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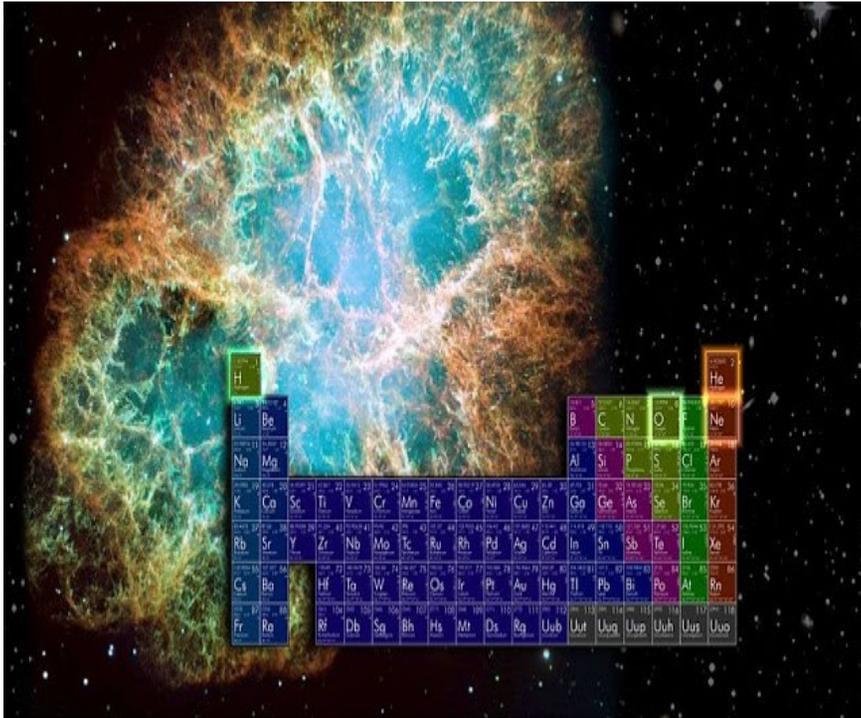
***Catholic Physics - Reflections of a  
Catholic Scientist - Part 4  
God's Periodic Table...And Evolution***



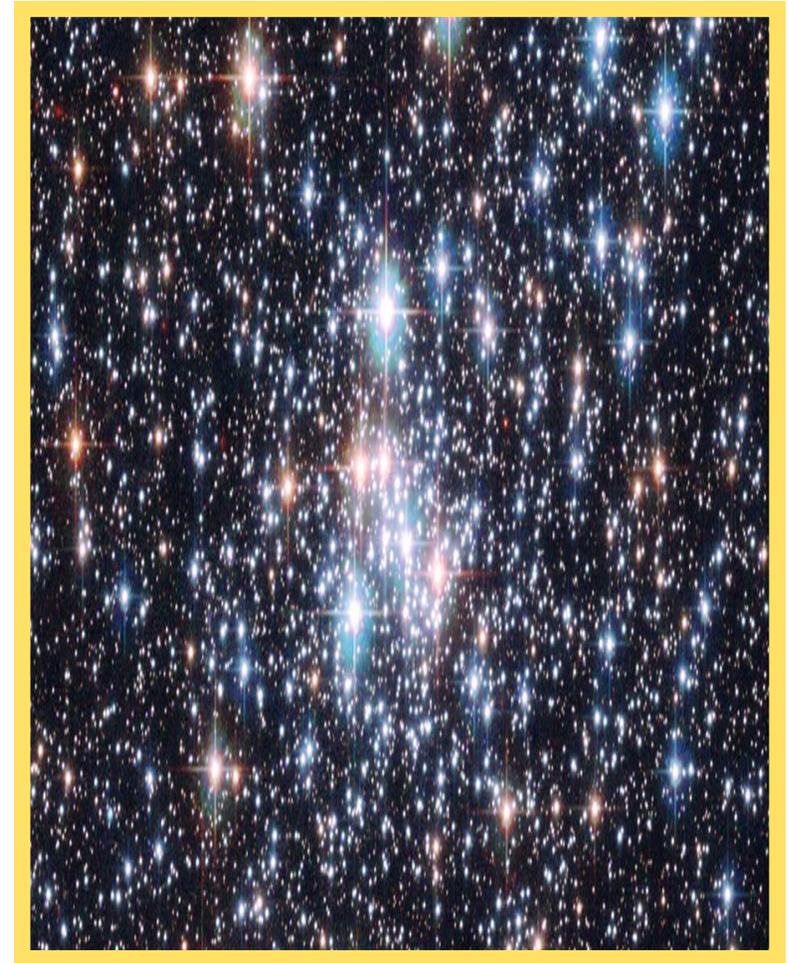
- ♦ 1200's
- ♦ Authority on physics, geography, astronomy, mineralogy, chemistry, zoology, and physiology
- ♦ "The aim of natural science is not simply to accept the statements of others, but to investigate the causes that are at work in nature"
- ♦ He understood that the Church is not opposed to study of nature
- ♦ Patron Saint of Scientists

# Catholic Physics - Reflections of a Catholic Scientist - Part 4

## God's Periodic Table...And Evolution



The Crab Nebula and the Periodic Table  
from [NASA/ESA Wikimedia Commons](#)



"Those distinct substances, which concretes generally either afford, or are made up of, may, without very much inconvenience, be called the elements or principles of them." — Robert Boyle, *The Sceptical Chymist*

"A common sense interpretation of the facts suggests that a super-intellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question." —Fred Hoyle (who predicted the triple-alpha process), *The Universe: Past and Present Reflections*. *Annual Review of Astronomy and Astrophysics*: 20:16

“And to tell the truth, rather than speaking about the theory of evolution, it is more accurate to speak of the theories of evolution. [emphasis added] The use of the plural is required here—in part because of the diversity of explanations regarding the mechanism of evolution, and in part because of the diversity of philosophies involved.

ibid.

“As a result, the theories of evolution which, because of the philosophies which inspire them, regard the spirit either as emerging from the forces of living matter, or as a simple epiphenomenon of that matter, are incompatible with the truth about man...”

ibid.

I’ve given a more detailed account of this in a post, Do Neanderthals have a soul?

## SUMMARY

Pope St. John Paul II in his Encyclical, *Fides et Ratio*, said:

“Faith and reason are like two wings on which the human spirit rises to the contemplation of truth; and God has placed in the human heart a desire to know the truth—in a word, to know himself—so that, by knowing and loving God, men and women may also come to the fullness of truth about themselves.”

Because we do not understand at present how evolution works are we to reject it as a magnificent work by God and rely on a literal interpretation of Scripture and Medieval Councils (which required Jews to dress differently from Christians)? We don’t do this for the creation of matter and the universe, for which physics gives a clearer explanation than molecular biology does for evolution. The Church today does not require that we do so; the Church requires only that we do not fall into the trap of believing materialistic theories that attempt to explain evolution.

I’ll close with a quote from my favorite saint, St. Augustine of Hippo, that says it all for living with science and faith:

“Often a non-Christian knows something about the earth, the heavens, and the other parts of the world, about the motions and orbits of the stars and even their sizes and distances,... and this knowledge he holds with certainty from reason and experience. It is thus offensive and disgraceful for an unbeliever to hear a Christian talk nonsense about such things, claiming that what he is saying is based in Scripture. We should do all that we can to avoid such an embarrassing situation, lest the unbeliever see only ignorance in the Christian and laugh to scorn.” —*De Genesi ad litteram*; the Literal Meaning of Genesis.

“Through his Word and wisdom he created the universe, for by his Word the heavens were established, and by his Spirit all their array. His wisdom is supreme. God by wisdom founded the earth, by understanding he arranged the heavens, by his knowledge the depths broke forth and the clouds poured out the dew.” —St. Theophilus of Antioch, Letter to Autoylcus

Evolution: "The process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth." —Oxford English Dictionary (OED)

Evolution: "The gradual development of something."—OED

## INTRODUCTION—EVOLUTION—IS IT TRUE?

Evolution—is it true? A few weeks ago an email was forwarded to me by Father Robert Spitzer’s Magis Institute (I’m on the Academic Advisory Board) for comment The correspondent—let’s call him “John Doe”—insisted that evolution violated Catholic Teaching, was in fact heretical, and cited the following pronouncements of the Ecumenical Councils—Lateran IV, Vatican I—and of Pope Pius XII’s encyclical, *Humani Generis*, to support his claim.

“God...creator of all visible and invisible things, of the spiritual and of the corporal; who by His own omnipotent power at once from the beginning of time created each creature from nothing, spiritual and corporal, namely, angelic and mundane, and finally the human, constituted as it were, alike of the spirit and the body.” [emphasis added by John Doe]—Lateran IV (D.428).

“If anyone does not confess that the world and all things which are contained in it, both spiritual and material, were produced, according to their whole substance, out of nothing by God; or holds that God did not create by his will free from all necessity, but as necessarily as he necessarily loves himself; or denies that the world was created for the glory of God: let him be anathema.” [emphasis added by John Doe]—Vatican I (Article 5).

“Some however, rashly transgress this liberty of discussion, when they act as if the origin of the human body from pre-existing and living matter were already completely certain and proved by the facts which have been discovered up to now and by reasoning on those facts, and as if there were nothing in the sources of divine revelation which demands the greatest moderation and caution in this question.” [emphasis added, RJK]—Pope Pius XII, *Humani Generis*

John Doe agreed that “microevolution” could occur by mutation (slight changes of phenotype and genotype within a species due to mutation of genes), but disagreed with the central tenet of evolution that all living things today descended from one primal original living thing.

#### GENERAL ARGUMENTS AGAINST JOHN DOE’S PROPOSITION

Here are general arguments that will be given in more detail below.

Evolution—the gradual change into different kinds from a single kind as per the second OED definition—is not limited to biological things, but to matter in general, so if evolution is forbidden for biology by John Doe’s interpretation of the Council pronouncements, it is forbidden also for matter in general, and thereby is forbidden all of physics and chemistry.

The evidence for evolution of living organisms is impressive. Without going into detail, I’ll cite the convincing features and also note that evolution—in the sense given by the first Oxford English Dictionary definition—is NOT the same as the proposed neo-Darwinian mechanism for evolution, which is a theory.

The Council pronouncements and the quote from *Humani Generis* have to be parsed very carefully to understand the full scope of the meanings of “at once” and “out of nothing”; moreover, the quote from *Humani Generis* must be put in context and related to other statements in that encyclical.

The position of the Catholic Church on evolution has been well stated by Pope St. John Paul II (see also “On Pope St. John Paul II’s Feast Day”), that the Church does not deny the scientific evidence for evolution, the descent of species. Indeed, Pope St. John Paul II said that there is no conflict between evolution and Church teaching:

“there is no conflict between evolution and the doctrine of the faith regarding man and his vocation, provided that we do not lose sight of certain fixed points.” St. John Paul II, 1996 address to the Pontifical Academy of Science.

Pope St. John Paul II emphasized that various theories have been proposed to explain this evidence, but that as Catholics we cannot accept any theory which denies that God creates the soul. Neo-Darwinism is one such theory to explain evolution; and it is one not universally accepted even by some atheistic scientists and philosophers.

then we can believe, along with St. Thomas Aquinas and the Catholic Catechism (CC 308), that God is a First Cause, and that He can operate through both primary and secondary causes. As St. Augustine posited:

“...each one [type of creature] fulfills its proper function, comes to creatures from those causal reasons implanted in them, which God scattered as seeds at the moment of creation [emphasis added] ... Time brings about the development of these creatures according to the laws of their numbers, but there was no passage of time when they received these laws at creation.[emphasis added] –St. Augustine of Hippo, *de Genesi ad Litteram* (the Literal Meaning of Genesis.)

Second, God is eternal, timeless—like a photon of light, time does not exist for God. He sees our future and our past and our present simultaneously, so the term “at once” to imply a single moment in past time is a limitation on this Godly timelessness.

With respect to the phrase “out of nothing,” I can’t believe that God, like a magician conjuring a rabbit out of a hat, made each individual species out of nothing. Certainly God created the whole universe out of nothing; I firmly believe in the dogma of *Creatio ex Nihilo*, but again—we have to consider not only primary but secondary causation.

#### THE PRESENT POSITION OF THE CHURCH ON EVOLUTION

The Dogma of Original Sin and the Dogma/Doctrine of monogenesis are crucial in determining the present position of the Church on evolution, I’ll use quotations from Pope Pius XII and Pope St. John Paul II to illustrate this. (Unfortunately John Doe’s quote from *Humani Generis* was out of context and thus did not reveal the full import of what Pope Pius XII was trying to impart.)

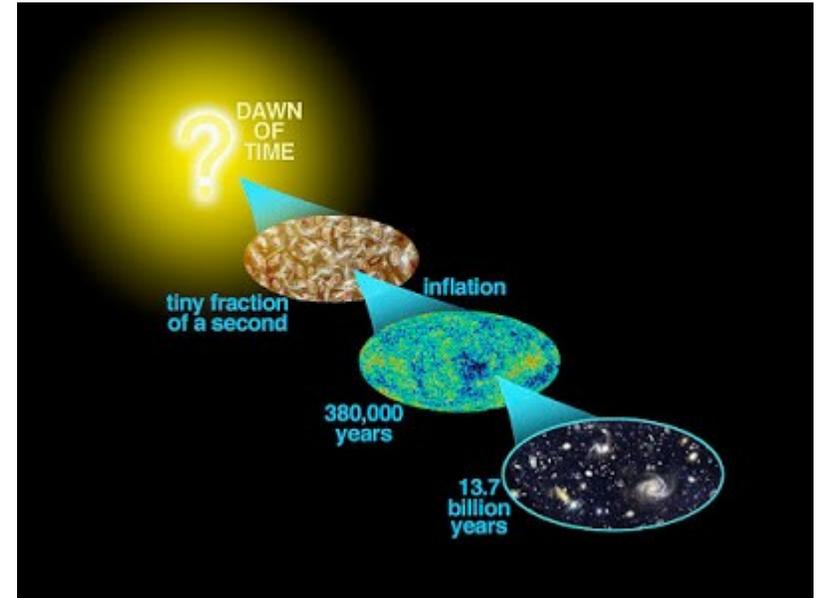
“...with regard to the doctrine of evolution, in as far as it inquires into the origin of the human body as coming from pre-existent and living matter [but] the Catholic faith obliges us to hold that souls are immediately created by God.” [emphasis added]—Pope Pius XII, *Humani Generis*

“Pius XII underlined the essential point: if the origin of the human body comes through living matter which existed previously, the spiritual soul is created directly by God...” Pope St. John Paul II, *Address to Pontifical Academy of Sciences: “On Evolution”*.

The table below gives example of changes in the composition of DNA coding for proteins and random DNA for different species.

	Gene Sequence That Codes for Protein	Random DNA Segment Between Genes
Chimpanzee	100%	98%
Dog	99%	52%
Mouse	99%	40%
Chicken	75%	4%
Fruit fly	60%	-0%
Roundworm	35%	-0%

## GOD'S PERIODIC TABLE AND THE EVOLUTION OF MATTER



Cosmic History for the Universe--not to scale  
from [Wikimedia Commons](#)

I want to emphasize again: evolution is the change of species one into another, along with the supposition of common descent from some single celled organism in the distant past. Many people—including scientists—confuse evolution with the neo-Darwinian proposed mechanism for evolution, mutation leading to small changes that enhance survivability and thus gradually yield different species. Many scientists and philosophers do not think the neo-Darwinian model is sufficient to explain evolution. Some of these critics are atheists or agnostics, so it isn't a question of neo-Darwinism violating their religious beliefs. (See, for example, Thomas Nagel's book, *Mind and Cosmos*.)

### PARSING LATERAN IV—"AT ONCE"; "OUT OF NOTHING"

"John Doe" emphasized the phrases "at once" and "each creature from nothing" in citing the dicta of Lateran IV against evolution. Now there are two ways of getting at the meaning, parsing, "at once." First, if we believe the universe evolved from an instant of creation, The Big Bang, *Creatio ex Nihilo*, as described in the section above,

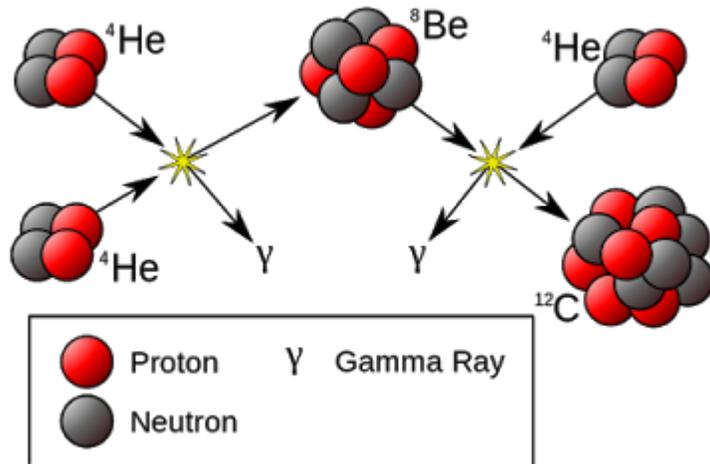
In trying to reconstruct how the universe has evolved (pardon that word!), we have to keep in mind that before a time of about 380,000 years after the Big Bang (the presumed origin of the universe from a singularity, i.e. "Ex Nihilo"), the history has to be reconstructed—speculatively—from what we know about the physics of elementary particles—the so-called "Standard Model" (see *God, Symmetry and Beauty I* and *Philosophic Issues in Cosmology 1*). The reason we have to infer what happened before this 380,000 year benchmark is the opacity of the early Universe to radiation—it consisted of a high energy plasma of quarks, gluons, photons and, in the later stages, elementary particles such as protons, electrons, neutrons. (See Luke Mastin's *Timeline of the Big Bang* for a complete, if perhaps somewhat speculative account of the early stages of the evolution.)

For purposes of this discussion, I'll accept (as do most physicists) that "In the Beginning" there was a super-hot tiny ball of energy, "one thing", that changed to quarks, anti-quarks, gluons and then yielded elementary particles—protons, neutrons, electrons. Subsequently gravitation induced star formation with protons and alpha particles (helium-4 nuclei) present in

early stars. There would have been a serious obstacle to further formation of the elements because a three-body collision of three alpha particles would be required for the formation of carbon-12 (the next step in formation of the elements) and as those of you who have shot pool know, the probability of a triple collision from random motion of particles is small.

Fred Hoyle (who had derisively labelled creation from a singularity as “The Big Bang”—the name stuck) saw a problem in the abundance of carbon-12 and other elements in the universe and the lack of a mechanism for their creation. He predicted an excited, higher energy state of carbon-12 nuclei that would enhance the formation of carbon-12 by the so-called “triple alpha process” (see the diagram below). His prediction was verified experimentally.

In this process, two alpha particles (helium-4 nuclei) collide to form a beryllium-8 nucleus, which is unstable. However, the likelihood of forming carbon-12 from a collision with an alpha particle is enhanced by a “resonance effect”. This effect comes about because an excited, high energy level of the carbon-12 nucleus has almost the same value as the nuclear energy levels of beryllium-8 and helium-4.



Triple Alpha Process  
from [Wikimedia Commons](#)

Carbon-12 formation would be the bottleneck; if carbon-12 could not be formed, then no oxygen, nitrogen, or heavier elements. All these reactions take place at a very high temperature in the interior of giant stars. When these stars implode, go nova (as with the Crab nebula picture above), all the heavy elements formed in the interior are scattered through the universe for the formation of planets and living organisms.

Here’s the important point to be emphasized in this: it is fundamental physics that enables the formation of the elements, the evolution of the Periodic Table, if you will. It is NOT a simultaneous creation of each element. It is a much more wonderful thing to have this occur as a consequence of “natural law”, rather than an ad individuum, separate and simultaneous creation of each element. It is evolution, not creation all at once. And it is God who created the rules of physics that enables this evolution.

#### EVIDENCE FOR EVOLUTION OF BIOLOGICAL ORGANISMS

That evolution of biological organisms, gradual changes in species and groups, occurs, is based on two types of evidence: fossil evidence of transitions between different types of organisms (see here) and similarities in DNA and protein composition. Perhaps the most illustrative of the transitional record is that of dinosaurs to birds.

Nevertheless, there are large gaps between groups in the fossil record, such that the paleontologists Stephen Jay Gould and Niles Eldridge proposed a modification of the Neo-Darwinian theory, Punctuated Equilibrium. Their theory posited large, discontinuous changes in species, rather than the gradual changes given by Darwinism.

Here’s a question for those who propose an instantaneous creation of all species: why does the fossil record of more than a billion years ago contain indicators of only microbial species, and why do the fossil records of different geologic eras contains a progression of types, with no recent phyla (e.g. mammalia) in older records?

