



EVOLUTION

A CATHOLIC PERSPECTIVE

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SINCE 1859, when Charles Darwin first published his *Origin of Species*, the scientific question of evolution has aroused intense and often bitter controversy. Time and again over the years, a supposed conflict between "science" and "religion" has raged in the public forums—in courtrooms, classrooms, and the press. This past decade has witnessed a new and even more heated debate concerning textbooks and school curricula.

Television has not ignored the dramatic possibilities of these confrontations. On newscasts and talk shows, partisans from both sides have had their say on camera. On the one hand, fundamentalist Protestants have insisted on an absolutely literal interpretation of Genesis: a "special creation" of each sepa-

rate species in only seven days, beginning a few thousand years ago. Opposing them, some scientists-turned-celebrities have proclaimed with equal fervor the supreme triumph of chance: matter blindly developing from molecules to man, with no intervention by a Deity, and no need for One to explain anything. Thus the controversy has been reduced, in public perception, to a disquieting choice—"superstition" vs. "atheism."

What is a Catholic to make of all this? To anyone who knows even a little theology and science, the choice presented here is clearly false. In this, as in so many other heated controversies, the first casualty is truth. The Catholic faith is dedicated to truth, indeed to Truth Himself. And science, open-mindedly and fairly exercised, is committed to the pursuit of truthful knowledge. A Catholic should suspect, therefore, even before studying the question closely, that faith and scientific knowledge must complement, not contradict, each other.

This suspicion is confirmed by fact. The more one studies what the Catholic Church teaches and what science knows for certain, the more clearly he sees that Catholic faith and scientific knowledge are wholly compatible. The conflicts being aired today are really a pseudo-controversy. Dogmatic fundamentalists do not reflect Catholic tradition, and dogmatic evolutionists do not fairly represent science.

In the following pages, we want to exa-

mine briefly what the Church has clearly taught and what science has clearly learned about evolution, especially in recent years. By an honest pursuit of the truth, we can avoid entanglement in pointless disputes, like the Sadducees whom Our Lord upbraided so long ago—those who "knew neither the scriptures nor the power of God" (Mt 22:29).

What does "evolution" mean?

Any intelligent understanding of a complex problem requires, at the outset, a definition of terms. In fact, much of the present confusion stems from a vague association of several meanings with the term "evolution." Properly speaking, the word should embrace a biological concept founded on careful scientific study from several interrelated disciplines. But by extension the term has also been used in other senses—historical, sociological, and philosophical. We will concern ourselves here with the two principal definitions that impinge upon religious faith: the biological and philosophical.

For a properly scientific definition of the term, we may cite a formula established by fifty internationally known scientists at the Darwin Centennial Celebration, held in 1959: "*Evolution* is definable in general terms as a one-way irreversible process in time, which during its course generates novelty, diversity, and higher levels of organization."

In the field of biology (where evolutionary studies have been most extensive and produc-

tive), the term more specifically means: "a process whereby organisms change with the passage of time so that descendants differ from their ancestors."

Note that these definitions deal with a *process*, a succession of observable events measured over time. Science deals essentially and necessarily with material phenomena, those which can be measured. It tries to deduce reasonable explanations for the cause-and-effect relationships between events. Because it limits itself to material facts, its generalizations are necessarily mechanical. A biologist concerns himself with *how* events occur. For him, the question *why* lies outside the proper limits of his discipline.

This is important because, in the properly scientific sense, "evolution" as a *how* question poses no problem for Catholic belief. For decades now, scientists have established a chronology of how life forms succeeded one another over eons of time. It is beyond reasonable doubt that some sort of process has taken place. (As we shall see later, the mechanics of this succession have yet to be fully understood.) Whatever science determines on this *how* level is compatible with a Catholic principle: that God ordinarily carries out His creative acts in natural ways.

No, problems with Christian belief generally arise when "evolution" is loosely used in a broad philosophical sense. This meaning is substantially different from the scientific

one above. It may be defined as follows: "an ideological frame of mind which sees the entire universe in terms of matter-in-development and which consciously denies the existence of spiritual or supernatural reality; all phenomena—scientific, historical, economic, and social—are explainable in exclusively material terms."

This understanding of "evolution" is not scientific, though it derives much prestige from association with the sciences. It is not founded on experimental knowledge or rational deduction. It is rather a preconceived set of attitudes and values, a prejudice that is not merely unscientific, but irrational. For it is altogether credulous to hold that complex organs like the eye are not indicative of an ordering intelligence, but are instead the result of blind chance which of course cannot know or plan the end (seeing) to which the eye's single parts combine and evolve. In fact, it is a latter-day form of the philosophical materialism which has been with us since the time of the Greeks.

Inasmuch as it is really an outlook on life, it is a kind of religion. Properly speaking, therefore, this set of beliefs should not be called "evolution" but rather "evolutionism." To subscribe to creation (which is *not* the same thing as "creationism"), that is, the contingent world's ultimate dependence on a necessary, creative being, is not, on the contrary, an act of religion at all. It is a matter of philosophy, of

drawing sure conclusions from incontrovertible premises.

Like the other religion-substitute “isms” of our time, evolutionism has adherents from all walks of life. Some physicists, astronomers, and geneticists believe in it. But so do many journalists, economists, teachers, and historians—and cab-drivers and businessmen and poets. The atheism of a biochemist is really no more significant than that of a file clerk, but it can have more sway on public opinion.

A Catholic can, as we shall see, give qualified assent to evolution in the scientific sense but not to evolutionism. The fact is that many scientists engaged in evolutionary studies are themselves devout Catholics. These people see no contradiction between what the Church teaches and what science, as science, has learned. Let us examine why this is so.

Catholic teachings

It comes as a surprise to many Catholics to learn how little the Church teaches in this area—how few tenets are established as true beyond doubt, and therefore how much latitude is left to Catholics for their personal judgment. The Church has not been concerned with evolutionary questions as such, but rather with their possible implications for Catholic belief.

The Church has maintained that the first three chapters of Genesis contain historical truth. Their inspired author used a popular literary form of his day to explain certain his-

torical facts of Creation. These were named specifically by the Pontifical Biblical Commission, with the approval of Pope Pius X in 1909. The official document states that the literal historical meaning of the first three chapters of Genesis could not be doubted in regard to:

“the creation of all things by God at the beginning of time; the special creation of man; the formation of the first woman from the first man; the unity of the human race; the original happiness of our first parents in the state of justice, integrity, and immortality; the command given by God to man to test his obedience; the transgression of the divine command at the instigation of the devil under the form of a serpent; the degradation of our first parents from that primeval state of innocence; and the promise of a future redeemer.”

Note that the Church says nothing definitive about how, in scientific detail, God created the world and its various forms of life, or how long any of this took. The only “special creation” mentioned is that of man, who is unique in having a spiritual immortal soul. In the Church’s eyes, Genesis deals with historical fact, not scientific process—with the *what* of creation, not the *how*.

In 1950, Pope Pius XII addressed the question of man’s origins more specifically in his encyclical *Humani Generis*. With a few terse

paragraphs, he set forth the Church's position, which we may summarize as follows:

1. The question of the origin of man's *body* from pre-existing and living matter is a legitimate matter of inquiry for natural science. Catholics are free to form their own opinions, but they should do so cautiously; they should not confuse fact with conjecture, and they should respect the Church's right to define matters touching on Revelation.

2. Catholics must believe, however, that the human *soul* was created immediately by God. Since the soul is a spiritual substance it is not brought into being through a transformation of matter, but directly by God, whence the special uniqueness of each person.

3. All men have descended from an individual, Adam, who has transmitted original sin to all mankind. Catholics may not, therefore, believe in "polygenism," the scientific hypothesis that mankind descended from a group of original humans.

So, from the Catholic point of view, the scientific questions of evolution are largely left open to debate. Evolutionary hypotheses which attempt to explain the development of living things may be accepted except where they conflict with these few explicit truths.

This position clearly contrasts with that of many fundamentalist Protestant sects. Lacking belief in the Church's teaching authority, fundamentalists have usually insisted on treat-

ing Genesis as a scientifically accurate, as well as historically true, account. Unfortunately, this stance has often appeared in the media as definitive Christian doctrine. Its details have contrasted so sharply with established scientific knowledge that "Christian belief" has been held in ridicule.

To give one example: In the 17th century, an Anglican clergyman, Bishop James Ussher, calculated from Biblical genealogies that God created the world on an October morning in 4004 B.C. Many fundamentalists today would hold this as an article of faith. For virtually all scientists, the figure is absurd. From the Catholic point of view, Bishop Ussher spoke only for himself, not for the Church; his feat was one of arithmetic, not theology.

Of course, Catholics *may* share many of these fundamentalist beliefs as their personal opinions. The point is that they are not *required* to. With the exception of the few matters mentioned above, Catholics may hold whatever scientific positions seem reasonable and intellectually convincing.

This leads us to the next consideration. Just how much does science know with certainty? What are the strengths and limitations of science in helping us find the truth?

Scientific certitude

Popular accounts of science—in textbooks, magazines, and television features—are often misleading about the certitude of scientific

knowledge. Writers who explain science to the general public must simplify a host of complex matters to make them understandable and interesting. But this task frequently leads to oversimplification. Non-scientists are led to believe that science is essentially a stable body of factual knowledge. In reality, however, it is a dynamic process, constantly engaged in self-correction and even radical revision. Interpretation, guesswork, and imagination play a larger role in scientific study than most people are aware.

Consequently, knowledge derived from this inquiry has several distinct but overlapping levels of certitude. Some scientific matters are known to be factually true; that is, they are certain beyond doubt. Others are reasonable conjectures, generally accepted as true by specialists in the field. Still others are untested hypotheses awaiting verification through further work.

Let us take one case in point: *Australopithecus* was an ape-like creature who lived more than a million years ago in Africa. It is a fact that his brain size averaged about 500 cc. and that his leg-bone had some human-like features. It is, however, a conjecture that he walked upright much of the time; this is a reasonable guess but not so certain as the aforementioned facts. But it is only an hypothesis that his body gave rise to that of man. These distinct degrees of probable certitude are often blurred in many popular science articles.

The evolutionary sciences are especially susceptible to difficulty in establishing certitude. Unlike physics or chemistry, which are verifiable through controlled laboratory experimentation, the evolutionary disciplines are essentially historical. All the forms of paleontology (including paleoanthropology, the study of ancient man) seek to determine what happened to living things over the course of time. When researchers advance hypotheses to explain fossil phenomena, they are giving *reasonable interpretations* which are verifiable only through subsequent research. Later findings may confirm these explanations, or perhaps render them less plausible, or even prove them "wrong"—that is, very highly unlikely. Thus what is generally accepted by specialists today may be outmoded only a few years from now. The field is highly dynamic.

Evolutionary research over the past century, and especially in recent years, has taken many such twists and turns, often leading in unexpected directions. This unsettled condition stands to reason. The relative scarcity of fossil evidence, the high reliance on imaginative interpretation, the inherent problem of verification—all combine to make this "detective" work subject to ongoing uncertainty. Unfortunately, textbooks seldom convey the cautious and provisional nature of evolutionary thinking at any given time. Science knows less for certain about evolutionary pheno-

mena than is generally supposed.

The history of science offers many examples of this self-corrective process. It is worth our while to examine a few of these, even briefly, to see the dynamic at work. (And, parenthetically, it is interesting to see how many outmoded scientific beliefs still survive in popular thinking.)

The cave-man myth: Fossil evidence does not speak for itself; it must be interpreted, and this task requires imagination. Scientists at the turn of the century took greater liberties in describing ancient man than their counterparts today would. Their image of paleolithic man has entered popular imagination: a hairy, hunched-over, stupid, and ferocious creature, speaking in grunts and living by violence. Countless illustrations have shown him this way, and still do today in some popular media.

Today's specialists would disavow this image because it does not fit the facts. From fossil evidence alone, one cannot say anything about ancient man's hairiness or intelligence or speech or facial expression or supposed ill-manners. These details were supplied through imagination. The "survival of the fittest" motif called for ape-like characteristics in early man, and these were dutifully provided. The bones themselves said nothing.

One set of bones was significant, however. In 1911, the famous French anatomist, Marcelin Boule, carefully studied a recently dis-

covered Neanderthal skeleton. This specimen was important for it was the first nearly complete skeleton of an ancient man. Using it, science could understand the details of a typical Neanderthal's body structure.

Boule's reconstruction of Neanderthal showed a hunched-over, misshapen creature with bent legs and face thrust forward, not unlike the stance of a gorilla. This depiction was highly influential for decades thereafter; it was reproduced in textbooks, drawings, and museum displays around the world. But later discoveries of Neanderthal finds cast doubt on Boule's work. Then, in 1957, a team of anatomists re-examined Boule's original skeleton and found a serious source of error: the Neanderthal man had suffered from a case of severe arthritis. His stance was indeed hunched-over, but it was not genetic in origin and was not typical. Today, we believe that ancient people walked and stood erect almost exactly as we do.

The image of ferocity was also without factual support. Over the years, in fact, many archeological sites have shown evidence of cooperation and even compassion among primitive people. Numerous fossils came from carefully prepared graves, some as old as 100,000 years. In several instances, the deceased had been old and crippled (like Boule's specimen) and had received care for years before being laid to rest. In one grave, a youth had been buried carefully on his side, with one arm tucked under his head, as if he were sleeping; in

one hand, he held a beautifully carved quartz knife. In another grave, archeologists found the body of an elderly Neanderthal who had had his forearm amputated years before in his youth. (Surgery 60,000 years ago!) He had been cared for all his life. And in yet another Neanderthal site, researchers found evidence that the deceased had been buried with flowers.

Care for cripples and burial with flowers give a dimension of humanness to ancient man that earlier scientists would have found astonishing.

Species classification: Several decades ago, scientists habitually classified almost every new hominid (man-like) find into a separate species. These fossil creatures were thus named "Peking ape-man," "Java ape-man," "Neanderthal man," and so forth. Drawings of the day used to show an upward development: some primitive ape leading to the ape-man, who in turn led to Neanderthal, who then led to Cro-Magnon (identical to "modern" man in nearly every respect).

Within the last 25 years, these have all been reclassified. All the "ape-man" types (from 100,000 to 500,000 years ago and more) now belong to one species, *Homo erectus*, the "upright man." Neanderthal, we now believe, was a racial type of modern man, *Homo sapiens*. But this distinction needs some clarification. In what sense were these two forms of man different? Were they really separate and dis-

tinct species?

The true test for species difference is genetic isolability—that is, whether mating of two individuals will produce sterile offspring or not. But obviously we have no way to determine this among creatures long dead.

It is important to realize that, when scientists classify ancient fossils into distinct species, they do so exclusively on the basis of anatomical structure. If a given specimen has bone configurations within the known range of a given species, then it is called by that species' name. If, however, some significant features lie outside that range, then it probably belongs to a different species and is thus classified differently. *Homo erectus* had several anatomical features which differ from those of modern man. He had, for example, a prominent brow ridge over his eyes, a smaller stature, and a smaller average brain size.

The key point here is that both were forms of man, the genus *Homo*, with all that this implies. The anatomical variation was possibly, even probably, the only significant difference. We know that *erectus*, even from remotest antiquity, made several types of tools and used fire. Both of these activities show intelligent manipulation of nature. In other words, he, like the *sapiens* form, could think.

Brain size: At one time, scientists believed that relative brain size correlated closely with intelligence. This viewpoint has been mod-

ified considerably because of subsequent research data.

Modern man's brain averages 1250 cc., but with wide variation. It typically falls between the extremes of 1000 cc. and 2000 cc. *Homo erectus*, being small in stature, varied between 775 cc. and 1200 cc. All of these figures are much larger than those for apes and ape-like creatures: 450 cc. on the average.

But the wide variation in modern man seems unrelated to thinking powers. In at least one instance, a man with 900 cc. brain size exhibited normal intelligence. Consequently, we cannot with certainty predicate a lower level of intelligence to early man merely on the basis of his brain size.

Tool-making: As far back as man's fossil record indicates (currently about two million years), we find evidence of tool-making. Several decades ago, scientists correlated tool-making skill with native intelligence. A primitive tool indicated a primitive mind; a more complex form showed a relatively stronger intelligence. This value judgment no longer holds sway among specialists.

Today it is generally held that mastery of technique is distinct from native intelligence. Tool-fashioning is a skill acquired through learning and practice. Moreover, today's anthropologists have a much higher regard for the considerable skill which ancient man wielded in fashioning his implements.

One remarkable detail is the great variety of

these ancient tools. For scores of thousands of years, paleolithic man fashioned dozens of different tools—axes, scrapers, awls, burins, saws, knives, and many other types of implement. These were formed with extraordinary consistency, and even artistry, through hundreds of generations. Many were expertly fashioned in quartz and semi-precious stone.

Such variety in this paleolithic tool-chest implies that early man used tools extensively on other materials (wood, leather, bone) which have, of course, perished without a trace. Tools imply intelligence, not only because they are deliberately fashioned (an intelligent act itself), but because they are intended for some purpose further in the future. Such purposeful planning is a clear sign of rationality. So scientists believe today.

How much could early man have accomplished with these primitive stone tools? To find out, a team of anthropologists recently hired an expert Scandinavian woodsman and supplied him with a set of genuine paleolithic tools. The craftsman hafted stone axe-heads onto wooden shafts and experimented with various cutting techniques. Shortly afterward, he succeeded in felling large trees, splitting logs and making them into planks. Within three months, the expert constructed a complete one-story frame house.

Clearly, skill lies in the minds and hands. Little can be predicted from crudity of the tools.

Current theoretical developments: Over the past fifteen years, several major developments in research and interpretation have left the theoretical picture highly unsettled. These are too complex to explain in detail here, but they are worth noting in brief. From the mid-1920's until the early 1970's, scientists generally believed that man evolved gradually from a small ape-like creature called *Australopithecus*. As we mentioned earlier, this animal lived more than a million years ago and its fossils showed some human-like characteristics. It may have walked upright, at least some of the time, and its teeth roughly approximated those of man. Moreover, and perhaps most significantly, researchers often found stone tools scattered among Australopithecine fossils.

The theory during these decades held that some form of *Australopithecus*, enjoying free use of its hands, developed tool-making, and this skill gave rise in turn to an ever-larger brain through the well-known Darwinian forces of natural selection. Countless drawings in magazines and textbooks showed the hairy *Australopithecus*, holding his tools, standing next to *Homo erectus*, his later evolutionary offspring. This evolution was supposed to have taken place between 1,000,000 years ago and about 500,000 years ago, when *Homo erectus* first appeared.

But in the early 1970's, researchers were astonished to discover forms of *Homo erectus* from almost two million years ago, complete with tools. In other words, man had lived alongside and even before some forms of *Australopithecus*. Almost certainly it was he who had fashioned the tools found among the ape-

like fossils. If man had been around when the Australopithecines lived, then there was no reason to assume the apes had been tool-makers, or for that matter ancestors of man. The 1970's and 1980's have seen dozens of discoveries of *Homo erectus* fossils from one million to two million years ago. These discoveries have thrown into question, to say the least, the evolutionary relationship—if any—between *Australopithecus* and man. As of this writing, the problem is still being debated and even heatedly argued, among evolutionary specialists.

These startling developments—showing man to have been around at least five times longer than had previously been believed—shows once again the highly provisional nature of evolutionary generalizations. What the public sees as “conclusions” or “scientific facts” in this area are really ongoing best-estimates, subject to drastic revision in the face of new evidence. Note that Pius XII had been right: conjecture should not be confused with fact.

The 1970's also saw a growing and heated controversy among evolutionary specialists concerning the whole mechanism of evolutionary change. A number of prominent paleontologists went on record to question the prevailing theory of gradualism, the well-known Darwinian idea of evolution through natural selection. (High school and college textbooks taught this as virtual dogma up until very recently.) These researchers claimed that, contrary to Darwin's predictions and common scientific belief, the fossil record does not show gradual transitions between species. On the contrary, they maintained, the evidence

shows extreme stability of form. Species seem to appear relatively suddenly on earth, remain virtually unchanged for millions of years, and then disappear just as abruptly—or remain with us today just as they have always been, with only relatively minor changes of shape.

Macroevolution

What could account for this phenomenon? Current theory holds, among other positions, that major genetic alterations resulted in relatively sudden appearances of new species. For some reason, presently unexplained, the genetic structure of creatures underwent some drastic alterations; these in turn gave rise to significantly different species. The driving mechanism was thus principally genetic, not environmental as Darwin and his successors believed.

At present, this genetic leap is called “macroevolution.” Meanwhile, within a species at any given time, the forces of Darwinian natural selection were at work effecting minor alterations of structure—like the reshaping of finches’ beaks and other structural “breeding” changes noted by Darwin. This process is now called “microevolution.” In other words, the natural-selection mechanisms of classical Darwinism have now been significantly downgraded in explaining evolutionary changes.

This brief sketch cannot do justice to the highly confused and unsettled state of present evolutionary theory. There are now many competing explanations as to how genetic and environmental forces may have interacted to produce new species. No scientist doubts that *some* mechanism was at work; but what this

mechanism was remains an open question.

What is unquestionable, however, is that evolutionists’ confidence has been seriously shaken. Unlike the period before the 1970’s, evolutionary hypotheses are now presented in provisional and tentative ways. Gone is the certitude and assuredness that characterized previous explanations. For decades, there had been a kind of faith in the Darwinist and post-Darwinist mechanisms. That faith is, for the moment, gone. In the eyes of many observers, scientists included, this development is for the better. Science is generally diminished by smugness. Research and theory only retain a healthy dynamism when conducted with an open mind.

The history of science has seen many such periods of theoretical uncertainty, leading eventually to a dramatic breakthrough. Apparently the evolutionary sciences are in such a period of transition right now. For people who love science, the prospects are fascinating, even exciting.

The new attention given to genetic sources of change has opened up a new frontier of understanding. In studying the genes, scientists are once again at the place where scientific inquiry has always begun—the sense of awe. The genes are speck-like particles of chemical compounds, stretched out in “programmed order” of stunning complexity. Each “program” leads—somehow—to the richly diverse panoply of phenomena in living things: size, structure, amazingly complicated feedback mechanisms, growth and development patterns, and (perhaps most mysteriously of all) the array of instinctive

behaviors. How such beautifully coordinated activities can arise from microscopic "programs" is endlessly intriguing to scientists.

Given the stark and lifeless nature of the rest of the universe, the phenomena of life on earth are all the more awe-inspiring. In a real sense, life itself is a miracle.

Where these investigations will lead, no one can say for certain. In any event, our purpose here has been to demonstrate the dynamic nature of scientific inquiry. Even these few brief sketches show how evolutionary thinking has undergone an evolution of its own, a process that still continues. Science has many uncertainties and very few dogmas. This quality of uncertainty accounts, in large measure, for the fascination that scientists find in their work.

Catholics have nothing to fear from science's honest inquiries, honestly explained. On the contrary, every new discovery is a source of wonder and a reason for giving praise to God. Every "mechanism" implies a Mechanic; every "program" implies a Programmer. Of the Creator, we can say with St. Paul, "... from the foundations of the world, men have caught sight of his invisible nature, his eternal power and his divinity, as they are known through his creatures" (Rom 1:20).

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