass of our sun, gets shocked by a

supernova explosion or something similar and this causes an interplay between the magnetic and gravity fields. The cloud begins to break up and chunks of the cloud begin to collapse. And as any gas collapses, it begins to heat up; as it expands, it cools down. In this case the mass is so great that the internal temperature reaches millions of degrees and thus turns on a thermonuclear furnace. A star is born. Thermonuclear energy is the source whereby a star radiates to the universe. You need a very hot piece of the universe to do this, and so you can only get this thermonuclear furnace by having a cloud collapse and raise the temperature. You can only get it, in other words, in stars, with one exception, namely, in the very hot early universe before galaxies or stars were born.

Stars also die. A star at the end of its life can no longer sustain a thermonuclear furnace and so it can no longer resist against gravity. It collapses for a final time, explodes and expels its outer atmosphere to the universe. This may happen nice and peacefully or it may happen in a violent cataclysmic explosion, called a supernova. The most famous of these is the Crab Nebula which has a pulsar at the middle as its dead star.

So stars are born and stars die. And as they die they spew left over star matter out to the universe. The birth and death of stars is very important. If it were not happening, you and I would not be here, and that is a scientific fact. In order to get the chemical elements to make the human body, we had to have three generations of stars. A succeeding generation of stars is born out of the material that is spewed out by a previous generation and mixed with primordial gas. But now notice that the second generation of stars is born out of material that was made in a thermonuclear furnace. The star lived by converting hydrogen to helium, helium to carbon, and if it were massive enough, carbon to oxygen, to nitrogen, all the way up to iron. As a star lives, it converts the lighter elements into the heavier elements. That is the way we get carbon and silicon and the other elements to make human hair and toe nails and all of those things. To get the chemistry to make amoebas we had to have the stars regurgitating material to the universe.

Obviously this story of star birth and death is very important for us. Out of this whole process around one star, which we call the sun, a group of planets came to be, among them the little grain of sand we call the Earth. An amazing thing happened with that little grain of sand when, in the 16th and 17th centuries with the birth of modern science, we developed the capacity to put the universe in our heads. We do that by using mathematics and physics, and to some extent the laws of chemistry and biology. Since we have the capacity to put the

universe in our heads, further questions come to us, even some, as we shall see, which go beyond science.

But first let us review what we know of the history of the expanding universe. As it aged, distances got larger in the universe. As this happened certain key events took place. Quarks combined to form elementary particles, which in turn formed atoms and then molecules. The universe became transparent and the cosmic background radiation came to be. Galaxies and stars were formed. The first microscopic life forms came to be after about ten billion years in a 13.7 billion year old universe. Why did it take so long to make even an amoeba? We have already discussed one reason. We did not have the chemistry to make even an amoeba until we had had three generations of stars.

How did we humans come to be in this evolving universe? It is quite clear that we do not know everything about this process. But it would be scientifically absurd to deny that the human brain is a result of a process of chemical complexification in an evolving universe. After the universe became rich in certain basic chemicals, those chemicals got together in successive steps to make ever more complex molecules.

Finally in some extraordinary chemical process the human brain came to be, the most complicated machine that we know. I should make it clear that, when I speak about the human brain as a machine, I am not excluding the spiritual dimension of the human being. I am simply prescind from it and talking about the human brain as a biological, chemical mechanism, evolving out of the universe.

Did this happen by chance or by necessity in this evolving universe? Was it destined to happen? The first thing to be said is that the problem is not formulated correctly. It is not just a question of chance or necessity because, first of all, it is both. Furthermore, there is a third element here that is very important. It is what I call “fertility” or “opportunity.” What this means is that the universe is so prolific in offering the opportunity for the success of both chance and necessary processes that such a character of the universe must be included in the discussion. The universe is 13.7 billion years old, it contains about 100 billion galaxies each of which contains 100 billion stars of an immense variety.

We might illustrate what opportunity means in the following way. Einstein said that God does not play at dice. He was referring specifically to quantum mechanics, but it can be applied in general to his view of the universe. For him

God made a universe to work according to established laws. This is referred to as a Newtonian Universe. It is like a clock that just keeps ticking away once you supply it energy. Today we might be permitted to challenge this point of view. We could claim that God does play at dice because he is certain to win. The point being made is that God made a universe that is so prolific with the possibilities for these processes to have success that we have to take the nature of the universe into consideration when we talk about how we came to be.

For 13.7 billion years the universe has been playing at the lottery. What do I mean by the lottery? When we speak about a small chance we mean that it is very unlikely that a certain event would happen. The “very unlikely” can be calculated in mathematical terms. Such a calculation takes into account how big the universe is, how many stars there are, how many stars would have developed planets, etc. In other words, it is not just guesswork. There is a foundation in fact for making each successive calculation.

A good example of a chance event would be two very simple molecules wandering about in the universe. They happen to meet one another and, when they do, they would love to make a more complex molecule because that is the nature of these molecules. But the temperature and pressure conditions are such that the chemical bonding to make a more complex molecule cannot happen. So they wander off, but they or identical molecules meet billions and billions of times, trillions if you wish, in this universe, and finally they meet and the temperature and pressure conditions are correct. This could happen more easily around certain types of stars than other types of stars, so we can throw in all kinds of other factors.

The point is that from a strictly mathematical analysis of this, called the mathematics of nonlinear dynamics, one can say that as this process goes on and more complex molecules develop, there is more and more direction to this process. As the complexity increases, the future complexity becomes more and more predetermined. In such wise did the human brain come to be and it is still evolving. Can we call this process “destiny?”

Let us pause for a moment to review the degree of certainty which we can place in the above scenario. We certainly do not have the scientific knowledge to say how each living creature came to be in detail. We do not know precisely how each more complex chemical system came to contribute to the process of self organization which brought about the diversity of life forms as we know them today. Most importantly, we do not know with scientific accuracy the sufficient elements in nature to have brought about the unbroken genealogical continuity

in evolution that we propose actually happened. There are, in brief, epistemological gaps which prevent natural science from saying that a detailed theory of biotic evolution has been proven. What we have presented is the most adequate account conceivable at this time considering the available empirical data. And that empirical data, with respect to biotic evolution, comes from various independent scientific enterprises, including molecular biology, paleontology and comparative anatomy.

It is clear that evolution is an intrinsic and proper characteristic of the universe. Neither the universe as a whole nor any of its ingredients can be understood except in terms of evolution. And evolution is a daily happening. We, for instance, are constantly exchanging atoms with the total reservoir of atoms in the universe. Each year 98% of the atoms in our bodies are renewed. Each time we breath we take in billions and billions of atoms recycled by the rest of breathing organisms during the past few weeks. Nothing in my genes was present a year ago. It is all new, regenerated from the available energy and matter in the universe. My skin is renewed each month and my liver each six weeks. In brief, human beings are among the most recycled beings in the universe.

How are we to interpret the scientific picture of life's origins in terms of religious belief. Do we need God to explain this? Very succinctly my answer is no. In fact, to need God would be a very denial of God. God is not the response to a need. One gets the impression from certain religious believers that they fondly hope for the durability of certain gaps in our scientific knowledge of evolution, so that they can fill them with God. This is the exact opposite of what human intelligence is all about. We should be seeking for the fulness of God in creation. We should not need God; we should accept her/him when he comes to us.

The religious believer is tempted by science to make God "explanation." We bring God in to try to explain things that we cannot otherwise explain. "How did the universe begin?", "How did we come to be?" and all such questions. We sort of latch onto God, especially if we do not feel that we have a good and reasonable scientific explanation. He is brought in as the Great God of the Gaps. I have never come to believe in God, nor do I think anyone has come to believe in God, by proving God's existence through anything like a scientific process. God is not found as the conclusion of a rational process like that. I believe in God because God gave himself to me. That was not a miracle. It does make sense that there is a personal God who deals with me and loves me and who has given himself to me. I have never come to love God or God to love me

because of any of these reasoning processes. I have come to love God because I have accepted the fact that she/he first made the move towards me. St. Augustine describes this very well when he speaks of his own conversion. He searched all the byways of the world in search of God until he became aware that it was God who was searching for him and he opened himself to that search.

But the personal God I have described is also God, creator of the universe. It is unfortunate that, especially here in America, creationism has come to mean some fundamentalistic, literal, scientific interpretation of Genesis. Judaic-Christian faith is radically creationist, but in a totally different sense. It is rooted in a belief that everything depends upon God, or better, all is a gift from God. The universe is not God and it cannot exist independently of God. Neither pantheism nor naturalism is true.

But if we confront what we know of origins scientifically with religious faith in God the Creator, in the senses described above, what results? I would claim that the detailed scientific understanding of origins has no bearing whatsoever on whether God exists or not. It has a great deal to do with my knowledge of God, should I happen to believe he exists. Let me explain.

Take two rather extreme scientific views of origins: that of Stephen Gould of an episodic, totally contingent and, therefore, non-repeatable evolutionary process as contrasted to a convergent evolutionary process such as that which I have described, in which the interplay of chance, necessity and opportunity leads inevitably to life and intelligence. In either case, it is scientifically tenable to maintain an autonomy and self-sufficiency of the natural processes in a natural world, so that recourse to God to explain the origins of all that exists, is not required. It is not a question as to whether chance in nature excludes God and destiny in nature requires God. In neither case is God required.

If, however, I believe in God then what nature tells me about God in one case is very different from what nature tells me about God in the other. Please note that I am not calling upon faith to adjudicate between contrasting scientific viewpoints. I do think that convergent evolution is more consistent with God's revelation of himself in the Book of Scripture, so that, as Galileo was fond of stating, the Book of Scripture and the Book of Nature speak of the same God.

If we take the results of modern science seriously, then what science tells us of God must be very different from God as seen by the medieval philosophers and theologians. For the religious believer modern science reveals a God who made

a universe that has within it a certain dynamism and thus participates in the very creativity of God. Such a view of creation can be found in early Christian writings, especially in those of St. Augustine in his comments on Genesis. If they respect the results of modern science, religious believers must move away from the notion of a dictator God, a Newtonian God who made the universe as a watch that ticks along regularly. Perhaps God should be seen more as a parent or as one who speaks encouraging and sustaining words. Scripture is very rich in these thoughts. It presents, indeed anthropomorphically, a God who gets angry, who disciplines, a God who nurtures the universe. Theologians already possess the concept of God's continuous creation. I think to explore modern science with this notion of continuous creation would be a very enriching experience for theologians and religious believers. God is working with the universe. The universe has a certain vitality of its own like a child does. It has the ability to respond to words of endearment and encouragement. You discipline a child but you try to preserve and enrich the individual character of the child and its own passion for life. A parent must allow the child to grow into adulthood, to come to make its own choices, to go on its own way in life. Words which give life are richer than mere commands or information. In such wise does God deal with the universe. It is for reasons of this description that I claim that Intelligent Design diminishes God, makes her/him a designer rather than a lover.

These are very weak images, but how else do we talk about God? We can only come to know God by analogy. The universe as we know it today through science is one way to derive analogical knowledge of God. For those who believe modern science does say something to us about God, it provides a challenge, an enriching challenge, to traditional beliefs about God. God in his infinite freedom continuously creates a world which reflects that freedom at all levels of the evolutionary process to greater and greater complexity. God lets the world be what it will be in its continuous evolution. He does not intervene, but rather allows, participates, loves. Is such thinking adequate to preserve the special character attributed by religious thought to the emergence not only of life but also of spirit, while avoiding a crude creationism? Only a protracted dialogue will tell.