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|  |  |  *Evolution* |
|  *and* |
|  *Theology* |
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# The Case for Evolution

## Introduction

### “Evolution”

1. “**evolution**”
	1. “Evolution”: simpler things becoming other, more complex things.
	2. “Evolution” applies literally only to organisms. Here it has strongest support.
	3. “Evolution” applies only metaphorically to the universe, the stars, the solar system, and life from non-life. These “evolutions” “have varying degrees of support . . .” (Nogar 236)
		1. Evolution is not a universal law shown to apply equally everywhere. (Nogar 236)

### Creationism and Evolution

1. **creationism**
	1. simultaneous creationism: all species have existed since the beginning
		1. For thousands of years, humans thought the world in the beginning was the same as the world they saw.
		2. For Jews, Christians, and Muslims, Genesis 1 reinforced the common assumption.
		3. Scientists before Darwin thought the world was unchanged.
			1. Carolus Linnaeus (1707-78, inventor of our biological classification system): “existing species are identical in number and kind to those created by God from the beginning of time.” (Qtd. in Nogar 44)
	2. sequential creationism
		1. Each new species since the beginning was a special act by God. (Nogar 69)
		2. There were “hundreds of thousands of separate” special creations. (Nogar 64)
2. **evolution before Darwin**
	1. French biologists Georges Buffon (1707-88) and Jean-Baptiste Lamarck (1744-1829)
		1. Used “evolution” for “derivation of new species . . .” (Nogar 27)
		2. Believed present species “descended by natural processes from one or a few original species . . .” (Nogar 75)
	2. 1849: “Nature, red in tooth and claw”
		1. Alfred Lord Tennyson (1809-92) “expressed the difficulties evolution raised for faith . . .” (“In Memoriam”)
		2. *In Memoriam* (1850), Cantos 55 and 56

“Are God and Nature then at strife,

That Nature lends such evil dreams?

So careful of the type she seems,

So careless of the single life . . .”

“[Man] trusted God was love indeed

And love Creation’s final law . . .

Though Nature, red in tooth and claw

With raving, shrieked against his creed . . .”

1. **Charles Darwin** (**1809**-**82**)
	1. 1831-38: Darwin (aged 22) on the H.M.S. *Beagle* records the natural history of the lower half of South America and of islands in the Atlantic and Pacific.
	2. 1839: *Journal and Remarks* (now *The Voyage of the Beagle*) makes him famous.
	3. 1859: *On the* *Origin* *of* *Species by Means of Natural Selection* (Darwin is aged 50)
		1. first great insight: common descent with modification
			1. “Darwin’s axiom”: common descent is the cause of similarity in organisms. (Nogar 106, 116)
				1. “. . . similarity among children is a sign that they have common parents . . .” (Nogar 106)
				2. You assume two strikingly similar children in a group of less similar children are related. (Nogar 97-98)
			2. The only exceptions are cases of “*parallel* *evolutionary* development,” where similar ecological niches cause similar morphology in “different lines of ancestry.” (Nogar 120 n. 8)
				1. the long tongues of frog and anteater
				2. the streamlined bodies of fish and aquatic mammals
			3. “. . . the closer the similarity . . ., the closer the common parentage.” (Nogar 106)
		2. second great insight: natural selection
			1. Natural selection is the cause of common descent with modification. (Nogar 76)
			2. 1838: Darwin (*Autobiography*, 1876): “In October 1838, [I read] ‘Malthus on Population,’ and . . . it at once struck me that under these circumstances [the struggle for existence] favorable variations would tend to be preserved, and unfavorable ones to be destroyed. The result of this would be the formation of new species.” (Qtd. in Nogar 100)
			3. artificial selection
				1. “He was a very successful pigeon breeder” and had horse-breeder friends. (Nogar 75)
				2. “. . . Darwin found his agent of the evolutionary process by a simple analogy . . . Just as he bred pigeons, and the livestock holders bred cattle, pigs and horses, so also nature bred more and more species to fit the ecological niche . . .” (Nogar 76)
		3. “The reason that Darwin’s theory of evolution took hold . . . was that he simultaneously proposed a *plausible* *mechanism* . . .” (Nogar 75)
2. **controversies**
	1. over evolution
		1. Christian philosophy stressed “the fixity of things.” Evolution stressed “the flux of things.” Early on, “one seemed required to choose between” them. (Nogar 17)
		2. Nature “red in tooth and claw,” in which everything must “eat or be eaten,” “seemed to rule out the existence of divine order and harmony in the world.” (Nogar 386)
	2. over human evolution
		1. 1863: Thomas Henry Huxley applied evolution to humans in *Man*’*s Place* *in* *Nature*.
		2. 1871: Darwin applied evolution to humans in *The Descent of Man*.
		3. “. . . violent debates waged between those who would place man *totally* *outside* the pattern of evolution and those who would place him *wholly* *within* . . .” (Nogar 151)
3. **So there are two ways to explain the variety of species**. (Nogar 44)
	1. creationism: a supernatural explanation
	2. evolution: a natural explanation
4. **Natural explanations are preferable to supernatural**.
	1. Creationism (simultaneous or sequential) is a “*possible* explanation of the paleontological record, for God certainly *could* have extended His creative power in any way that He wished.” (Nogar 70)
		1. A set or series of interventions “*could* explain any series of occurrences in nature, for nothing is impossible to God.” (Nogar 105)
	2. Most theologians agree with scientists that one should seek “*a* *natural* *explanation* *if* *one* *is* *to* *be* *had*.” One should assume “proximate, cosmic forces until it becomes evident that natural forces do not sufficiently explain the data.” (Nogar 45)
	3. The reason for preferring natural explanations is that God *usually* works “through secondary or natural causes. To assume the miraculous at the outset would be poor theology . . .” (Nogar 105)
	4. Aquinas (1225-74)
		1. Aquinas (*ST* 1.22.3 corpus): “He [God] governs things inferior by superior, not on account of any defect in His power, but by reason of the abundance of His goodness; so that the dignity of causality is imparted even to creatures.”
		2. Aquinas (*ST* 1.103.6 corpus): “it is a greater perfection for a thing to be good in itself and also the cause of goodness in others, than only to be good in itself. Therefore God so governs things that He makes some of them to be causes of others . . .”
	5. “. . . because a natural explanation for the origin of new species *is* available, namely, descent with modification, . . . creationism is not needed.” (Nogar 70)
	6. So a natural explanation is a priori preferable. But it remains “to be proved that evolution is a [44] more likely account of the evidence than creationism.” (Nogar 44-45)

### Fact and Evidence

1. **fact**
	1. Most scientists today say evolution is no longer an hypothesis or theory but “*a* *scientifically* *established* *fact*.” (Nogar 31)
	2. “fact” (*Merriam-Webster*’*s Dictionary*)
		1. a true statement
		2. the reality that a true statement asserts to exist
2. **evidence in law**
	1. standards of proof (“Reasonable Doubt”)
		1. civil cases: “preponderance of evidence” (over 50% certainty)
		2. criminal cases: “beyond a reasonable doubt” (over about 75% certainty) (“beyond a shadow of a doubt” is not used in law)
		3. In both standards, certainty is impossible. A direct witness may know for certain; but since a witness can lie, hearers of testimony cannot be certain.
		4. The best that can be hoped for is a high degree of probability. (Nogar 41)
			1. reasonable conviction
				1. most probable
				2. more probable
				3. probable
			2. not unreasonable conviction (possible; not contrary to known fact)
			3. unreasonable conviction
	2. types of evidence (“Reasonable Doubt”)
		1. “Direct evidence supports the truth of an assertion directly . . . without an intervening inference.” A witness who saw a shooting gives direct evidence.
		2. “Circumstantial evidence supports the truth of evidence.” The truth of the assertion is inferred. A ballistics expert gives circumstantial evidence, from which guilt or innocence is inferred.
3. **evidence in evolution**
	1. Evidence for evolution is circumstantial. (Nogar 38)
		1. Fossil-record evidence *must* be circumstantial, since the past cannot be present. (Nogar 39)
		2. The prehistorian, then, only seeks “reasonable conviction”: most probable, more probable, or probable. (Nogar 41)
	2. types of evidence for evolution: form and function
		1. Every organism has “morphology (shape) [and] physiology (function) . . .” (Nogar 326)
		2. Evidence for evolution can be found in four morphological subdisciplines of biology: paleontology, biogeography, taxonomy, and comparative anatomy.
		3. Evidence for evolution can be found in three functional subdisciplines of biology: general biology, physiology, and embryology.

## Paleontology

1. “**prehistory**”
	1. narrow sense: study of humans prior to writing, 1 million-3500 bc (Nogar 39)
	2. broad sense: study of the past prior to writing, 4.5 billion-3500 bc (Nogar 39)
	3. prehistoric sciences
		1. geology: study of rocks
		2. paleontology: study of the fossil record (also paleobiology, etc.)
		3. archaeology: study of human cultures prior to writing (Nogar 39)
2. **fossil formation**
	1. “fossil”: an “impression or trace of an animal or plant of [the] past . . . includes footprints . . .” (Nogar 56)
	2. “permineralization”: “spaces filled with liquid or gas during life [and also pores]) become filled with mineral-rich groundwater and the minerals precipitate from the groundwater . . .” (“Fossil”) Common minerals are calcite, iron, and silica.
	3. “. . . the first requirement is that an organism or its part be buried.” (Nogar 56)
		1. “. . . igneous rocks have solidified from a molten state . . .” (Nogar 56)
		2. “. . . metamorphic rocks are made up of igneous rocks . . .” (Nogar 56)
		3. So sedimentary rocks (from settling sediments) preserve most fossils. (Nogar 56)
			1. Rocks with fossils are usually shale (clay), sandstone, and limestone. (Nogar 57)
			2. Shale and sandstone are from rock grains settling in water. (Nogar 56)
			3. Limestone is from organisms’ calcified remains settling. (Nogar 56)
3. **dating techniques**
	1. Basic to “scientific chronology is the *doctrine of uniformitarianism*”: [51] the universe operated in the past as in the present. In particular, “The time clocks of nature are ticking away at the same rate” yesterday as today. (Nogar 51-52)
	2. Prehistory uses radioactive dating (radiometric dating).
		1. isotopes
			1. An isotope is an element with an unusual number of neutrons. (Nogar 53)
			2. Some isotopes are stable. (Nogar 53)
			3. Some break down into another element: they are “radioactive.” (Nogar 53)
				1. Radioactive elements “are unstable forms of matter in which the nuclear rearrangements occur quite spontaneously.” (Nogar 53)
			4. radioactive isotopes
				1. 1896: Henri Becquerel discovers radioactivity.
				2. Radioactive elements include “the uranium family, the thorium family and the actinium group . . .” (Nogar 53)
		2. Radioactive dating is “the principal source of information about the absolute age of rocks and . . . of the Earth itself . . .” (“Radiometric Dating”)
		3. noble-gas dating
			1. Metals such as gold and silver were only owned by the wealthy nobility, so they became known as “noble metals.” They are largely inert (hence little corrosion). Since certain gases are largely inert, they became known as “noble gases.” (“No­ble Gas”)
			2. The noble gases are helium, argon, neon, krypton, and xenon. (“Noble Gas”)
			3. Meteorites contain radioactive isotopes of noble gases. “By counting the few atoms of the “noble” gases . . . trapped in the crystal lattices of meteoritic stone and iron, the date of crystallization can be computed. [These atoms are] clocks that have stopped. By comparing these with the parent elements which have been in process of radioactive transformation at an immutable rate which is known,” we can estimate the meteorites’ age. (Nogar 55)
			4. The meteorites’ age “is just about the same as the age of the basic materials of our planet: 4.5 billion years.” (Nogar 55)
		4. uranium-lead dating
			1. Some uranium isotopes are radioactive and break down into lead. Two are used for dating. (Nogar 53)
				1. 238U decays into 206Pb (lead). Half-life: 4.47 billion years.
				2. 235U decays into 207Pb. Half-life: 704 million years.
			2. You date when the isotope began turning to lead by comparing the amounts of isotope and lead. (Nogar 53)
		5. radiocarbon dating
			1. Six miles up, cosmic rays turn atmospheric nitrogen into the carbon isotope, carbon 14 (C14). C14 turns atmospheric oxygen into carbon dioxide (CO2). Organisms that absorb CO2 from the atmosphere also absorb C14 “in a small but constant proportion.” (Nogar 54)
			2. C14 in living organisms decays at about 16 disintegrations per gram per minute. (Nogar 54)
			3. At death a plant or animal stops absorbing C14. If it becomes a fossil, its C14 will decay at a constant rate. (Nogar 54)
				1. Half is gone in 5,760 years.
				2. Three-fourths is gone in 11,500 years.
				3. Seven-eighths is gone in 17,280 years.
		6. potassium-argon dating
			1. 40K decays into calcium 40 and argon 40. “The rate of change is very slow” but constant. You date when the isotope began turning to argon by comparing the amounts of isotope and argon. (Nogar 54)
			2. “. . . the potassium-argon method is used widely in present determinations of the overall geological time scale.” (Nogar 55)
		7. gap (Nogar 55, 175)
			1. Uranium-lead dating is only good for 4.5 billion to 25 million.
			2. Radiocarbon dating is only good for 50,000 to the present.
			3. The gap is 25 million to 50,000—which includes hominid prehistory.
			4. Potassium-argon dating may help illuminate the gap.
4. **geologic timescale**
	1. Application of dating techniques to the fossil record has produced the geologic timescale.
	2. See handout.
	3. Divisions are based on
		1. geologic and geographic conditions
		2. fossils’ characteristics
		3. archaeological evidence of human culture (Nogar 57)
5. **the fossil record as a proof for evolution**
	1. Creationism is false.
		1. Early forms “did not perdure until the present.” (Nogar 63)
			1. Most species become extinct and are replaced by very similar forms. (Nogar 64)
		2. Later forms “were not all present from the beginning . . .” (Nogar 63)
	2. Evolution is true.
		1. Few life forms become many life forms. (Nogar 63)
		2. Simple life forms become complex life forms. (Nogar 63)
		3. Differences between organisms widen. (Nogar 87)
			1. The older the fossil, the less similar to the living species. (Nogar 103)
			2. The newer the fossil, the more similar to the living species. (Nogar 103)
	3. Roger Lewin (*Thread of Life*: *The Smithsonian Looks at Evolution*. Washington: Smithsonian, 1982): “Nowhere do you find fossils out of place: you don’t see amphibians among the earliest trilobites in the Bright Angel shale, you don’t come across traces of reptiles side by side with the first amphibians, and you never see fossils of mammals with those of the earliest reptiles. “This strict segregation or progression of fossils is found in rocks throughout the world,” says Porter Kier [paleobiologist at the National Museum of Natural History]. “Every time you go to look at fossil-bearing deposits you are testing that observation. . . . Nobody has found a fossil that is out of place in the sediments, anywhere.””
6. **objection 1**: **missing links**
	1. If evolution were true, why are there thousands of missing links? (Nogar 65)
	2. rebuttal
		1. Past organisms cannot be known completely.
			1. “. . . only hard parts (with few exceptions) fossilize . . .” Most plants and many animals (worms, jellyfish) left few fossils. (Nogar 65)
			2. Sedimentation must be available. (Nogar 65)
			3. “. . . the site must not be disturbed . . .” (Nogar 65)
			4. Fossils “must be complete enough to [permit] interpretation . . .” (Nogar 65)
			5. Only vertebrate fossils are numerous and in good condition. (Nogar 65)
		2. When the fossil record *is* known in detail, it supports evolution.
			1. vertebrate example: the horse family (*Equidae*)
				1. *Eohippus* (oldest known, Early Eocene Epoch, 55.8-48.6 million) (Nogar 66)

under “a foot high at the shoulder”

44 teeth “low crowned and [fit] for browsing”

“four toes and a splint on his front feet”

“three toes and two splints on his hind feet”

* + - * 1. The line of descent passes, “by branching and gradual modifications, through *Mesohippus*, *Miohippus*, *Parahippus*, *Merychippus* and *Pilohippus* . . .” (Nogar 66)
				2. 13 other horse genera not in the line of descent to the present horse were dead ends. (Nogar 67-68)
				3. *Equus*, “our own domestic horse and his fellow species” (Nogar 66)

Size “has increased from that of a fox to that of the stallion.”

Teeth are “high crowned and very specialized for grinding coarse, siliceous grasses.”

elongated limbs

reduced number of toes (Nogar 66)

metacarpals and metatarsals fused into hooves

elongated neck is “much more mobile than it was in the earlier genera” (Nogar 67)

* + - * 1. The fact “that at every stage there were many diverse developments going on” supports natural selection. (Nogar 68)
				2. “Only the ones which led to modern *Equus*, the domestic horse, had survival value in terms of the prehistoric circumstances which prevailed. The “direction” of the horse family evolution was not predictable, yet it was not random, but was determined from age to age by natural adaptability to the environment which, in turn was constantly undergoing radical changes.” (Nogar 68)
			1. “Add to this the numerous phylogenies [evolutionary histories] of the camels, swine, crocodiles, ammonites, fishes, etc., which manifest the same appearance of descent with modification,” and the missing-link objection is rebutted. (Nogar 68)
1. **objection 2**: **fossils from different strata and areas**
	1. The horse family has been reconstructed “from fossils deposits from all over the world . . .” (Nogar 69)
	2. rebuttal: evolution of a genus in the same locale also shows descent with modification
		1. Here “The degree of arbitrariness . . . where fossils are taken from several different strata located in diverse, unrelated areas is eliminated.” (Nogar 69)
		2. example 1: “In a single 300-foot deposit, the freshwater mollusk *Paludina* can be traced through nine species, varying from one smooth-shelled species through eight progressively complicated shells to the present living species.” (Nogar 69)
		3. example 2: “five species of sea urchins (the echinoid *Micraster*) found buried in the English Chalk” is “the most conclusive evidence to date . . .” (Nogar 69)
2. **objection 3**: **plants and invertebrates**
	1. Evolution is harder to see in plants and invertebrates. (Nogar 122)
		1. Vertebrates “can be traced with remarkable continuity.” (Nogar 24)
		2. But relationships among “invertebrate phyla [are] a puzzle . . .” (Nogar 125)
			1. Most of the present invertebrate phyla were already “well represented in the first great fossil period, the Cambrian [542-488 million], and no definitive temporal sequence based upon incontrovertible fossil evidence has been found.” (Nogar 126)
			2. Each invertebrate “phylum seems to be constructed according to a basic blueprint quite unlike that of any other [124] phylum.” (Nogar 124-25)
			3. Did worms become “snails, oysters and clams,” which then became “insects, crabs, [and] spiders”? “Or did the insects come before snails, oysters and clams?” Basic structural dissimilarities prevent us settling the case. (Nogar 125)
	2. rebuttal
		1. There are reasons why evolution is harder to see in plants and invertebrates.
			1. Invertebrates are less studied than vertebrates. (Nogar 123)
			2. Most plants and invertebrates lack hard parts to fossilize. (Nogar 123, 141)
				1. But “some invertebrate groups have excellent records, for example, [141] corals, mollusks and echinoderms.” (Nogar 141-42)
			3. “The simpler the forms of life . . ., the greater the difficulty in perceiving related shapes.” (Nogar 122)
			4. The earlier the stratum, the more likely geological events have disrupted it.
				1. So the fossil record does not display “the lower and simpler phyla of animals and plants in a temporal order . . .” (Nogar 123)
				2. “Work done recently on the Precambrian Era in Australia has been very fruitful, but at present it gives little hint of a solution to this issue.” (Nogar 123)
		2. The history of invertebrates with hard parts (such as arthropods and mollusks) *within* “the phylum is very good.” (Nogar 123)
		3. The argument for evolution *can* “be extended to the lower phyla, to the development of the simpler forms of life . . .” (Nogar 126)
			1. “One solution is to use the argument from *analogy*.” (Nogar 126)
				1. “The principle can be expressed thus. Where more complete and less complete histories of [organisms] are compared, if the less complete parallels the more complete in those respects that are known, then it is sound to fill in the gaps in the less complete case by analogy to the more complete.” (Nogar 126)
				2. Vertebrate example: the more certain sequence of the horse can, by analogy, fill in gaps in the less certain sequence of the camel. (Nogar 126)
				3. Because invertebrate life histories have more gaps, analogy is used more often when comparing “more complete and less complete invertebrate histories . . . the conclusions are quite reliable.” (Nogar 126)
				4. Nevertheless, “application of this principle is indirect and therefore subject to a wider degree of error than” when comparing actual fossils. (Nogar 126)
			2. “Another solution . . . is the argument by *extrapolation*.” (Nogar 126)
				1. “. . . missing members of the sequence are assumed to exist and are searched for. Often these links are discovered. Sometimes they are not.” The projection, if reasonable, “is accepted as a “thought experiment” . . .” (Nogar 126)
				2. The danger is obvious. But “extrapolation is valid within reasonable limits.” (Nogar 126)
			3. “Both analogy and extrapolation can be applied with reliability to the invertebrates provided that the dangers of subjectivism and arbitrary interpretation are guarded against.” (Nogar 127)
			4. A third solution is evidence from comparisons of organisms’ functions.
				1. “Where structural similarities are wanting or unknown, functional similarity of whole organisms and their parts [can] supply the necessary basis for the evolutionary argument.” (Nogar 142)
				2. See the following handouts on “Arguments from Function.”
	3. “In summary, then, it can be said that *within* many invertebrate phyla, the problems are not fundamentally different from those *within* the vertebrates. Even for relationships *between* *and* *among* the phyla the problem is not insurmountable, but analogies and extrapolations must supply for more direct inferences of evolutionary relationships. A reasonably similar situation exists in the plant world.” (Nogar 127)

## Biogeography

1. “**biogeography**”
	1. Biogeography studies the distribution of organisms. (Nogar 98)
2. **geographical barriers**
	1. “Areas separated by great land masses show a great diversity of species, but areas separated by recently emerging land masses, e.g., the Isthmus of Panama, show a high percentage of similar or identical species on both sides of the land mass.” (Nogar 103)
3. **biogeographical zones**
	1. There are six biogeographical realms: “the Ethiopian, Oriental, Palearctic, Australian, Nearctic and Neotropical . . .” (The Palearctic and Nearctic are together the Holarctic Region.) (Nogar 103)



* 1. “The biotic barriers among these regions are almost insurmountable and are geologically very ancient.” (Nogar 103)
	2. “There is close continuity among the species within each realm . . .” [103] Living species resemble one another “according to their close proximity in space and time.” (Nogar 103-04)
	3. But there is great diversity between regions. “Each has its own range of species of plants and animals, very dissimilar to those of another region.” (Nogar 103)
	4. “Why are some species *excluded* from areas that are identical to the areas in another realm? Why, for example, should the two populations of magnolias be located in the Holarctic Region . . . when both the Oriental and Neotropical regions are perfectly suitable habitats?” (Nogar 103) Answer: they evolved in one region and not the anothers.

## Taxonomy

1. **principles of classification**
	1. Taxonomy (classification of organisms) studies logical relations of types of organ­isms.
	2. “Two individuals (or more) which resemble each other in considerable detail yet are distinguishable from the rest of nature are placed into a category called *species*. . . . [Species] can be naturally and logically grouped into a larger unit called the *genus*,” then the family, order, class, phylum, kingdom, and domain. (Nogar 107)
	3. The categories of species, genus, etc. “are *not* *merely* *logical*, they correspond to *natural* *divisions* into which nature falls.” (Nogar 106)
	4. bases of classification
		1. those “visible to the naked eye” (morphology, anatomy, behavior, the fossil record)
		2. those “detectable only under a microscope” (embryology, molecular biology)
		3. those “that can be determined only by chemical tests” (biochemistry, genetics)
	5. “The most successful diagram of life has been the *model* *of* *the* *tree* . . .” (Nogar 108)
	6. numbers of species (2004) (International Union for Conservation of Nature Species Survival Commission)

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| vertebrates 58,195mammals 5,416birds 9,917reptiles 8,163amphibians 6,199fishes 28,500 | plants 287,655flowering plants (angiosperms) 258,650dicotyledons 199,350monocotyledons 59,300conifers (gymnosperms) 980ferns and allies 13,025mosses 15,000 |
| invertebrates 1,190,200insects 950,000mollusks 70,000crustaceans 40,000others 130,200 | others 10,000lichens 10,000total species 1,546,050 |

1. **the argument for evolution from taxonomy**
	1. Systematic classification reveals “*an* *observable* *logical* *pattern* . . .” (Nogar 108)
		1. “There is a simple beginning as it were from a seed . . .” (Nogar 109)
		2. Chronologically, there are simpler forms “at the base and the complex forms last.” (Nogar 109)
		3. “. . . the most primitive forms in one group resemble the members of the other groups (near this branching) more than they [109] resemble the more specialized members of their own group.” (Nogar 109-10)
		4. There is “a remarkable progressive similarity of structure” as one ascends from lower classes to higher. (Nogar 111)
	2. The logical pattern “must be explained either by [creationism or evolution]. The best explanation of these phenomena is descent with modification, or evolution . . .” (Nogar 111)
	3. Hierarchic subordination results from descent with modification. Taxonomic categories indicate “degrees of blood relationship.” (Nogar 110, emphasis deleted)

## Comparative Anatomy

1. **Darwin’s axiom**
	1. Here too Darwin’s axiom applies: “the only known natural cause of close similarity is common descent.” (Nogar 111)
	2. Comparisons of an organ or organ-system within a phylum suggest that the organ or system “is based upon some prototype . . .” (Nogar 112)
	3. Example: the vertebral column is “extremely similar in the Cyclostomata (most primitive living vertebrates), the sharks, the bony fishes, the amphibians, the reptiles, the birds and the mammals. . . . Differences seem to depend upon functional adaptation to problems of locomotion, feeding, etc.” (Nogar 112)
2. **homologous and analogous organ structures**
	1. homologous structures
		1. “Homologous structures are those which, though built upon the same basic structural pattern, are functionally diversified.” (Nogar 113)
		2. “Within a single organism, . . . the basic organ is structurally modified to serve several different functions.” (Nogar 114)
		3. This “can be verified in every group of living things . . .” (Nogar 114)
		4. Example: crustacean appendages. “In the typical crustacean, the body is segmented and each segment bears a pair of appendages. The surprising fact is that each appendage is structurally based upon a similar pattern, but their functions vary from sensory, chewing, food handling, grasping, walking, mating, carriage and swimming.” (Nogar 113-14)

 

“Types of appendage of the crayfish. Roman numerals indicate the body segment from which each was taken. *pr*, protopodite; *ex*, exopodite; *en*, endopodite; *ep*, epipodite; *g*, gill.” (Nogar 114)

* + 1. Example: mammal forelimbs. “The design of the forelimb is structurally the same, bone for bone, in the shrews, the mole, the bat, the horse, the deer, the rhinoceros and man. Yet the function of [114] the forelimb varies from digging, to running, to flying, to writing poetry . . . This functional variation is accompanied by differences of proportion, and sometimes by fission or suppression of parts . . .” (Nogar 114-15)
	1. analogous structures
		1. Homologous organs have the same structure but many functions.
		2. Analogous organs have many structures but the same function. (Nogar 115)
		3. Example: “the wing of the bird, the bat and the insect have the same function, [115] that of flying; but the structural plan of the wing and its materials is, in each case, totally diverse.” (Nogar 115-16)



“Analogical resemblances of the wings of an insect (A), a bird (B) and a bat (C). In each, a planing surface is formed from completely different materials.” (Nogar 115)

1. **vestigial organs**
	1. 1893: Robert Weidersheim’s *The Structure of Man*: *An Index to His Past History* lists almost a hundred vestigial organs. (Nogar 116) Examples from humans:
		1. appendix
		2. “third eyelid” (the nictitating membrane, used by birds etc. to clean the orb, that is now mostly a small crescent in the inner corner of the eye)
		3. ear muscles
		4. caudal vertebrae (tail)
		5. wisdom teeth
	2. Vestigial organs support the conclusion that, “in the course of adaptation, . . . structures do become modified by mutation. If a structure is useful, then mutations which impair it are [116] eliminated, and the structure is maintained; if a structure is no longer useful, then there is no selection against degenerative mutants, and the structure becomes vestigial.” (Nogar 116-17)
2. **comparative-anatomy conclusions**
	1. The structural similarities among organisms—homology, analogy, vestigial organs—are best explained by evolution, not creationism. (Nogar 112)
		1. Homologies are explicable as “modifications by functional adaptation to environment . . .” (Nogar 116)
		2. Homologous structures are far more common than analogous. But “if each structure were created for the purpose for which it is now used—the assumption of the creationists—would not analogous structures be far more pervasive and important . . . ?” (Nogar 116)
		3. Creationism also cannot explain why “variation of function without variation of plan . . . becomes greater and greater as we [ascend] the taxonomic scale.” (Nogar 116)
3. **morphological-patterns conclusion**
	1. Together, the arguments from morphological patterns (paleontology, biogeography, taxonomy, and comparative anatomy) mean that “the probability that the [evolutionary] explanation is erroneous is very slight.” (Nogar 118)

## General Biology

The four preceding arguments were from forms: paleontology, biogeography, taxonomy, comparative anatomy.

The three following arguments are from functions: general biology, physiology, embryology.

1. **introduction**
	1. “. . . no matter how simple or complex the organism, all living things have remarkable functional activities in common.” These are studied in general biology. (Nogar 142)
	2. All organisms have these common functions. (Nogar 130) (Taken from: Woodruff, L.L., and G.A. Baitsell. *Foundations* *of* *Biology*. New York: Macmillan, 1951. 25.)
		1. directive activity
		2. chemical composition
		3. cellular organization
		4. metabolism (maintenance, growth, repair, reproduction)
		5. irritability (“response to stimulation”)
		6. adaptation (response to irritation)
2. **directive activity**
	1. E.S. Russell (*The* *Directiveness* *of* *Organic* *Activities*. London: Cambridge UP, 1946. 6): an organism directs its metabolism (maintenance, growth, repair, reproduction) to the end of its life-cycle. This “directive activity . . . distinguishes living things from inanimate objects.” (Qtd. in Nogar 129)
3. **chemical composition**
	1. All organisms combine carbon (“the indispensable bond”), “oxygen, hydrogen and nitrogen . . . to form *proteins*, *carbohydrates* *and* *fats* [with] . . .” (Nogar 131)
	2. “That all living organization should have this functional chemical composition in common suggests that living matter originated from a common source.” (Nogar 131)
4. **cellular organization**
	1. That “the basic structure and function of the cell and its components *is* *found* *in* *almost* *all* *living* *things* . . . suggests that living matter originated from a common source.” (Nogar 131)
5. **metabolism**
	1. Metabolism is “the maintenance of dynamic equilibrium” by nutrition, growth, repair (e.g., wound-healing), and reproduction. (Nogar 131)
		1. Nutrition, growth, repair, and reproduction “are the fundamental basic similarities of all living matter . . . the palm tree, the amoeba, the starfish and the chimpanzee all have” these basic functions. (Nogar 132)
	2. Nutrition (catabolism, destructive metabolism) provides energy for growth, repair, and reproduction. (Nogar 132)
		1. Catabolism includes, e.g., digestion, and burning sugar. (Nogar 132)
	3. Death is “the cessation of metabolism.” (Nogar 132)
	4. “. . . that all living matter has the functional pattern of birth, maintenance, growth, repair, reproduction and death shows the fundamental functional unity of living nature. This strongly suggests a common origin for all living things.” (Nogar 132)
6. **irritability and adaptation**
	1. Irritability is “capacity for reacting to environmental changes . . .” (Nogar 132)
	2. Most plants react through *tropisms*, “simple, immediate movements in a direction . . . Light, heat, pressure, water and chemicals are the agents of such tropisms . . .” (Nogar 133)
	3. Most animals react through *local* *movement*, “Movement from place to place . . .” This presupposes “perception of the outer world through *sensation*.” (Nogar 133)
		1. External senses are found in most animals. (Nogar 133)
		2. Internal senses (memory, imagination) are found in higher animals. (Nogar 133)
		3. Man has “intellect and free will . . .” (Nogar 165)
	4. That all plants and animals have “irritability and adaptability . . . suggests common origin.” (Nogar 133)
7. **common functional characteristics as evidence of evolution**
	1. A natural explanation is to be preferred.
	2. “The only known natural explanation of close functional similarity” is evolution. (Nogar 133)
	3. Therefore, “evolution is probable.” (Nogar 133)

## Physiology

1. **definitions**
	1. *anatomy*: subdiscipline of biology that studies “morphology, the shape and form,” of parts of organisms. (“Definition of Physiology”)
	2. *physiology*: subdiscipline of biology that studies the function of parts of organisms. (“Definition of Physiology”)
		1. Whereas general biology studies the “fundamental life functions” that all organisms share, physiology studies the functions of organisms’ *parts*.
		2. Organisms’ parts have “remarkable functional activities in common . . .” (Nogar 142)
	3. *biochemistry*: subdiscipline of physiology that studies the chemistry of parts of organisms. (“Definition of Biochemistry”)
2. **example facts from physiology**
	1. chromosomes
		1. “. . . throughout the entire living world, the chromosomes consist of similar basic proteins combined with nucleic acid.” (Nogar 135)
		2. “In view of the great diversity of organisms, . . . it is amazing to find those same chromosomes so uniform in their material constitution.” (Nogar 135)
	2. hormones
		1. “Very similar or identical enzymes and hormones are found to be common to large groups of animals.” (Nogar 136)
		2. “The thyroid hormone, for example, is found in all the vertebrates, and has been proved to be interchangeable among them.” (Nogar 136)
		3. “. . . the pituitary hormone which causes pigmented cells to expand and darken the color in amphibians has such common properties that, even though this hormone has no color effect in mammals, it can be extracted from mammals and be used to supply deficiencies in this color in amphibians. This transfer among the vertebrates of functional hormones strongly suggests the presence of “vestigial hormones” in the higher vertebrates.” (Nogar 136)
	3. antigen-antibody reactions
		1. “If a small amount of blood serum from some animal is injected into a test animal, say the guinea pig, the latter immediately produces antibodies which will destroy the foreign blood at the next inoculation.” (Nogar 136)
		2. “. . . immunization against antigens of other species *varies* *in* *degree* according to the morphological relationship of the antigen species. For example, if serum from an animal immunized against human blood were divided among five tubes, and then serum (antigens) added from man, an anthropoid ape, an Old World monkey, a New World monkey and a lemur—animals which have a known order of morphological [136] relationship—the effectiveness of the immunization would decrease in the order given.” (Nogar 136-37)
		3. “Such serological studies have been made . . . among vertebrates, . . . the crustaceans, insects and mollusks. The same result is obtained.” (Nogar 137)
		4. “Always, animals which have been shown to be closely related on comparative morphological grounds show close serological affinity. Species of a single genus show close affinity; genera of the same family show a moderate affinity; families of the same order show slight but detectable similarity.” (Nogar 137)
		5. “Here is another clear instance of the correspondence of functional and structural similarity, arguing again to common descent with modification.” (Nogar 137)
	4. “There are, of course many other data taken from biochemistry, such as the analysis of phosphagens, muscle-contraction, and visual pigments . . .” (Nogar 137)
3. **physiology as proof of evolution**
	1. argument from degrees of relation
		1. Closely related “plants and animals manifest, in direct proportions to their proximity in the scale of classification, more similar basic biochemical and physiological characteristics . . .” (Nogar 135)
	2. argument from evolution’s organizing power
		1. “Once it was manifest that common origin might be the natural explanation for close . . . functional similarities among organisms, the *hypothesis* was set up as an organizing principle for the data of [physiology].” (Nogar 134)
		2. “So great has been the accumulation of factual data [in physiology] that without the theory of [evolution] these sciences would be little more than an endless catalogue.” (Nogar 134)
		3. That evolution “so effectively organize[s] the data of comparative physiology” is evidence that evolution is true. (Nogar 134)
	3. creationism or evolution
		1. creationism
			1. “. . . all that can be said is that . . . species were created according to a graduated pattern of physiological organization.” (Nogar 137)
			2. “This is not an explanation, however, but only a fiat assertion.” (Nogar 137)
		2. evolution
			1. A natural explanation is to be preferred to a supernatural.
			2. According to Darwin’s axiom, “*there is but one known* [natural] *cause of close similarity in the living world and that is common descent*.” (Nogar 106)
			3. So the “natural cause of close similarity, . . . common descent,” is to be preferred. (Nogar 137)
	4. “Therefore, biochemical and physiological facts make evolution most probable.” (Nogar 135)

## Embryology

1. **embryology**
	1. Embryology: subdiscipline of biology that “studies the individual development of the organism from seed or embryo to the adult stage.” (Nogar 140)
		1. The “developmental process of plants and animals from seed or embryo . . . [shows] remarkable functional similarities among closely related groups.” (Nogar 142)
	2. “The early embryonic stages of natural groups (e.g., the vertebrates) are . . . indistinguishable at first (except to the specialist) . . . [An animal] departs progressively from the form of other animals.” (Nogar 140)

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| --- | --- |
| [138] | [139] |

* 1. E.H. Haeckel (1834-1919): “ontogeny recapitulates phylogeny.” (Nogar 140)
		1. “Ontogeny”: an individual’s developmental stages.
		2. “Phylogeny”: a species’s developmental stages.
		3. An individual’s development repeats its species’s history.
		4. Haeckel’s law “proved inaccurate and excessive . . .” (Nogar 141)
1. **embryology as proof of evolution**
	1. “. . . the great similarities of the embryonic stages and development of natural groups . . . must be explained by creationism or descent with modification . . .” (Nogar 141)
	2. Creationism says that species were just created that way. But this is just “a fiat assertion.” (Nogar 137)
	3. The natural explanation (“Darwin’s axiom”): “there is but one known cause of close similarity in the living world and that is common descent.” (Nogar 106, emphasis deleted)
		1. “. . . every terrestrial vertebrate embryo for the past 300 million years has developed at some point a set of gill arches . . ., about as good evidence of evolution as one could wish for.” (Lewin 39)
	4. Therefore, embryology makes evolution more probable. (Nogar 141)

## The Mechanism for Evolution:

## Mutation and Natural Selection

1. **introduction**
	1. The “probable way” evolution occurs is by genes. (Nogar 75)
		1. Gene mutation causes heritable variations. (Nogar 78)
		2. Natural selection causes increasing discontinuity among species. (Nogar 78)

### Genetics

1. **Gregor Mendel** (1822-84)
	1. Mendel was “abbot of an Augustinian monastery at Brünn” (now in the Czech Republic). He was an amateur botanist. (Nogar 79)
	2. 1856-63: Mendel’s “research on garden peas [was] going on while Darwin was publishing his great work” (*The Origin of Species by Natural Selection*, 1859). (Nogar 79)
	3. Mendel’s Laws are “the fundamental laws of heredity . . .” (Nogar 81)
		1. “the law of segregation”: sperm or egg contains only half of the individual’s genetic information.
		2. “the law of independent assortment”: “traits are inherited independently of each other, so that there is no relation, for example, between a cat’s color and tail length. This is actually only true for genes that are not linked to each other.” (“Mendelian Inheri­tance”)
		3. “. . . these laws made it possible to predict with great constancy the exact characters of the parents which would be passed down to the progeny.” (Nogar 81)
2. “**gene**”
	1. “generally accepted definition”: “a section of DNA coding for a particular protein.” (“Gene”)
	2. *Merriam-Webster*’*s* (2000): a “sequence of nucleotides in DNA or RNA . . . that is the functional unit of inheritance controlling the transmission and expression of one or more traits by specifying the structure of a particular polypeptide [amino acids joined by a peptide] and especially a protein or controlling the function of other genetic material.”
	3. A gene is 1/500,000th of a sentence period. (Nogar 80)
	4. number of pairs of genes
		1. fruit fly (*Drosophila* *melanogaster*, has giant chromosomes): 5000-15,000 [83] (Nogar 83, 84)
		2. Oct. 2004: the International Human Genome Sequencing Consortium estimated the number of human protein-coding genes at 20,000-25,000, “a surprisingly low number . . .” (Stein)
	5. An individual has two aspects. (Nogar 81)
		1. a *within* (genotype): “number, types and arrangement of genes in the chromosomes.”
		2. a *without* (phenotype): “the collection of manifest characteristics of the organism, including anatomical, physiological and psychological traits.” Genotype and environment determine phenotype.
3. **mutation**
	1. Darwin assumed that variations in the phenotype altered the genotype. (Nogar 81)
	2. But Mendel’s Laws proved that “Modifications in the phenotype did not enter the genotype and were not inherited.” (Nogar 81)
	3. But where were variations” to come from [to form] new species . . .?” (Nogar 82)
	4. 1890s: Hugo De Vries (1848-1935) and William Bateson (1861-1926) discover mutation.
	5. causes of mutation (Nogar 83)
		1. “X ray and other types of high energy radiation” (mutations are usually lethal)
		2. “Among chemicals, nitrogen mustards, formaldehyde, phenol and many others . . .”

### Natural Selection

1. **mutations and natural selection**
	1. “. . . mutations are the materials upon which natural selection works.” (Nogar 83)
	2. Because “more individuals [are] produced than can survive” (1 fish can spawn 120 million eggs, 76), those with advantageous mutations “have a better opportunity to adapt and survive than others. Those that do survive are, thereby, naturally selected.” (Nogar 86)
2. **observed instances of natural selection**
	1. Experiments in the laboratory prove natural selection. (Nogar 86)
		1. “For example, climatic conditions were varied in the process of reproduction of the gypsy moth (*Lymantria* *dispar*), and ultimately [only] the type of moth which could adapt [to] the temperature [survived].” (Nogar 86)
		2. 1967, Sol Spiegelman experiment
			1. “In 1967, Sol Spiegelman showed that replicating molecules could evolve new forms in an experiment that allowed him to observe molecular evolution in the test tube. He used as his evolving molecules RNA molecules derived from a bacterial virus called bacteriophage Q*β*. The genome of bacteriophage Q*β*, a single RNA strand of approximately 3300 bases, depends for its replication on the activity of a protein complex termed Q*β* replicase. Spiegelman mixed the replicase with a starting population of Q*β* RNA molecules.” (Berg et al.)
			2. “Under conditions in which there are ample amounts of precursors, no time constraints, and no other selective pressures, the composition of the population does not change from that of the parent molecules on replication.” (Berg et al.)
			3. “When selective pressures are applied, however, the composition of the population of molecules can change dramatically. For example, decreasing the time available for replication from 20 minutes to 5 minutes yielded, incrementally over 75 generations, a population of molecules dominated by a single species comprising only 550 bases. This species is replicated 15 times as rapidly as the parental Q*β* RNA . . . Spiegelman applied other selective pressures by, for example, limiting the concentrations of precursors or adding compounds that inhibit the replication process. In each case, new species appeared that replicated more effectively under the conditions imposed.” (Berg et al.)
	2. Observations in the wild prove natural selection. (Nogar 86-87)
		1. An example (at least on the subspecific level): “Over a period of a hundred years, the lighter forms of the nun moth (*Lymantria* *monacha*) have given way to the dark forms (melanistic) so that now the light forms are a rarity. The former light variety blended with light lichens on the bark of trees. These lichens have been killed by soot deposits, and now the moths rest on the darkened bark of the same trees. In each case, the result [87] is cryptic coloring . . .” (Nogar 87-88)
		2. “Evolution explains why many human pathogens have been developing resistance to formerly effective drugs . . .” (*Teaching about Evolution and the Nature of Science*)
3. **isolating mechanisms**
	1. These isolate subspecies or closely related species. (Nogar 89)
	2. They assist natural selection by restricting random mating. (Nogar 90)
		1. geographical barriers
		2. “ecological differences such as different habitats and breeding seasons”
		3. “behavioral differences such as courtship and breeding habits”
		4. physical differences of copulatory organs
	3. These force apart subspecies, then closely related species. Thus natural selection “drives the wedge deeper and deeper between the new and the old.” (Nogar 90)
4. **objection**
	1. Perhaps mutation and selection can cause slight modifications. (Nogar 92)
	2. But “the amoeba and the giraffe [cannot] be differentiated” that way. (Nogar 92)
	3. refutation: rates of evolution
		1. The rate of mutation varies with the organism and the evolving characteristic. (Nogar 83)
		2. Evolution of a new genus averages 6.67 million years. (Nogar 319)
		3. Evolution of a new species averages 50,000 years [306] but may take up to 500,­000. (Nogar 306, 318)
		4. “. . . mutation rates in man are quite typical . . .” (Nogar 350)
		5. permanence of species
			1. Sharks and crocodiles are largely unchanged since 100 million, but many species go back only 1 million years. (Nogar 318)
			2. 99% of species are extinct. (Nogar 63)
5. **conclusions**
	1. Even geneticists debate “whether gradual mutation or sudden systemic mutation fits the picture better. . . . The final *how* of evolution is not yet known by any means.” (Nogar 92)
	2. But taken together, the arguments from genetics and from natural selection support evolution. (Nogar 92-93)

## Conclusions

1. **summary of evidence**
	1. “Not all the arguments, nor all the evidence, have been reproduced here.” (Nogar 143)
	2. Evidence “from almost every department of biology [converges] to a single conclusion.” (Nogar 143)
	3. “Evidence from paleontology, genetics, natural selection, biogeography, taxonomy, comparative anatomy, general biology, physiology, biochemistry, and embryology certainly converge upon a single conclusion. The evolution of life is the best explanation of the facts of these sciences.” (Nogar 143)
	4. John Paul II (*Truth Cannot Contradict Truth* § 4): “Today . . . new knowledge has led to the recognition of the theory of evolution as more than a hypothesis. . . . The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of this theory.”
2. **conclusion**
	1. “The fact that all the organisms which now live or ever lived are the outcome of genetic descent and modification from remote, simple, unified beginnings is established” beyond a reasonable doubt. (Nogar 143)

# Evolution . . . and Theology

## Four Doctrines Contradicted?

introduction

1. **Evolution causes problems for original sin**.
	1. Evolution seems to contradict four Catholic doctrines.
		1. historicity of Adam
		2. preternatural gifts (integrity, infused knowledge, impassibility, esp. immortality)
		3. universal fall
		4. Lamarckian transmission of original sin (how pass on an acquired characteristic?)
	2. Second problem: evolution’s associations with atheism.

four doctrines contradicted

1. **historicity of Adam**
	1. Evolution calls into question the real existence of two individuals named Adam and Eve.
	2. Catholic doctrine seems to present Adam and Eve as really existing individuals.
	3. Gen 1-3
		1. Gen 2:7, “then the Lord God formed man from the dust of the ground, and breathed into his nostrils the breath of life; and the man became a living being.”
		2. Adam and Eve appear as individual characters throughout the narrative.
	4. Paul
		1. Rom 5:14-19, “death exercised dominion from Adam to Moses, even over those whose sins were not like the transgression of Adam . . . 17because of the one man’s trespass, death exercised dominion . . . 18one man’s trespass led to condemnation for all . . . 19by the one man’s disobedience the many were made sinners . . .”
	5. Augustine
		1. Augustine (*The Literal Meaning of Genesis* [*De Genesi ad litteram*, from 401 to 415] 8): “Man, made from the slime of the earth, having a human body, was placed in a corporeal paradise. Although, as the Apostle says, this Adam signifies something else, although he is the prototype of a being that is to come, yet he was a man in the literal sense of the word; a man who lived a certain number of years, and who, when he had begotten numerous posterity, died like other men, although, unlike the others, he was not born of parents (forebears), but was taken from the earth. So then, the paradise in which he was placed by God should be understood as a real place, a land where an earthly man would dwell.” (Qtd. in Rondet 117)
	6. Trent
		1. Trent (*Decree on Original Sin* § 1): “the first man Adam, when he had transgressed the commandment of God in Paradise, immediately lost his holiness . . .” (Denzinger § 788)
	7. Pontifical Biblical Commission (1909)
		1. Pontifical Biblical Commission (1909): “Can it be taught that the first three chapters of Genesis contain, not the accounts of events that have truly occurred . . . [but] allegories and symbols without basis in objective fact, proposed in historical form in order to inculcate religious and philosophical truths; or finally that they contain legends partly historical and partly fictitious, freely composed for the instruction and edification of minds? Reply: in the negative to each part.” (Qtd. in Rondet 226)
		2. Pontifical Biblical Commission (1909): “In particular, may the literal historical sense be called in doubt where, in these same chapters, it is a question of facts which touch the fundaments of the Christian faith, such as, among others, the creation of all things by God at the beginning of time, the special creation of man; the formation of 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 test man’s obedience; the transgression of the divine command, at the instigation of the devil in the guise of a serpent; the forfeiture by our first parents of that state of primeval innocence; and the promise of a redeemer to come? Reply: in the negative.” (Qtd. in Rondet 226)
	8. Pius XII, *Humani Generis* (1950)
		1. Pius XII (§ 37): “original sin . . . proceeds from a sin actually committed by an individual Adam and which, through generation, is passed on to all and is in everyone as his own.” (Pius XII)
	9. *Catechism of the Catholic Church* (1997)
		1. *CCC* § 399: “Adam and Eve immediately lose the grace of original holiness.”
		2. *CCC* § 404: “By yielding to the tempter, Adam and Eve committed a *personal sin*, but this sin affected *the human nature* that they would then transmit . . .”
2. **preternatural gifts**
	1. Evolution says the first humans were ordinary humans.
	2. Catholic doctrine seems to say the first two humans were superhuman.
	3. Augustine
		1. “For Augustine, man is ‘a fallen god who remembers the heavens’ . . .” (Rondet 37)
		2. “In paradise, man was endowed with all sorts of privileges: he was virtually immortal; he never experienced the revolt of the senses; he possessed wonderful knowledge and enjoyed greater freedom.” (Rondet 120)
		3. Scholasticism delineates the 4 traditional preternatural gifts:
			1. integrity, infused knowledge, impassibility, immortality
	4. Trent
		1. Trent (*Decree on Original Sin* § 1): “the entire Adam was transformed in body and soul for the worse . . .” (Denzinger § 788)
	5. *Catechism of the Catholic Church*
		1. integrity
			1. *CCC* § 400: “The harmony in which they had found themselves . . . is now destroyed: the control of the soul’s spiritual faculties over the body is shattered . . . Finally, . . . *Death makes its entrance into human history*.” [Rom 5:12]
			2. *CCC* § 405: “human nature . . . [is] inclined to sin—an inclination to evil that is called “concupiscence.””
		2. infused knowledge
			1. *CCC* § 405: human nature . . . is wounded in the natural powers proper to it; subject to ignorance, suffering, and the dominion of death . . .”
			2. Trooster: “. . . our catechesis still maintains this paradise-privilege—though in a negative formulation—in the “clouding of the mind” as a “result of original sin” in us.” (Trooster 19-20)
		3. impassibility
			1. *CCC* § 405: “human nature . . . is wounded in the natural powers proper to it; subject to . . . suffering . . .”
	6. **especially immortality**
		1. Evolution says death pre-existed the first humans.
		2. Catholic doctrine says death post-dated the first humans.
		3. Gen 1-3
			1. Gen 2:17, (God to Adam) “of the tree of the knowledge of good and evil you shall not eat, for in the day that you eat of it you shall die.”
			2. Gen 3:4, “But the serpent said to the woman, “You will not die . . .””
			3. Gen 3:17-19, “in toil you shall eat of it [the ground] all the days of your life . . . 19By the sweat of your face you shall eat bread until you return to the ground, for out of it you were taken; you are dust, and to dust you shall return.”
			4. Gen 3:22-24, “Then the Lord God said, “See, the man . . . might reach out his hand and take also from the tree of life, and eat, and live forever”—23there­fore the Lord God sent him forth from the garden of Eden, 24[and] he placed the cherubim, and a sword flaming and turning to guard the way to the tree of life.”
		4. Paul
			1. Rom 5:12-21, “sin came into the world through one man, and death came through sin, and so death spread to all because all have sinned . . . 14death exercised dominion . . . even over those whose sins were not like the transgression of Adam, who is a type of the one who was to come. 15. . . the many died through the one man’s trespass . . . 16. . . the effect of the one man’s sin [was that] the judgment following one trespass brought condemnation . . . 17because of the one man’s trespass, death exercised dominion through that one . . . 18one man’s trespass led to condemnation for all . . . 19by the one man’s disobedience the many were made sinners . . . 20But law came in, with the result that the trespass multiplied; . . . 21so that . . . sin exercised dominion in death . . .”
		5. Augustine
			1. Council of Carthage XVI (418), canon 1: “whoever says that Adam, the first man, was made mortal, so that, whether he sinned or whether he did not sin, he would die in body, that is he would go out of the body not because of the merit of sin but by reason of nature, let him be anathema.” (Qtd. in Zimmerman 72)
		6. Trent
			1. Trent (*Decree on Original Sin* § 1, D 788): “he incurred through the offense . . . the death with which God had previously threatened him . . .”
		7. *Catechism of the Catholic Church*
			1. *CCC* § 400: “Finally, . . . *Death makes its entrance into human history*.”
			2. Rom 5:12, “Therefore, just as sin came into the world through one man, and death came through sin, and so death spread to all because all have sinned . . .”
3. **universal fall** (**i**.**e**., **fall of the universe**)
	1. Evolution says evil pre-existed the first humans.
	2. Catholic doctrine suggests that evil post-dated the first humans.
	3. Gen 1-3
		1. Eden
			1. Gen 2:8-9, “8And the Lord God planted a garden in Eden, in the east; and there he put the man whom he had formed. 9Out of the ground the Lord God made to grow every tree that is pleasant to the sight and good for food . . .”
			2. Gen 2:15, “The Lord God took the man and put him in the garden of Eden . . .”
		2. after the fall
			1. Gen 3:17-19, “cursed is the ground because of you; in toil you shall eat of it all the days of your life; 18thorns and thistles it shall bring forth for you; and you shall eat the plants of the field. 19By the sweat of your face you shall eat bread . . .”
	4. Paul
		1. “Rom 8:20-21, “for the creation was subjected to futility . . . 21the creation itself will be set free from its bondage to decay . . .”
	5. *Catechism of the Catholic Church*
		1. *CCC* § 400: “Because of man, creation is now subject “to its bondage to decay.”
		2. Rom 8:21, “the creation itself will be set free from its bondage to decay and will obtain the freedom of the glory of the children of God.”
	6. “Does the Catholic faith require belief in a world that was once without pain and death?” (Korsmeyer 8)
4. **Lamarckian transmission of original sin** (how pass on an acquired characteristic?)
	1. Evolution says acquired characteristics are not inherited.
		1. 1800: Jean-Baptiste Lamarck (1744-1829) proposes “soft inheritance” (inheritance of acquired characteristics). Use or disuse of an organ over generations determines its inheritance. (“Jean-Baptiste Lamarck”)
		2. 1876: meiosis discovered (germ-cell division) (vs. mitosis, cell-nucleus division)
		3. 1883: August Weismann proposes that “germ plasm (the sex cells, later redefined as DNA) remained separate and distinct from the soma (the rest of the body); thus nothing which happens to the soma may be passed on with the germ-plasm. This model underlies the modern understanding of inheritance.” (“Jean-Baptiste Lamarck”)
	2. Catholic doctrine suggests original sin *is* an acquired characteristic that has been inherited.
	3. Gen 3
		1. Gen 3:15 (snake’s punishment), “I will put enmity between you and the woman, and between your offspring and hers . . .”
		2. Gen 3:16 (woman’s punishment), “in pain you shall bring forth children, yet . . . your husband . . . shall rule over you.”
	4. Paul
		1. Rom 5:12-21, “sin came into the world through one man, . . . and so death spread to all because all have sinned . . . 15the many died through the one man’s trespass . . . 16 the effect of the one man’s sin [is that a] judgment following one trespass brought condemnation . . . 18 one man’s trespass led to condemnation for all . . . 19 by the one man’s disobedience the many were made sinners . . .”
	5. Augustine
		1. Council of Carthage XVI (418): infants are baptized “unto the remission of sins [because] of the original sin from Adam, which is expiated in the bath of regeneration . . .”
	6. Trent (*Decree on Original Sin*)
		1. Trent (canon 2, D 789): “the transgression of Adam has [not] harmed him alone [but also] his posterity . . .”
		2. Trent (canon 3, D 790): “this sin of Adam, which is one in origin and[,] transmitted to all[,] is in each one as his own by propagation, not by imitation . . .”
		3. Trent (canon 4, D 791): “infants newly born from their mothers’ wombs are to be baptized . . .”
		4. Trent (canon 5, D 792): by “baptism, the guilt of original sin is remitted . . .”
	7. Pius XII, *Humani Generis* (1950)
		1. Pius XII (§ 37): “original sin . . . proceeds from a sin actually committed by an individual Adam and which, through generation, is passed on to all and is in everyone as his own.”
	8. *Catechism of the Catholic Church*
		1. *CCC* § 403: “humans’ “inclination toward evil and death cannot be understood apart from their connection with Adam’s sin and the fact that he has transmitted to us a sin with which we are all born afflicted . . .”
		2. *CCC* § 404: “How did the sin of Adam become the sin of all his descendants?
			1. “The whole human race is in Adam “as one body of one man.” [Aquinas *De Malo* 4.1] By this “unity of the human race” all men are implicated in Adam’s sin . . .”
			2. “Still, the transmission of original sin is a mystery that we cannot fully understand. . . . By yielding to the tempter, Adam and Eve committed a *personal sin*, but this sin affected *the human nature* that they would then transmit in a *fallen state*. [Trent DS 1511-12] It is a sin which will be transmitted by propagation to all mankind, that is, by the transmission of a human nature deprived of original holiness and justice. And that is why original sin is called “sin” only in an analogical sense: it is a sin “contracted” and not “committed”—a state and not an act.”

## An Introduction to Spectrum Positions

introduction

1. **If evolution and Catholic doctrine are both true**, **then they must be reconcilable**.
	1. Augustine (*The Literal Meaning of Genesis* 1.19.39. Trans. John Taylor, SJ. 2 vols. New York: Newman, 1982. 42-43): “Usually . . . a non-Christian knows something about the earth, the heavens, . . . the kinds of animals, shrubs, stones, and so forth . . . Now it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn.” (Qtd. in Korsmeyer 2)
	2. Leo XIII, *Providentissimus Deus*, 1893: “There can never, indeed, by any real discrepancy between the theologian and the physicist [21] . . . If dissension should arise between them, here is the rule also laid down by St. Augus­tine for the theologian: “Whatever they can really demonstrate to be true of physical nature we must show to be capable of reconciliation with our Scriptures” [22] . . . The Catholic interpreter . . . should show that those facts of natural science which investigators affirm to be now quite certain are not contrary to the Scripture rightly explained . . .” (Qtd. in Gaul 21-23)
		1. Leo added a caution: one “must, nevertheless, always bear in mind, that much which has been held and proved as certain has afterwards been called in question and rejected.” (Gaul 23)
	3. “Notre Dame philosopher of science Ernan McMullin (McMullin, Ernan, ed. *Evolution and Creation*. Notre Dame: U of Notre Dame P, 1985. 2.): “When an apparent conflict arises between a strongly supported scientific theory and some item of Christian doctrine, the Christian ought to look very carefully to the credentials of the doctrine. It may well be when he does so, the scientific understanding will enable the doctrine to be reformulated in a more adequate way.” (Qtd. in Korsmeyer 132)
	4. John Paul II (*Truth Cannot Contradict Truth.* Address to the Pontifical Academy of Sciences, 22 Oct. 1996. § 2): “truth cannot contradict truth . . .”

## Extreme Right Attempt at Reconciliation

1. **far right** (**concordism**, **fundamentalism**): **Gen 1-3 are not symbolic but historical**.
	1. Concordism is the attempt to reconcile a literal reading of scripture with scientific discoveries.
	2. example: the attempt “to match the six days of creation with the geological periods and ages elaborated by science.” (Nogar 371)
2. **on fundamentalism**
	1. origin of the term “fundamentalism”
		1. Europeans who came to America led hard lives with little time for study. Those who migrated to the South and West, where there were no churches, became largely un-Christian. To convert them, evangelists drastically simplified theology: believe in this book because every word is true; and accept Christ as your Lord and savior. Thus the theology in which fundamentalism arose was American frontier theology.
		2. “Christian orthodoxy was identified with biblical inerrancy, and was tested by whether or not one accepted literally the Genesis account of creation, the virgin birth of Jesus, his substitutionary atonement, physical resurrection, and imminent bodily return to earth.” (148)
		3. “The publication of twelve small volumes of *The Fundamentals* [148] between 1909 and 1912 marked the transformation of . . . a movement of dissent into a power group . . .” (Hudson 148-49)
		4. “. . . Curtis Lee Laws, editor of the *Watchman-Examiner*, first coined the term [“fundamentalism”] . . . in 1920 . . .” (Hudson 147)
	2. characteristics of fundamentalism
		1. absolute inerrancy of the Bible
			1. “. . . a belligerant [*sic*] anti-Modernist reaction stemm[ed] from the “Prophetic” Bible conferences of the latter part of the nineteenth century. The premillennial views [Christ will come before the millennium Christ’s thousand-year reign on earth mentioned in Rev 20:4-6] enunciated at these conferences presupposed the verbal inspiration of Scripture in every detail as the basis for their whole system, and consequently the itinerant revivalists who found their inspiration at the conferences were [147] quick to assail all forms of biblical liberalism.” (Hudson 147-48)
			2. “Fundamentalism can probably best be understood as a phase of the rural-urban conflict, representing the tendency of many who [around 1900] were swept into a strange new urban environment to cling to the securities of their childhood in rural America. In this sense, Fundamentalism was . . . “conserving the cosmological and biological notions of older cultures . . .”” (Hudson 148)
		2. anti-intellectualism
			1. Europeans diffused through the east and south of America in the first half of the 1800s, and “in the rural areas of the South . . . there were few opportunities to secure an education. Consequently, . . . the Baptists of the South were of low social and economic status. . . . The “Christians” [present-day Disciples of Christ and Churches of Christ], with their initial opposition to an educated ministry, . . . were closely akin . . . to the Baptist farmer-preachers. The Methodists were also characterized by a lack of education . . .” (Hudson 61)
		3. enthusiasm (in the sense of emotionalism)
			1. “The Methodists were also characterized by . . . an undisciplined emotionalism . . .” (Hudson 61)
			2. “Evangelicalism in general stressed the primacy of heart religion manifesting itself in the conversion experience . . .” (Hudson 100)
		4. emphasis on morality rather than doctrine
			1. Already in colonial times, “as a result of the tough-grained individualism fostered by the hard conditions of life in a frontier society . . . [ministers] were soon “shorn of every weapon except moral persuasion.”” (Hudson 26)
			2. “Actually the five or six “fundamentals” for which the Fundamentalists were ready to do battle were scarcely adequate to spell out a full-orbed understanding of the Christian life and, in the absence of a fully developed theological structure, such a conspicuous representative of Fundamentalism as Billy Sunday tended to equate “salvation with decency, patriotism, and manliness.”” (Hudson 148)
		5. political conservatism
			1. “. . . Fundamentalism consistently aligned itself with “ultra-conservative political, economic, and social views” . . .” (Hudson 148)
3. **Catholic statements on fundamentalism**
	1. “Fundamentalism indicates a person’s general approach to life which is typified by unyielding adherence to rigid doctrinal and ideological positions—an approach that affects the individual’s social and political attitudes as well as religious ones. Fundamentalism in this sense is found in non-Christian religions and can be doctrinal as well as biblical.” (National Conference of Catholic Bishops Ad Hoc Committee on Biblical Fundamentalism 1-2)
	2. Fundamentalism “tends to interpret the Bible as being always without error or as literally true . . . For some biblical fundamentalists, inerrancy extends even to scientific and historical matters. The Bible is presented without regard for its historical context and development. . . . We [Catholics] do not look upon the Bible as an authority for science or history.” (National Conference of Catholic Bishops Ad Hoc Committee on Biblical Fundamentalism 1-2)
		1. Vatican II (*Dei Verbum* [*Dogmatic Constitution on Divine Revelation*] ch. 3 § 11): “the books of Scripture must be ac­knowledged as teaching solidly, faithfully and without error that truth which God wanted put into sacred writings for the sake of salvation.”
	3. “. . . fundamentalism actually invites people to a kind of intellectual suicide. It injects into life a false certitude, for it unwittingly confuses the divine substance of the biblical message with what are in fact its human limitations.” (Pontifical Biblical Commission § I. F., “Fundamentalist Interpretation”)
	4. But Genesis can’t be read literally: “grass and fruit trees were created a day before the sun.” (Lack 33)
	5. Concordism is still popular.
		1. 1992: a Gallop poll showed “that half the American people believe that humans were directly created within the last ten thousand years.” (*The New York Times*. [26 July 1992]: E5.) (Korsmeyer 8; see 71)

## Moderate Right Attempt at Reconciliation

1. **moderate right position**
	1. The moderate right position says that Gen 3 is a symbolic narrative, but Adam was historical.
2. **literary form**
	1. Pope Pius XII in the encyclical *Divino Afflante Spiritu* (1943): “the ancient peoples of the East, in order to express their ideas, did not always employ those forms or kinds of speech which we use today: but rather those used by the men of their times and countries.”
	2. Pontifical Biblical Commission, *Response to Archbishop Suhard*, 1948
		1. “. . . they [Gen 1-3] relate in simple and figurative language, adapted to the understand­ing of a less developed people, the fundamental truths presupposed for the economy of salvation . . .” (Qtd. in Gaul 152)
		2. “The question of the literary forms of the first eleven Chapters of Genesis is [complex. One can] neither deny nor affirm their historici­ty, taken as a whole . . .” (Qtd. in Gaul 152)
		3. “. . . there is no one today who doubts the existence of . . . sources [in the pentateuch] or refuses to admit a progressive development [in the historical narratives] . . . due to social and religious conditions of later times . . .” (Qtd. in Gaul 151-52)
	3. Ratzinger on scripture’s “images”
		1. Ratzinger (*In the Beginning* 62): “The essence of an image consists in the fact that it represents something. . . . It points to something beyond itself.”
		2. Ratzinger (*In the Beginning* 17): “Is the distinction between the image and what is intended to be expressed only an evasion, because we can no longer rely on the text even though we still want to make something of it, or are there criteria from the Bible itself that attest to this distinction?”
		3. Ratzinger (*In the Beginning* 26-27): “The ancient Church and the Church of the Middle Ages . . . knew that the [26] Bible is a whole and that we only understand its truth when we understand it with Christ in mind—with the freedom that he bestowed on us and with the profundity whereby he reveals what is enduring through images.”
			1. Ratzinger (*In the Beginning* 19): “we only interpret an individual text theologically correctly . . . when we see in the text where this way is tending and what its inner direction is.”
		4. Ratzinger (*In the Beginning* 24-25): “In its confrontation with Hellenistic civilization, Wisdom literature reworks the theme without [24] sticking to the old images such as the seven days. Thus we can see how the Bible itself constantly readapts its images to a continually developing way of thinking . . . In the Bible itself the images are free and they correct themselves ongoingly. In this way they show, by means of a gradual and interreactive [*sic*] process, that they are only images, which reveal something deeper and greater.”
		5. Ratzinger (*In the Beginning* 82-83): “At the moment when the paradise narrative took its final literary form there was a great danger that Israel would succumb to the many seductive elements of these religions and that the God of the promise and of creation, who seemed so far off, would disappear and be forgotten. [82] . . . In that religious setting the serpent was a symbol of that wisdom which rules the world . . . Thus the serpent also serves as a symbol of the attraction that these religions exerted over Israel in contrast to the mystery of the God of the covenant. . . . It is with Israel’s temptation in mind that Holy Scripture portrays Adam’s temptation and, in general, the nature of temptation and sin in every age.”
3. **historical events in figurative language**
	1. “. . . Roman Catholics tend to treat [Gen 1-3] as allegorical history,” not ahistorical allegory. (Lack 37)
	2. Generally, “On the Catholic view, Genesis describes events that really took place, though not in the form in which they are pictured.” (Lack 37)
	3. 1948: Pontifical Biblical Commission (“Letter to Cardinal Su­hard.” In Gaul 152): Gen 1-3 “relate in simple and figurative language, adapted to the under­standing of a less developed people, the funda­mental truths presupposed for the economy of salvation.”
	4. Pius XII (*Humani generis* [1950] § 36): “the first eleven chapters of Genesis, although properly speaking not conforming to the historical method used by the best Greek and Latin writers or by competent authors of our time, do nevertheless pertain to history in a true sense . . .”
	5. Stephanus Trooster (*Evolution and the Doctrine of Original Sin* [1965] 19): “even within the framework of the modern scientific theories about the genesis of man and the universe, it remains quite conceivable that the first parents became recipients of sanctifying grace. The supernatural gift of being God’s children is by no means tied to a specific stage of cultural development.”
4. **attempts to distinguish imagery from history**
	1. 1947: “Citing from the biblical commission of 1909, [H.J.T. Johnson, *The Bible and the Early History of Mankind*] stated that the following six points in the story of the Fall are to be interpreted strictly:
		1. “the unity of the human race;
		2. “the original happiness, integrity and immortality of our first parents;
		3. “a precept given by God to man to prove his obedience;
		4. “its transgression through [37] persuasion by the devil;
		5. “a resulting fall from primeval innocence;
		6. “the promise of a future Redeemer.” (Lack 37-38)
		7. “Only one of these points, the postulated unity of the human race, is strictly biological . . .” (Lack 38)
	2. 1949: Charles Hauret (*Beginnings: Genesis and Modern Science*. 1964. French: 1949) made “an attempt to distinguish the “imagery” from the historical reality . . .” (Hauret 180)
	3. 1973: Bruce Vawter, CM (d. 1986; *A Path Through Genesis* 1954, new ed. 1973) listed the “fundamental truths of faith” (Pontifical Biblical Commission’s phrase, 1909) in Gen 3: “There is one God, Creator of the universe by the act of His will, who created man in His image and likeness, raised him to a level above his created state and endowed him with gifts which he forfeited through sin, who promised man an eventual redemption from this sin.”

## None of the Four Doctrines Is Defined

1. **historicity of Adam**
	1. Gen 1-3
		1. What about the Pontifical Biblical Commission?
			1. Pontifical Biblical Commission (1909): “In the interpretation of passages of these chapters which the Fathers and Doctors understood diversely and did not teach [226] as something certain and definite, is it possible, without prejudice to the Church’s judgment and keeping within the analogy of faith, to follow and defend the opinion that each one, after mature consideration, believes should be adopted? Reply: in the affirmative.” (Qtd. in Rondet 226-27)
			2. 1948: Pontifical Biblical Commission (*Letter to Archbishop Suhard*, 1948): Gen 1-3 “relate in simple and figurative language, adapted to the understanding of a less developed people, the fundamental truths presupposed for the economy of salvation, as well as the popular description of the origin of the human race and of the chosen people.” (Qtd. in Gaul 152)
			3. Athanasius Miller (secretary of the Pontifical Biblical Commission; in *Benedictinishce Monatschrift* [1955]): “it is easy enough for us to smile at the narrowness and constraint that prevailed fifty years ago.”
		2. Charles Hauret (122): “The Church has never thought it necessary to settle the question [of the historical character of Gen 2-3] by her authori­ty.”
	2. Paul
		1. True: Paul historicized.
			1. Compared to Gen 1-3, Adam in Rom 5:12-21 “is visualized . . . much more distinctly as an (historically) individual person, “one man.”” (Trooster 84)
			2. Paul “. . . “historicized” motifs occurring in the story of paradise. This would mean that he incorrectly understood as historical those texts that were originally meant to convey doctrinal matters only.” (Trooster 75)
			3. “Contemporary theologians [assume Paul’s] “*historicization*” of the original ideas on the matter as found in Gen. 3. [Historicization] consists in the later evaluation as historical . . . texts that were originally only intended to convey doctrines. Paul is particularly supposed to have construed Adam as an historical, purely individual-personal human being. They propose that we should understand these texts once again as expressions of doctrinal thought and refrain from interpreting them as reflecting any historical reality whatsoever.” (Trooster 85)
		2. Adam-Christ typology
			1. Paul historicized; but for Paul, Adam is a “type” to Christ as antitype.
				1. Rom 5:14, “Adam . . . is a type [τύπος] of the one who was to come.”
				2. definition

Raymond Brown (*The Sensus Plenior of Sacred Scripture*, 1955)

“. . . the literal sense and the typical sense have been considered as the two great senses of Scripture.” (Brown *Sensus* 16)

“. . . the literal sense is a sense expressed by the text . . .” (Brown *Sensus* 149)

“. . . the typical sense is a sense [expressed by] things . . .” (Brown *Sensus* 149)

“Things” can be “persons, events, and institutions . . .” (Achtemeier *IDBSup* 926) (Alsup, *Anchor Bible Dictionary* 1997)

* + - * 1. G.W.H. Lampe and K.J. Woolcombe (*Essays on Typology* [1957] 62): “. . . Paul invariably uses τύπος in the sense of ‘pattern’ or ‘model’ . . .”
				2. Rom 5:12-21 in context of Romans

Rom 1-4 have as their primary purpose to show that, though Jews have the Mosaic Law and the Gentiles have natural law, “neither has been able to live without sin . . .” (Trooster 77)

Rom 2:12, “All who have sinned apart from the law will also perish apart from the law, and all who have sinned under the law will be judged by the law.”

Rom 3:23-24, “since all have sinned and fall short of the glory of God . . . 24they are now justified by his grace as a gift, through the redemption that is in Christ Jesus . . .”

Then Rom 5:1-11 present “The reconciliatory effects of man’s faith in Christ . . .” (Trooster 78)

Rom 5:6, 8, “while we were still weak, at the right time Christ died for the ungodly. . . . 8But God proves his love for us in that while we still were sinners Christ died for us.”

Then in Rom 5:12-21 “universal sinfulness is reduced to its very root, the sin of Adam. This theme, however, is introduced exclusively to shed light upon the . . . redemptive merit of faith in Christ which eliminates all distinctions between Jews and Gentiles before God.” (Trooster 78)

* + - * 1. “In Paul’s thinking the nature of the “one man,” Adam, is completely determined by the “one man, Jesus Christ” . . .” (Trooster 85)

Rom 5:14-21, “Adam . . . is a type of the one who was to come. 15. . . if the many died through the one man’s trespass, much more surely have the grace of God and the free gift in the grace of the one man, Jesus Christ, abounded for the many. 16And the free gift is not like the effect of the one man’s sin. For the judgment following one trespass brought condemnation, but the free gift following many trespasses brings justification. 17If, because of the one man’s trespass, death exercised dominion through that one, much more surely will those who receive the abundance of grace and the free gift of righteousness exercise dominion in life through the one man, Jesus Christ. 18Therefore just as one man’s trespass led to condemnation for all, so one man’s act of righteousness leads to justification and life for all. 19For just as by the one man’s disobedience the many were made sinners, so by the one man’s obedience the many will be made righteous. 20But law came in, with the result that the trespass multiplied; but where sin increased, grace abounded all the more, 21so that, just as sin exercised dominion in death, so grace might also exercise dominion through justification leading to eternal life through Jesus Christ our Lord.”

1 Cor 15:21-22, 44-48, “since death came through a human being, the resurrection of the dead has also come through a human being . . . 22for as all die in Adam, so all will be made alive in Christ. . . . 44If there is a physical body, there is also a spiritual body. 45Thus it is written, “The first man, Adam, became a living being”; the last Adam became a life-giving spirit. 46But it is not the spiritual that is first, but the physical, and then the spiritual. 47The first man was from the earth, a man of dust; the second man is from heaven. 48As was the man of dust, so are those who are of the dust; and as is the man of heaven, so are those who are of heaven.”

So who was Christ for Paul?

“Christ is eschatologically the “corporate personality” par excellence, i.e., a strictly individual man who at the same time, however, epitomizes in Himself and personifies all of mankind according to God’s ultimate intention, and He does this in the most real sense of the word.” (Trooster 86)

“Thus also the “one man,” Adam, of Romans 5 . . . transcend[s] the merely chronologically first man standing at the beginning of the history of mankind. . . . Paul must have certainly also seen him as “corporate personality” . . .” (Trooster 87)

Paul “historicized “Adam,” but in the typology Adam-Christ, Adam immediately transcends the purely chronologically first man, and becomes . . . the [man] who, as in Gen. 3, represents all of mankind steeped in sin.” (Trooster 87)

“. . . Paul thinks of Adam as the “first man” in the sense of the sinful opposite of complete dedication to God. . . . [He is] the one who initiates the long lineage of “brethren” and precisely in this he includes all before God. He is indeed an individual person, but one who, in his relationship with God, personifies the existence of all. In the typology Adam-Christ, Adam only then appears completely as “type of the one who was to come” when in an analogical sense he is as [i.e., similarly to] Christ “the first-born among many brethren” (Rom. 8, 29 [nrsv, “the firstborn within a large family”]). . . . here [Rom 5:12-21] he represents these “brethren” in their solidarity in rejecting God’s redemptive love, in their universal sinfulness which has unleashed and perpetuated the powers of “sin” in this world.” (Trooster 87)

* 1. Trent
		1. “The historical nature of Adam and Eve was not defined . . .; it was assumed.” (Korsmeyer 56)
		2. A. Vanneste (“Le décret du Concile de Trente sur le péché originel” 714-17): “To what extent does this decree [*On Original Sin*] suppose or even affirm the historicity of a first human pair and of a first sin? . . . The question of the historicity or non-historicity of the account of the fall did not even cross the minds of the conciliar fathers. In the sixteenth century, all—Catholics as well as Reformers—considered ‘naively’ that things had in fact occurred as they were presented in Genesis . . .” (Qtd. in Rondet 273)
		3. “. . . Trent in its dogmatic decree on original sin (1546), while clearly assuming the existence of an individual Adam, does not directly set out to affirm the strict unity of original sin: it takes it for granted. When it does speak of it, it is in an interpolated relative clause in a canon whose main object is to define . . . the reconciliation won by the blood of Christ.” (Dubarle 227)
	2. What about Pius XII, *Humani generis*?
		1. John Paul II: hypothesis to theory
			1. John Paul II (*Truth Cannot Contradict Truth* § 4. Address to the Pontifical Academy of Sciences, 22 Oct. 1996): “In his encyclical *Humani Generis* (1950), my predecessor Pius XII . . . considered the doctrine of “evolutionism” a serious hypothesis, worthy of investigation . . . new knowledge has led to the recognition of the theory of evolution as more than a hypothesis. It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of this theory.”
	3. *Catechism of the Catholic Church*
		1. “. . . the new *Catechism of the Catholic Church* . . . proposes as literal truth the creation of the first humans with advanced knowledge and not subject to suffering or death.” (Korsmeyer 2)
		2. “Theologians and Scripture scholars were confused by [5] this, since Vatican II had clearly affirmed the use of historical critical methods when interpreting the Bible.” (Korsmeyer 5-6)
		3. “As a result of this presentation in *Catechism*, Catholics are faced with a number of questions that challenge their faith. Is [7] evolution now favored or feared? One can see that there have been two differing trends in Catholic thought on this subject.” (Korsmeyer 7-8)
		4. “When the curial commission responsible for *Catechism* was pressed, it became clear that they were unsure how to handle the doctrine of “original sin.” *Catechism*’*s* Editorial Secretary, Christoph Schönborn, stated: “A particularly delicate subject is original sin. . . . It cannot be the task of the Catechism to represent novel theological theses . . .”” (Korsmeyer 6)
1. **preternatural gifts** (**esp**. **death**)
	1. Augustine
		1. “. . . the Cappadocians or St. Ambrose . . . interpreted the earthly paradise much less literally than the school of Antioch, St. Augustine, St. Thomas and the tradition that claims to follow him . . .” (Rondet 270)
		2. Pope Zosimus never approved the Council of Carthage XVI’s canon concerning immortality.
			1. Canon 1: “whoever says that Adam, the first man, was made mortal, so that, whether he sinned or whether he did not sin, he would die in body, . . . not because . . . of sin but by reason of nature, let him be anathema.” (Qtd. in Zimmerman 72)
		3. Orange II condemned double predestination.
	2. Trent
		1. André-Marie Dubarle, OP (*Biblical Doctrine of Original Sin* 232-33):“The Council of Trent passed over a doctrinal draft in which Adam’s exceptional gifts were described in the classical way, and simply promulgated a [232] canon stating that by his sin the first man lost ‘the holiness and righteousness in which he had been constituted’. These words correspond to those defining man’s role on earth in the book of Wisdom (9:2-3). They do not imply that this holiness and righteousness were the equal of what the theologians call sanctifying grace, making men ‘partakers of the divine nature’ (2 Peter 1:4). In the following session, which was devoted to justification, the Council went on to teach that authentic Christian righteousness replaces the original righteousness lost by Adam, without making clear whether it surpasses it or not.” (*Decree on Justification* ch.7, D 800 or 1531)
		2. A “high-flown description of [the preternatural gifts] . . . had been circulated among them [the council fathers] in a preliminary draft [93] . . . In the final definition the supposed angelic state of Adam in an original paradise is totally omitted, and there is no description whatsoever of Adam’s condition before the Fall.” (Zimmerman 93-94)
		3. no sudden concupiscence
			1. “Trent does not state that concupiscence started suddenly with original sin as St. Augustine had claimed.” (Zimmerman 96)
			2. “Nor does Trent state in so many words that concupiscence is anything other than our spontaneous and vigorous natural drives.” (Zimmerman 96)
		4. death
			1. *Decree on Original Sin* (1546)
				1. Trent set aside Council of Carthage XVI (418) canon 1. (Zimmerman 72)

Carthage XVI canon 1: “whoever says that Adam, the first man, was made mortal, so that, whether he sinned or whether he did not sin, he would die in body, . . . let him be anathema . . .” (Qtd. in Zimmerman 72)

The canon “declared that Adam would not have died physically had he not sinned. Carthage had made it a priority declaration . . .”

“But the Papal Legates apparently did not circulate it at Trent.” (Zimmerman 72)

* + - * 1. canon 1

draft one of canon 1: Adam “incurred the wrath and indignation of God (from which death followed), with which God had previously threatened him . . .” (Concilium Tridentinum 5: 196.) (Qtd. in Zimmerman 75)

canon 1 (D 788): Adam “incurred . . . the wrath and indignation of God and hence the death with which God had previously threatened him . . .”

The Fathers chose to say “that God punished Adam for his sin by inflicting “the kind of death with which God had threatened him.” That takes the heat off the Council. With such a wording the Council could avoid explicit mention of *physical death*, and allow the Scriptures and Tradition to speak for themselves.” (Zimmerman 73)

* + - * 1. canon 2

draft of canon 2: “If anyone asserts . . . that he incurred because of this sin of disobedience only death and penalties of the body . . . but not the sin, *anathema sit*.” (Qtd. in Zimmerman 75)

canon 2 (D 789): “If anyone asserts that the transgression of Adam . . . has transfused only death “and the punishments of the body into the whole human race, but not sin also, which is the death of the soul,” let him be anathema . . .” (Deferrari translation)

“. . . many of the Fathers . . . asked that “death of the body” as punishment for original sin be excluded from the definition. Their intervention prevailed. This sentence indicates that the Council of Trent knowingly avoided a definition which would teach that death of the [75] body is a punishment for original sin.” (Zimmerman 75-76)

“Trent’s canon 2, using part of a canon of Orange II (529), casually mentions death of the body as a common belief. Then by astute wording the Council avoids defining explicitly that physical death is a punishment for original sin. Trent allowed the popular belief to remain in place, though without taking a stand on the question.” (Zimmerman 76)

* + - * 1. “The Fathers, who had heard [during the] discussions that physical death was one of the punishments of original sin, were certainly aware that it was a belief hallowed by the authority of Saint Augustine, [that it was] prevalent in scholastic theology, and that it was a persuasion held dear by Christians. . . . Trent worded the definition discreetly to avoid offending pious ears, but did not make this popular belief into a part of the definition to be held by the Church.” (Zimmerman 76)
			1. Henri Rondet (*Original Sin*: *The Patristic and Theological Background* 1967)
				1. Many of our hardships are natural. The “wounds” of original sin (“ignorance, concupiscence, . . . suffering and death”) are from our body/soul composition. (Rondet 261)
			2. Stephanus Trooster (*Evolution and the Doctrine of Original Sin*, 1965, 22): R. Troisfontaines, SJ (*Je ne meurs pas* 1960) has reasoned that evolution without death “is unthinkable . . ., for immortality would by its very nature undo evolution because of a surplus of people. Indeed, life—and certainly its progressive development—is unthinkable, unless by the grace of the death of individuals. Hence human nature must be necessarily mortal in its very essence.”
	1. *Catechism of the Catholic Church*
		1. “The CCC does not mention a “tree of life” with miraculous powers in paradise, nor does it use the term “preternatural gifts.” The wording of the text (No. [94] 374-376) ascribes special efficacy to the original “radiance of grace” which brought inner harmony to man, to the union of man and woman, and with all of creation, without explicitly teaching that the condition was miraculous, over and above the effects of the “radiance of grace.”” (Zimmerman 94-95)
1. **universal fall**
	1. Trent: no sudden concupiscence
		1. “Trent does not state that concupiscence started suddenly with original sin as St. Augustine had claimed.” (Zimmerman 96)
		2. “Nor does Trent state in so many words that concupiscence is anything other than our spontaneous and vigorous natural drives.” (Zimmerman 96)
2. **Lamarckian transmission**
	1. Paul
		1. Lamarckian transmission of original sin
			1. Rom 5:14-19, “death exercised dominion from Adam to Moses, even over those whose sins were not like the transgression of Adam . . . 17because of the one man’s trespass, death exercised dominion . . . 18one man’s trespass led to condemnation for all . . . 19by the one man’s disobedience the many were made sinners . . .”
			2. Rom 5:12c, ἐφ’ ᾧ
				1. Rom 5:12, “Therefore, [*a*] just as sin came into the world through one man, [*b*] and death came through sin, [*c*] and so death spread to all because [ἐφ’ ᾧ] all have sinned . . .”)
				2. “In the days of St. Augustine this sentence was translated from the Greek as follows: “in whom [Adam] all men sinned” [i.e.,] “in Adam all men are sinners.” As a defense against Pelagius and his followers, who only accepted personal sins but not original sin, it was hoped that every thought of personal sins could be suppressed in Paul’s text.” (Trooster 81)
				3. But ““in whom” is erroneous . . . [One should] translate “because.”” (Trooster 81)
				4. “Nevertheless, the phrase “because all men sinned” retained until recently the meaning “because all are [81] sinners”; and one can add to this: “in Adam.”” (Trooster 81-82)
			3. But Rom 5:12 refers to personal sins.
				1. Rom 5:12c, “death spread to all because [ἐφ’ ᾧ] all have sinned . . .”
				2. Stanislaus Lyonnet, SJ (“Le péché originel et l’exégèse de Rom. 5, 12,” 1956), “has shown conclusively that the Greek word used [for “sinned”—ἥμαρτον, 3rd person pl. of ἁμαρτάνω] actually does mean “to sin” in a real, active sense, and that the translation “all are sinners” is therefore incorrect. It is quite definite then that Paul speaks here about the personal sins of “all me,” . . . to be correctly rendered [Rom 5:12 must read]: “given the fact that all men sinned (personally).”” (Trooster 82)
				3. “This rule of sin [manifest in death’s dominion, 5:12, 14, 17] has not come upon all of mankind as an inevitable fate, but it has been personally affirmed and realized by “all” in the fact that “all have sinned.” Hence the universal depravity of mankind does not constitute a being-determined because of one man’s sin; nay, man’s universal sinfulness prevails so universally precisely because each of us has affirmed and perpetuated it through his personal sins.Nevertheless these personal sins are a substantiation of the reign of sin as it took possession of man through Adam’s sin.” (Trooster 82)
			4. Paul does not assert original sin (*peccatum originans*).
				1. “Does Paul presuppose the existence of a single sinner at the very beginning? This seems quite certain . . . But does the Apostle make of this assertion a formal teaching, and is this teaching part of revealed truth?” (Rondet 267)
				2. Peter Lengsfeld (*Adam und Christus* [1965] 100-11) maintains that “Paul did not make the typology of the two Adams the subject matter of his teaching. He used it freely, to better express his thought on the universality of sin and the superabundant universality of the salvation brought by Christ, the unique mediator.” (Rondet 269)

## Moderate Left Attempts at Reconciliation

1. **moderate left**: **Gen 3 is a symbolic narrative**, **and Adam was not historical**.
	1. David Lack (1957): whereas “. . . Roman Catholics tend to treat them [Gen 1-3] as allegorical history,” “Many Protestants now regard the first three chapters of Genesis as poetic imagery . . .” (Lack 37)
2. **like a parable**
	1. G. Ernest Wright (“The Nature of Man: An Exposition of Genesis 3” [1960] 83): “the parabolic aim [in Gen 3] is so obvious that for a parallel one might turn to the parables of Jesus.”
	2. “Various statements concerning natural history in the first three chapters of Genesis are factually wrong. . . . these chapters should be regarded as allegorical, . . . which is probably what their writers intended them to be. This need in no way lessen their spiritual truth, which is concerned with matters that come outside science.” (Lack 113)
	3. Stephanus Trooster (44): “This story of paradise can be characterized as a *mashal*, an allegory, a parable, but nevertheless one intended to illustrate a concrete historical truth.”
3. **Adam is Everyman**.
	1. advocates
		1. Henri Rondet (*Original Sin* 1967): “Without denying that chronologically there may have been a first man, . . . *Adam is Man*, mankind taken as a whole . . .” (Rondet 263)
		2. Robert Davidson (*Genesis 1-11* [1973] 28): “This is the story of ‘Everyman’.”
		3. Bruce Vawter (*On Genesis: A New Reading* [1977] 89): “The man and the woman of Genesis 2-3 are in­tended to repre­sent everyman . . .”
		4. Michael Maher (*Genesis* [1982] 48): ““The man” and “the woman” of the story repre­sent “Ev­ery­man” and “Every­wo­man” . . .”
		5. Ratzinger (*In the Beginning* 63-64): “In the New Testament Christ is referred to as the second Adam [1 Cor 15:44-48]. [63] . . . Hence this relationship of creature to Christ, of the first to the second Adam, signifies that the human person is a being en route . . .” (*Note*: first Adam = all human persons.)
	2. In the Hebrew of Gen 2-3 *adam* “is always written with the definite article” (*ha*´*adam*, = “man”). That suggests that “Adam” is not a proper name but is Everyman. (Trooster 44)
	3. Gen 3 is a paradigm of human conduct in the face of temptation.
		1. Robert Davidson (*Genesis 1-11* [1973] 48): “the self-will of man [is], for the narrator, . . . not ancient story but an ever pres­ent reality.”
		2. Charles Sommer (*The Sin in the Garden*: *The Narrative of Genesis 3*. Washington DC: Catholic University of America, 2004. Master’s thesis): “the story requires a mythic rather than a historical interpretation. Since it is myth, the sin committed by the man and the woman is one that functions as a type for sin in general, as opposed to describing a specific event occurring at a specific time in the past. . . . While the text does not preserve an “original event,” . . . it provides a clue to the reason why all individuals require the salvation offered by Christ.”
		3. Ratzinger (*In the Beginning* 82-83): when “. . . Scripture portrays Adam’s temptation [it has in mind] the nature of temptation and sin in every age.”
4. **after scripture**
	1. “Irenaeus, Clement and Athanasius likewise referred to the Fall in allegorical terms.” (Lack 34)
	2. “At the end of the fifteenth century, Dean Colet, one of the early reformers in England, regarded Genesis as [34] a poetic fiction conveying essential truths.” (Lack 34-35)
	3. Sir Thomas Browne (*Religio Medici*. 1643. Part 1 section 45): “unspeakable mysteries in the Scriptures are often delivered in a vulgar and illustrative way; and being written unto man, are delivered, not as they truly are, but as they may be understood.’” (Lack 35)
	4. Henri Rondet
		1. Rondet, Henri. *Original Sin*: *The Patristic and Theological Background*. Trans. Cajetan Finegan. Staten Island: Alba House, 1972.
		2. Many of our hardships are natural. The “wounds” of original sin (“ignorance, concupiscence, . . . suffering and death”) are from our body/soul composition. (Rondet 261)
		3. But “these afflictions do not seem to be explained sufficiently by” our body/soul composition. “Why should [little children] suffer thus? . . . These hardships can result either from “an original fault [or] a multitude of sins.” (Rondet 261)
		4. “But the doctrine of original sin immediately calls for a fundamental distinction [between] the ‘originating’ sin and the ‘originated’ sin that is proper to each of us and is transmitted by generation.” (Rondet 262)
		5. “Original sin [*in us*] is formally “privation of divine life [262] . . . A privation “implies much more than a mere absence, of divine life. . . . “The [un]baptized infant should belong to Christ, should be a member of Christ’s body, but in fact at its entry into this world it is separated from it . . .” (Rondet 262-63)
			1. “. . . some theologians see the essence of original sin in the privation of habitual grace . . .” (Rondet 263)
			2. “. . . others locate it immediately in the privation of original justice with the concomitant privation of grace.” (Rondet 263)
		6. three stages of the divine plan
			1. “. . . the basic question is the relationship between Christ . . . [and] the first man, this first Adam who is at the source of the misfortunes of the whole race.” (Rondet 249)
			2. God’s “first” perception
				1. “From all eternity, God sees all men in his well-loved Son, leader of a mystical body whose head, purpose and reason for existence he [Christ] is.” (Rondet 263)
				2. The “solidarity that unites all men of all time in Christ the saviour” is “prior in nature, not in time,” to our solidarity in Adam. (Rondet 263)
				3. “. . . the perfect man . . . will be God himself, clad in human flesh, animated by an intelligent and free soul. It is this Man-God who [is the first object of God’s] vision, before the works that are chronologically the most ancient, before the heavens and the earth are created . . . He sees him too as head of an immense family, of an innumerable company, as the image of the invisible God logically preceding all created things, all the heavenly powers (Col 1:15-16]. From all eternity too God contemplates in the succession of the millennia the unfolding of the history of this humanity gathered together about his Son, true God and true man. It is this eternal idea that will be realized in time.” (Rondet 264)
			3. God’s “second” perception
				1. “But he also sees them to be sinners, as the result at once of a personal and a collective sin which constitutes the sin of Adam.” (Rondet 263)
				2. God “envisages man not yet under the influence of grace but left to a nature which is supposed to be orientated towards Christ, the one principle of unity.” (Rondet 272)

Yet according to the Church “man deprived of grace cannot [271] long avoid sin.” (Rondet, *Essais sur la théologie de la péché* 44-45.) (Rondet 721-72)

* + - * 1. In this second “moment,” “Mankind as a whole . . . appears in the sight of God as separated by sin from this Christ [263] whose role will be to make it one with him.” (Rondet 263-64)
				2. In this second “moment,” God sees mankind “made one in sin.” (Rondet 265)
				3. “. . . a world untouched by the redemption [is what] the second dialectical moment envisages . . .” (Rondet 272)
			1. God’s “third” perception
				1. “A third moment of reflection brings us to the redemption. God now looks from all eternity at a saved mankind [264] . . . To the declaration that all are sinners (Rom 3:23), “the Apostle adds, ‘God has consigned all men to disobedience that he may have mercy upon all’ (Rom 11:32; Gal 3:22).” (Rondet 264-65)
		1. “. . . it is not forbidden to follow a less rigid tradition than that which has prevailed for some centuries . . .” (Rondet 270)
			1. Pontifical Biblical Commission (30 June 1909, D § 2124): as long as one is “without prejudice to the Church’s judgment and keeping within the analogy of faith,” “it [is] possible . . . to follow and defend the opinion that each one, after mature consideration, believes should be adopted . . .” (Qtd. in Rondet 227)
		2. “The hypothesis that we propose can claim to follow St. Anselm and Odo of Cambrai . . .” (Rondet 271)
		3. conclusion: Original sin (*peccatum originans*) is personal sins.
			1. “Original sin in us has as its cause an actual, but collective, sin, formed by [270] the sum of the personal sins of men of all times.” (Rondet 270-71)
			2. “. . . human nature is that which is common to members of the human species. This nature that they possess is a sinful one, turned away from its end, turned away from God, as a result, not of personal sin, but of an innumerable multitude of personal sins constituting a collective sin, the sin of the world, the sin of Adam.” (Rondet 266)
			3. Adam “is legion; he is mankind; he is man insofar as he is still a stranger to grace and in need of a saviour . . .” (Rondet 266)
			4. “All this suggests that we should not found upon an Adam of overly precise historicity that which ultimately must be founded on Christ; that we not take as a fundament of faith something that is merely one statement [276] within a body of truths based primarily on our solidarity with Christ the saviour.” (Rondet 276-77)
			5. “In order to speak of original sin in us, to . . . treat of work, suffering and death, it is perhaps not necessary to have precise details on Adam and his sin.” (Rondet 277)
1. **Gen 3 does not describe a fall**.
	1. Bruce Vawter, CM (*A Path Through Genesis* [1954, new ed. 1973] 79): Gen 2-3 do not describe “a fall in the sense that man after has become anything else than man was before. . . . it is man’s nature to be prone to wrongdoing (cf. Genesis 8:21, J). . . . no explanation is given for this undoubted fact of life, either by the Yahwist or by the Priestly author.”
	2. Bruce Vawter, CM (*A Path Through Genesis* [1954, new ed. 1973] 79): “The doctrine affirms that man is born into a sinful world and into a sinful race, and that from both of these he stands in need of re­demp­tion.”

## Extreme Left AttemptS at Reconciliation

1. **Pierre Teilhard de Chardin**, **SJ**
	1. Omega Point
	2. International Theological Commission (*Communion and Stewardship* [2004] § 24): “Without denying the gift of man’s original creation in the image of God, theologians want to acknowledge the truth that, in the light of human history and the evolution of human culture, the *imago Dei* can in a real sense be said to be still in the process of becoming.”
2. **far left**: **process theology**
	1. Whiteheadean process theology
		1. Alfred North Whitehead’s philosophy; Charles Hartshorne’s theology
			1. Jewish process theology: Kushner, Harold. *When Bad Things Happen to Good People*. New York: Doubleday—Anchor, 2004
		2. God is not omnipotent.
			1. God is persuasive, not coercive. (Hartshorne, Charles. *Omnipotence and Other Theological Mistakes*. Albany: State U of New York, 1984.)
			2. universal free will: free will “characterizes everything in the universe, not just human beings. God cannot totally control any series of events or any individual . . .” (“Process Theology”)
		3. God is not immutable.
			1. “Because God interacts with the changing universe, God is changeable: God is affected by actions that take place in the universe.” (“Process Theology”)
			2. “But God’s goodness, wisdom, etc. remain eternally solid.” (“Process Theology”)
		4. Catholic: Jerry D. Korsmeyer (*Evolution and Eden* 84): “The painfully slow evolution of life, spreading in great diversity into all available niches, trying out all possible avenues of advance, the huge role of chance, the stumbling advances to greater complexity, all these things suggest a divine nature at odds with the omnipotent God of classical theism. . . . It is as though divinity labored to persuade, to lure creatures forward . . . [Evolution’s characteristics] suggest shared power, and free determination by creatures . . . The idea of creation by persuasion, surprisingly, suggests a Creator much closer to the biblical God of love than that of classical theism.”
		5. God is not Jesus.
			1. “God is incarnate in the lives of all humans when they act according to a call from God. Jesus fully and in every way responded to the call of God.”

## Second Problem: Evolution’s Associations with Atheism

1. **Tennyson** (**1849**): “**Nature**, **red in tooth and claw**”
	1. Alfred Lord Tennyson (1809-92) “expressed the difficulties evolution raised for faith . . .” (“In Memoriam”)
	2. *In Memoriam A*.*H*.*H*. (1849), Cantos 55 and 56

“Are God and Nature then at strife,

That Nature lends such evil dreams?

So careful of the type she seems,

So careless of the single life . . .”

“[Man] trusted God was love indeed

And love Creation’s final law . . .

Though Nature, red in tooth and claw

With raving, shrieked against his creed . . .”

1. “**eat or be eaten**”: **nature**’**s savagery**
	1. It is “hard for some Christians to reconcile natural selection with the God of mercy, or for some secular humanists to reconcile man’s evolution by natural selection with morality or beauty . . .” (Lack 114)
	2. “There are things evident in the evolved universe that one strains to find consistent with belief in a loving God. Consider over a hundred million years of dinosaurs, half of which savagely hunted and ate the others. To what end? Was God pleased in some way with this spectacle? What about insects that have evolved to be parasites living within and destroying other life? Anyone who has watched the wonderful nature shows put on television by *National Geographic* has been startled, or perhaps horrified, by the seemingly endless array of barbarous predatory life living on our planet. Such things bewilder the believer trying to relate them to the Christian God of love. Is the God of nature a being of awful and savage indifference, totally inscrutable in divine purpose and enjoyment? Does the existence of nature negate belief in the God we call our Father? Some people think so. Are these things we have been discussing reasonably the products of a God who can do anything? Perhaps our ideas about the divine nature and activity are too simplistic and historically conditioned.” (Korsmeyer 85)
2. “**the fear that evolution proceeds blindly**, **and not in accordance with a divine plan**” (Lack 67)
	1. Some anti-evolutionists “identify evolution with atheism, chance and disharmony.” (Nogar 386)
	2. *chance*: Darwinism means that evolution is . . . random . . .” (Lack 67)
		1. C.E. Smethurst (*Modern Science and Christian Beliefs*, 1955, 118): neo-Darwinians “attribute the results of the evolutionary process entirely to the blind and fortuitous working of natural selection upon variations produced by mechanistic forces.” (Qtd. in Lack 64)
		2. “. . . mutations are random in relation to the needs of the animal, but natural selection is not. Selection, as the word implies, is the reverse of chance.” (Lack 65)
		3. “The fear that the course of evolution has been entirely ‘fortuitous’ or ‘random’ is due to a misunderstanding, since evolution has proceeded in accordance with natural laws.” (Lack 113)
			1. “On a short-term view, the rigour of natural selection is best shown by the relatively uniform appearance of each individual of the same kind of animal, despite the repeated disadvantageous mutations that arise, and also by the speed with which an occasional favourable mutation spreads.” (Lack 65)
			2. “On a long-term view, the best evidence that evolution is not random is provided by convergent adaptation . . .” (Lack 65)
	3. *determinism*: “Darwinism means that evolution is rigidly determined . . .” (Lack 67)
		1. 1887: T.H. Huxley upheld strict determinism: from the gas cloud that, 4.5 billion years ago, became the solar system, “a sufficient intelligence could . . . have predicted, say the state of the British fauna in 1869 . . .” (Qtd. in Lack 66)
		2. 1950: Gaylord Simpson disagreed: “The peculiarity of [evolution] consists in its being historical and not mechanistic and in its permitting multiple solutions and not only a unique outcome.” (Lack 67)
	4. To Christians “the apparent waste and cruelty of natural selection have seemed incompatible with the God of mercy and love.” (Lack 74)
3. **John Paul II**: ***theories* of evolution**
	* 1. John Paul II (*Truth Cannot Contradict Truth* § 4): “we should speak of several theories of evolution [depending upon] the various philosophies on which it is based. Hence the existence of materialist . . . and spiritualist interpretations.”
		2. John Paul II (*Truth Cannot Contradict Truth* § 5): “The Church’s magisterium is directly concerned with the question of evolution, for it involves the conception of man: Revelation teaches us that he was created in the image and likeness of God (cf. Gn 1:27-29). . . . the human individual cannot be subordinated as a pure means or a pure instrument, either to the species or to society; he has value *per se*. He is a person. . . . Consequently, theories of evolution which, in accordance with the philosophies inspiring them, consider the spirit as emerging from the forces of living matter or as a mere *epiphenomenon* of this matter, are incompatible with the truth about man. Nor are they able to ground the dignity of the person.”
4. **reconciling evolution and providence**
	1. International Theological Commission (*Communion and Stewardship* [2004] § 69): “Many neo-Darwinian scientists . . . have concluded that . . . evolution is a radically contingent materialistic process driven by natural selection and random genetic variation . . . [So there is] no place in it for divine providential causality.”
	2. International Theological Commission (*Communion and Stewardship* [2004] § 69): “contingency in the created order is not incompatible with a purposeful divine providence.”
		1. Aquinas (*ST* 1.22.4 ad 1): “The effect of divine providence is not only that things should happen somehow, but that they should happen either by necessity or by contingency. Therefore, whatsoever divine providence ordains to happen infallibly and of necessity happens infallibly and of necessity; and that happens from contingency, which the divine providence conceives to happen from contingency.” (Qtd. in International Theological Commission, *Communion and Stewardship* [2004] § 69)
		2. International Theological Commission (*Communion and Stewardship* [2004] § 69): “Divine causality [is] active in a process that is *both* contingent and guided. Any evolutionary mechanism that is contingent can only be contingent because God made it so.”
		3. International Theological Commission (*Communion and Stewardship* [2004] § 69): “An unguided evolutionary process—one that falls outside the bounds of divine providence—simply cannot exist because [Aquinas, *ST* 1.22.2:] “the causality of God, Who is the first agent, extends to all being . . . It necessarily follows that all things, inasmuch as they participate in existence, must likewise be subject to divine providence.””
		4. International Theological Commission (*Communion and Stewardship* [2004] § 69): “Thus, even the outcome of a truly contingent natural process can nonetheless fall within God’s providential plan for creation.”
	3. International Theological Commission (*Communion and Stewardship* [2004] § 69): “neo-Darwinians who [assert that] evolution is absolutely unguided are straying beyond what can be demonstrated by science.”

## Conclusions

1. **Josef Ratzinger** (*In the Beginning* [1986] 37-38): “Physics and biology, and the natural sciences in general, have given us a new and unheard-of creation account with vast new images which let us recognize the face of the Creator and which make us realize once again that at the very beginning and foundation of all being there is a creating Intelligence. The universe [37] . . . comes from intelligence, freedom, and from the beauty that is identical with love. Seeing this gives us the courage to keep on living, and it empowers us, comforted thereby, to take upon ourselves the adventure of life.”
2. **International Theological Commission** (*Communion and Stewardship* § 66): God “calls out of nothingness those to whom He then calls out in love.”
3. **Pius XII**, ***Divino afflante Spiritu*** (1943, qtd. in Jean Levie, *The Bible*, *Word of God in Words of Men* [1958] 184)
	1. “It is to be hoped therefore that those difficulties which now appear to be most complicated and arduous will also, with persevering efforts, at some time find complete elucidation.”
	2. “It should not be forgotten that with the branches of human knowledge it is very much as it is with nature: the growth of undertakings ~~is gradual~~ [takes time] . . .”

dialogue

1. Too often scientist and theologian “regard the other’s pursuits in an unprofessional manner. Confusion, unnecessary harshness, and even grave misunderstandings are caused by theologians who refuse to acquaint themselves with the great achievements of prehistory. The same state is generated by evolutionists who regard as unintelligent and benighted the concern of Christian theologians . . .” (Nogar 384)
2. “. . . the only rule of success[ful dialogue is]: *let neither science nor theology assert something to be known to be a fact when it is not so known*. . . . caution and courtesy fore­stall needless rhetorical excesses and make for ultimate concord in the question of origins.” (Nogar 370)

# Appendices

GEOLOGIC TIMESCALE 2018

“b” is billion (years bce), “m” is million, “t” is thousand.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| date | eon | era | period | epoch | events |
| 11.7t | Phanerozoic (542m) | Cenozoic(65.5m) | Quaternary(total: 2.598m) | Holocene (10t) |  |
| 2.58m | Pleistocene (2.59m) | 300t: anatomically modern humans |
| 5.333m | Neogene(21.2m) | Pliocene (3.5m) |  |
| 23.03m | Miocene (17.7m) | 7m: earliest hominin (human-ancestral) fossils (*Sahelanthropus*)20m: grasses are widespread |
| 33.9m | Paleogene(43.5m) | Oligocene (10.9m) |  |
| 56m | Eocene (21.9m) | 50m: earliest primate fossils50m: bats50m: some mammals return to sea and become whales50m: atmospheric CO2 declines, which favors grasses |
| 66m | Paleocene (9.7m) | 65m: dinosaur extinction |
| 145m | Mesozoic(185.5m) | Cretaceous(80m) |  | 70m: earliest traces of grasses136m: earliest flowering-plant fossils |
| 201.3m | Jurassic(56.1m) | 150m: earliest birds150m: earliest extant mammals200m: earliest mammals |
| 251.9m | Triassic(49.4m) | 230m: earliest dinosaurs250m: earliest flies251m: end-Permian extinction (90% of species, e.g., trilobites) |
| 298.9m | Paleozoic(291m) | Permian(48m) | 280m: synapsids dominate on land |
| 358.9m | Carboniferous (60m) | 320m: synapsids (reptile-like pre-mammals) |
| 419.2m | Devonian(57m) | 370m: earliest tetrapod fossilby 380m: large vertebrate predators390m: earliest vertebrate tracks on land400m: earliest fungus fossil; earliest insect fossil |
| 443.8m | Silurian(28m) | 428m: earliest land-animal fossil (millipede) |
| 485.4m | Ordovician(44m) | 475m: earliest plant-spore fossils480m: earliest invertebrate tracks on land |
| 541m | Cambrian(54m) | 515m: earliest chordate fossils541m: Cambrian explosion (e.g., trilobites) |
| 635m | Precambri­an (super­eon)(4.06b) | Pro­tero-zoic(1.96b) | Neoproterozoic | Ediacaran |  | 575m: Ediacaran fauna585m: burrowing animals |
| 720m | Cryo-genian | 650m: first animals: sponges |
| 1b | Tonian | 750m: green algae |
| 1.6b | Mesoproterozoic |  | 1.2b: red algae1.6b: multicellular eukaryote (some form of algae) oceans have low oxygen and high sulphur |
| 2.5b | Paleoproterozoic |  | 1.8b: earliest fossils of (unicellular) eukaryotes2.1b: multicellular disks (bacteria? archaea? eukarya?)2.45-32b: atmospheric oxygen appears and builds |
| 4b | Archean (1.35b) |  |  |  | 2.6b: land prokaryotes (microbial mats on land)2.6b: cyanobacteria3.45b: bacteria create stromatolites by coasts (microbial mats)3.5b: first archaea (Euryarchaeota)3.5b: oldest fossils of prokaryote cells3.7b: traces of photosynthetic bacteria |
| 4.6b | Hadean (.65b) |  |  |  | 4.1-3.8b: late heavy bombardment4.1b: trace of biogenic carbon in a zircon (mineral grain)\*4.4b: Moon formsby 4.4b: oceans4.404b: oldest rocks (Jack Hills, Australia)4.568b: Solar System forms, including Sun and Earth |

“Date” through “Epoch” columns: International Commission on Stratigraphy. “International Chronostratigraphic Chart.” *Stratigraphy*.*org* (Feb. 2017). 26 July 2017. Web. <http://­www.stratigraphy.org/ICSchart/ChronostratChart2017-02.jpg>.

“Events” column: Zimmer, Carl, and Douglas J. Emlen. *Evolution*: *Making Sense of Life*. 2nd ed. New York: Macmillan Higher Eucation—Freeman, 2016.

\* “Events” column, “trace of biogenic carbon”: Bell, Elizabeth A., et al. “Potentially Biogenic Carbon Preserved in a 4.1 Billion-year-old Zircon.” *Proceedings of the National Academy of Sciences* 112 (19 Oct. 2015) 14518-21.

See also for “Events” column:

Judson, Olivia P. “The Energy Expansions of Evolution.” *Nature Ecology and Evolution* 1.6 (28 Apr. 2017). 20 May 2017. Web.

Urry, Lisa A., Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, and Jane B. Reece. *Campbell Biology*. 11th ed. Hoboken: Pearson Higher Education, 2016.

## Classification of Primates

2009

In the primate order (c. 200 species), there are 2 suborders, which split c. 78 million years ago.

*strepsirrhines* (“curly-nosed,” lemurs, lorises) (c. 40 species)

*haplorrhines* (“dry-nosed,” tarsiers, monkeys, apes, humans)

 *Old World monkeys* (catarrhines [prominent muzzles, nostrils face downwards])

arboreal monkeys (c. 70 species)

terrestrial monkeys (c. 15 species): baboons, macaques

 *New World monkeys* (platyrrhines [nostril holes at sides of a low nose bump]) (c. 65 species)

*apes and humans*. There are 3 families:

gibbons (5 species) and siamang (1 species) (Asia) (arboreal)

great apes

orangutan (Asia) (1 species, 2 subspecies: Borneo, Sumatra) (arboreal)

gorilla (Africa) (1 species, 3 subspecies: western lowland, mountain, eastern lowland) (terrestrial)

chimpanzee (Africa) (2 species: common, bonobo [pygmy]) (arboreal and terrestrial)

humans (1 species) (terrestrial)

## Evolution of Apes and Humans

|  |
| --- |
|  |
| pre-34 million |
|  |  |  |
| Old World monkeys |  | New World monkeys |
|  |  |
| 17 million (+/–2 m.) |
|  orangutans |  |
|  7.5 million (+/–1) |
| gorillas |
|  |  |
|  5.5 million (+/–1) |  *Australopithecus* (5 m.; to 1.5 million) *Homo habilis* (2.5-1.5 million) *Homo erectus* (1 million-300,000) |
|  chimpanzees |
|  |
|  |  |  |
|  *Homo sapiens* *Archaic Homo sapiens* *Neanderthalensis* (200,000-100,000) |
|  (250,000-35,000) |  |
|  humans (*Homo sapiens sapiens*) (100,000-present) |

## Criticisms of the Theory of Evolution (Blatty)

Blatty, William Peter. *Legion.* New York: Simon and Schuster, 1983. 92-94.

 “. . . evolution. They keep saying that it’s chance, all chance, and that it’s simple. Billions of fish kept flopping up on the shore, and then one day a smart one looks around and says, ‘Wonderful. Miami Beach. . . . I’ll stick around here and breathe.’ . . .

 “You want it better? Scientific? . . . He just takes a little breath, a little whiff, a little tryout, then he’s back in the ocean in Intensive Care and playing his banjo and singing songs about his jolly times on land. He keeps doing this, and maybe he can breathe a little longer. . . . when he dies he leaves a will saying how his little children should try breathing on the land, and he signs it, ‘Do this for your father. Love, Bernie.’ And they do it. And on and [92] on it goes, maybe hundreds of millions of years they keep try­ing, each generation getting better and better because all of this practice is getting in their genes. And then finally one of them, skinny, with glasses, always reading, never playing in the gym with the boys, he breathes the air and keeps on breathing, and soon he’s doing Nautilus three times a week . . . Of course, needless to say, all his children have no trouble breathing air all the time, their only problem is walking and maybe throwing up. And that’s the story from the scientists . . . this theory about the fish, it has one little problem—God forbid this should deter them even though this problem makes the whole thing impossible . . . Every fish starts all over again from the beginning, and from only one lifetime nothing changes in the genes. . . .

 “Here’s the story on reptiles, however. Think this over. They come up on dry land and they lay their eggs. So far it’s a breeze, is that right? A piece of cake. But the little baby reptile in the egg needs water, or it dries up in the egg and never gets to be born. On top of that, it needs food—a whole lot, in fact—because it hatches as a grown-up, a great big person. In the meantime, don’t worry. You need it? You’ve got it. Because now inside the egg a lot of egg yolk appears and says, ‘I’m here.’ This is the food. And the white of the egg is making do as the water. But the egg white needs a whole special casing around it, or the whole thing evaporates and says to you, ‘I’m leaving.’ So a shell made of leathery stuff comes along, and the reptile is smiling. Too soon. It’s not so easy. Because of this shell, now the embryo cannot get rid of its waste. So we need now a bladder. Is this making you nauseous a little? I’ll hurry. Also, there is needed now some kind of *draydle*, [93] some tool the little embryo uses to get out of its hard, tough shell. There’s even more, but that’s enough, now, I’ll stop, it’s sufficient. Because . . . all these changes in the egg of the reptile have to happen all at once! Are you hearing? *All at once*! If even *one* of them is missing, it’s all over . . . You cannot have the egg yolk come along and then keep it on hold another million years until the casing or the bladder comes along jaunty jolly saying, ‘Sorry I’m late, the rabbi talked too long.’ You get the answering service. Every change would be *derhangenet* right on the spot before the other one ever got to make its appearance. . . .

 “But how could this pos­sibly come to be? All the changes in the embryo happened all at once by incredible coincidence? This notion only morons would embrace, I guarantee you.” [94]

## Criticisms of the Theory of Evolution (Hawkes)

Hawkes, Jacquetta. *Man on Earth*. New York: Random House, 1954.

“Is it possible today for any . . . intelligent person to believe in the orthodox view of the workings of evolution . . . by natural selection alone?” (Hawkes 16)

1. “First of all, one form of selection would so often seem to oppose another: sexual selection, say, working against protection from enemies. It is easy, for instance, to picture a million generations of lizards with snakes and other enemies always inclined to spare the individuals which had a larger horny carapace, and so gradually giving rise to the closed shop of the fully evolved tortoise. On the other hand would not the survival value of the shell be more than offset by the difficult and dangerous mating habits which it made inevitable?” (Hawkes 20)
2. “Then there is the question of how characters were evolved which were entirely useless until their evolution was complete. The woodpecker’s stout bill and neck enable it to nest in comparative safety in the chamber it can carve in a branch, but what happened when the hammer head was only stout enough to begin a small and quite unpractical boring?” (Hawkes 20)

“There is the recognized problem of evolutionary trends once started going too far and leading headlong to extinction, as with the dinosaurs and ammonites . . .” (Hawkes 20)

1. “. . . there is the perfectionism, the attention to detail far in excess of what could be biologically effective—can the mark simulating a hole eaten by a grub on the wings of leaf-butterfiles conceivably have been valuable enough as a protection to get itself established? Surely the perfect imitation of [20] shape, stem, veins and colouring were already disguise enough?” (Hawkes 20-21)
2. “Then again there is the problem of the extraordinarily various results of similar conditions of selection. Once in a Mexican forest [I saw] a humming-bird; . . . the plumage seemed to throw off sparks of emerald and gold. . . . other species of humming-bird living there . . . might be crimson and blue or . . . purple instead of this emerald and gold, might possess crests, wing and tail pennons . . .” (Hawkes 21)
3. “. . . biologists have replies of a kind to most of these arguments, but for me they are refuted . . . when I think of the number of most peculiar chances intervening between the ancestral tree-shrew and William Shakespeare.” (Hawkes 22)

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