

The Rational Credibility of a Literal Adam and Eve¹

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Does God's direct creation of Adam definitively answer the timeless question posed by Joseph Cardinal Ratzinger, prior to his illustrious reign as Pope Benedict XVI: "Is there something proper to human beings that ultimately can be explained only in theological terms? Or in the cold light of day, must humankind be relegated to the domain of the natural sciences?"²

To settle this pivotal issue, I need to examine the theological doctrines and implications of Genesis, present a coherent philosophical interpretation of the matter, and test the scientific credibility of a literal Adam and Eve –especially in light of recent claims by some geneticists who deny the very possibility of a single pair of first human parents from whom all true humans descend. Indeed, to avoid the objections of these scientists, the hypothesis now arises that there might have been substantial interbreeding between the first true humans and subhuman primates– in order to account for current genetic diversity. This controversial concept will also be explored herein.

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¹ Edited by Mary Helen Klinge-Drucker. While I am indebted to Dr. Ann Gauger, Senior Research Scientist at the Biologic Institute, for her extensive discussions with me on current genetic research into our origins, all views expressed are my own. The present article represents a very detailed and comprehensive analysis of its topic, with extensive documentation and sources. Still, I want to acknowledge that the central theme and some of its sources are also to be found in a short chapter entitled, "The Myth of the 'Myth' of Adam and Eve", which appears in the volume, *Sztuka i realizm [Art and Reality]* that was published in Poland in 2014 by Polskie Towarzystwo Tomasza z Akwinu.

² J. RATZINGER, 'In the Beginning...': *A Catholic Understanding of the Story of Creation and the Fall*, 80.

Divine revelation and historical evidence clearly affirm that God directly intervenes in the world as evinced by the miracles that permeate both Old and New Testaments—even to present day wonders— such as Lourdes and Fatima. Salient among divine interventions was the creation of the first true human being, the first fleshly creature possessing a spiritual and immortal soul—the founder of our race— Adam. His instant appearance suddenly introduced to Earth a superior order of existence. Adam’s intellect breached sensation’s limits to penetrate his fellow creatures’ intelligible inner natures. Scripture celebrates in imagery this new ability to “name” every “living creature” (Gen 2:19). For the first time, a genuine *person* walked the earth—a reflectively-conscious, rational being— possessing an eternal destiny, freely to be decided. Corporeal, yes, but a being whose spiritual form renders natural his dominion over physical creation (Gen 1:28): Adam radically transcended all that preceded him.

And yet, with Adam appeared the first earthly creature capable of the tragedy of sin. Through a single rebellious act, mankind plunged forever into the struggle between moral good and evil: the domain of ethics becomes central to God’s created world.

Foundational to Christian belief is the literal reality of Adam and Eve, and of Original Sin. The Genesis promise of a Redeemer makes sense solely in terms of an actual individual Adam having committed an actual Original Sin that requires redemption for him and his descendants (Gen 3:15). However literally or figuratively one may read Genesis itself, central to St. Paul’s directly inspired teaching is that Original Sin was the act of “one man”, Adam, by whom sin and death entered into this world and passed upon all men (Rom 5:12-21). While this paper uses primarily Catholic sources, historically most Christians have shared belief in our first parents’ literal reality.

Today, many educated people reject a literal Adam and Eve, based upon claims by some population geneticists that the entire human race could not have descended from a single pair of mating human beings. Those espousing “creation science” avoid this problem by insisting that God instantly and literally created Adam from “the slime of the earth” and Eve from “the rib which he took from Adam” (Gen 2:7, 21-23). Still others suggest that there is empirical evidence of God’s creative action within the natural world either through secondary causes or by direct intervention at certain points in its development, such as when Adam and Eve appeared.

Rather than debate which approach reflects good science, I propose herein to examine whether it is reasonable to believe in the biblical Adam and Eve as ancestors of all true human beings, even in light of recent scientific studies. I am not espousing Darwinian naturalism. Instead, I propose a Christian philosophical perspective, which recognizes that God created all finite things, including the laws of chemistry and physics which sustain any process of biological evolution. The question is whether what we know from sound science can rationally comport with belief in a literal Adam and Eve.

Many others have sought to address this same question, but the complexity of the task is daunting. It is like a simultaneous equation with three variables: theological, philosophical, and scientific. Getting one, or even two, of the factors right does not assure that all three will “fit”. If even one element is wrong, no genuine solution has been achieved. As we shall see, “solutions” that permit theological polygenism, or that fail to recognize the exceptional nature of the first true man, or that find a single mating couple too early in the paleoanthropological record to fit the biblical Adam, simply will not work. All three aspects –theological, philosophical, and scientific– must correlate realistically into a synthetic solution, which incorporates proper definitions from each appropriate discipline, and which shows how each element properly fits with the other two. I will begin with the theological aspect.

I. Theological doctrine and implications

Pius XII’s 1950 encyclical *Humani Generis* teaches that “revealed truth and... the *magisterium* of the Church teach” that Original Sin is “a sin truly committed by one Adam [*ab uno Adamo*], and which is transmitted to all by generation, and exists in each one as his own.”³ This teaching affirms two essential elements: (1) there actually was an individual human being, Adam, who committed Original Sin, and (2) each and every human being is an actual descendant of this first parent. Since Adam transmitted Original Sin by the natural act of generation, he must have done so with his spouse, Eve. Thus, the Catholic Church has traditionally taught that

³ *Humani Generis*, n. 37 in *The Companion to the Catechism of the Catholic Church, A Compendium of Texts Referred to in the Catechism of the Catholic Church*, 113.

a literal set of first parents, male and female, Adam and Eve, is a divinely revealed doctrine.

Humani Generis' same text teaches that Catholics are not free to embrace theological polygenism, which means that not all humans are descended from the *same* first parents, since "it is by no means apparent how such an opinion can be reconciled with" the doctrine of Original Sin.⁴ Clearly, Pius XII was aware of the complexity of the relationship between polygenism and the implications of Original Sin—and thus spoke about it in a more nuanced manner than he did in his earlier comments about the freedom of theological and scientific speculation regarding evolutionary theory and human bodily origins.⁵ I suggest that theological monogenism, which maintains that Adam and Eve are progenitors of the entire human race, is actually an "indirect dogma" that is, a teaching that flows logically from the essential elements of the dogma of Original Sin, and has importance for all Christians who affirm the necessity of Redemption. Indeed, some theologians view polygenism's rejection as "*sententia proxima fidei*," since it appears entailed in the Council of Trent's teaching about Original Sin's transmission.⁶

The *Catechism of the Catholic Church* affirms that the fall of Adam and Eve was "a primeval event, a deed that took place *at the beginning of the history of man*", a revealed truth known with "the certainty of faith."⁷ The burden of proof should therefore remain upon those who would declare Adam and Eve could never have existed. The first true human being would be completely human, that is, a fully rational animal, essentially superior to all previous animals. Christian theology maintains that true man possesses a spiritual soul, making him radically superior even to the anatomically-closest subhuman primate. Christian philosophy demonstrates the spirituality and immortality of the human intellectual soul, which again distinguishes man essentially from other animals.⁸ Subhuman primates, with advanced sentient powers, would remain separate in nature from true man. Man alone, among earthly creatures, would have spiritual powers of intellect and free will. Since a being must be either spiritual in nature—or

⁴ *Ibidem*.

⁵ *Ibidem*, n. 36, 107.

⁶ H. DENZINGER - P. HÜNERMANN, *Sacrae Theologiae Summa*. Vol. 2, Tractatus II, no. 545, 660.

⁷ *Catechism of the Catholic Church*, 390.

⁸ THOMAS AQUINAS, *Summa theologiae*, I, q. 75.

not—there is no possibility of gradual “development” of a spiritual soul. Man must have appeared instantly. And the first true man is Adam.

II. Analysis of scientific objections

When true human beings first appeared is not clear from the paleoanthropological record. Evidence of gradual changes in tool-making ability and other behaviors of primates over great spans of time seems to conflict with the sudden appearance of qualitatively superior human beings.⁹ Yet, such empirical data does not exclude Adam and Eve’s instant presence.

Christian philosophy tells us that, regardless of the exact process of material generation, the advent of the first true human being marks an essentially superior new step in life’s presence on earth, since it requires direct divine intervention to create man’s spiritual and immortal soul, whose essential properties entail intellective understanding, judging, and reasoning as well as free will.¹⁰

Still, spiritual faculties need not always be immediately evinced. We detect their presence through signs of intellective activity in the form of special types of tool making or art or culture. Absence of such signs need not mean the absence of intellect, since man sometimes engages in the same survival activities as irrational animals. In addition, physical evidence of intellective activity may be obliterated by the ravages of time. Paleontological evidence of gradual improvement in tool making or other activities over time does not prove that a radical line of demarcation between mere animals and true man is absent. At some point, unequivocal intellective signs make clear the presence of genuine human beings. Before that, merely complex sentient behaviors proper to irrational animals, including subhuman primates, are evident. Even though true man may have already been indiscernibly present, his actual first moment of existence would be difficult to determine.

A word about terminology is now necessary. According to the current theory of evolution, we are descended from a common ancestral population of primates that through a process of branching and divergence over time gave rise to orangutans, gorillas, chimpanzees and humans. The last branching to occur was between the lineages leading to modern humans

⁹ C. LORING BRACE, “Humans in Time and Space”, 245-282.

¹⁰ D. BONNETTE, *Origin of the Human Species*, 69-71, 103-110; See also THOMAS AQUINAS, *Summa theologiae*, I, q. 90, a. 2-3 and *Summa contra gentiles*, II, 21, 87.

and chimpanzees. The branch that led to modern humans went through additional branching and speciations; those species are collectively referred to as the hominin clade, and include several fossil genera and *Homo*. At present, the only living representative of the hominin clade is the biological species *Homo sapiens*. The lineage leading to modern chimpanzees (genus *Pan*) is called the panin clade.¹¹

Initially, it might appear that Adam and Eve could have been created at any time since the separation of the hominin and panin clades, now thought to have taken place at least seven million years ago.¹² Still, from what we know of the morphology and behavior of early hominins in that period, they do not appear to be good candidates. The first hominin population that might fit the criteria for true humanity appears somewhere around the early Middle Pleistocene period about three quarters of a million years ago. This hominin, *Homo erectus*, had, in this time frame, an arguably modern morphology and apparently could make congruent, three-dimensionally symmetrical stone hand axes, and may have been capable of the controlled use of fire.¹³ Such abilities evince essential intellectual attributes that would render their subjects fit for infusion of the human spiritual soul. As shown above, the first spiritual-souled hominin must be Adam. It must be granted, though, that if evidence of genuinely intellectual activities were manifest in yet earlier hominin populations, then the date of our first parents' appearance would have to be pushed back even further in time.

Because of the substantial disagreement among paleoanthropologists about which fossil hominins fall into the genus *Homo*, and which do not, and even which may be considered ancestral to the genus *Homo*, the fossil evidence does not provide the strongest challenge to the historicity of Adam and Eve. Rather, new attacks against Adam and Eve have arisen from speculations in molecular biology. Some leading geneticists claim that a bottleneck (severely reduced population) as small as a single mating pair cannot have occurred at any time during the seven million year period since

¹¹ B. WOOD, "Reconstructing human evolution; Achievements, challenges, and opportunities", 8902-8909.

¹² New studies suggest that previous estimates of four to six million years ago for this event should be revised to at least this earlier date. See "Our True Dawn: Pinning Down Human Origins", 34-37.

¹³ D. BONNETTE, *Origin of the Human Species*, XIV-XV, 163-167. See also T. WYNN, "Archeology and Cognitive Evolution", 389-438, especially 398; N. GOREN-INBAR et al., "Evidence of Hominin Control of Fire at Gesher Benot Ya'aqov, Israel", 725-727.

the hominin and panin groups diverged, thereby rendering the doctrine of a literal Adam and Eve mythical. Two major claims are made: (1) coalescence theory and studies of single nucleotide polymorphisms/linkage disequilibrium (SNP/LD) indicate that we arose from an hominin population of between two thousand and ten thousand, and (2) since the time of the *Homo/Pan* split, the number of alleles of ancient genetic markers exceeds that which could pass through a single mating pair.

According to the first claim, analyses of current human genetic diversity can be used to estimate the “effective population size” of populations over millions of years in the past. (“Effective population size” is a technical term depicting an idealized size of a breeding population.) Such estimates vary greatly, because of different methods used, ranging from as high as fourteen thousand to as low as two thousand.¹⁴ Some researchers infer that no hominin population has been smaller than one thousand individuals in the last two million years.¹⁵

What follows is drawn largely from a review of the current scientific literature.¹⁶ Estimates of effective population size are notoriously difficult to make because of the assumptions involved, such as “...a *constant background mutation rate* over time, *lack of selection* for genetic change on the DNA sequences being studied, *random breeding* among individuals, *no migrations* in or out of the breeding population, and a *constant population size*.”¹⁷ Scientists typically estimate these variables as best they can (note the wide range of values above for effective population size estimates), but the accuracy of their calculations depends on what assumptions they make, and the stability of these variables over time. In particular, any assumption about the regular behavior of the genes being studied may be unjustified. Processes like strong selection, hypermutation, and gene conversion can confound phylogenetic analysis.¹⁸ Because of these problems, some scientists have argued that DNA sequence differences (polymorphisms) alone are not enough to allow one to determine effective population size.¹⁹

¹⁴ M. G. B. BLUM - M. JAKOBSSON, “Deep Divergences of Human Gene Trees and Models of Human Origins”, 889-898; A. TENESA *et al.* “Recent human effective population size estimated from linkage disequilibrium”, 520-526.

¹⁵ J. HAWKS *et al.*, “Population Bottlenecks and Pleistocene Human Evolution”, 2-22.

¹⁶ A. GAUGER, “The Science of Adam and Eve”, 105-122.

¹⁷ *Ibidem*, 112.

¹⁸ *Ibidem*, 113.

¹⁹ P. SJÖDIN, I. KAJ, S. KRONE, M. LASCoux - M. NORDBORG, “On the Meaning

The second major claim against a literal Adam and Eve that I will consider is derived from studies of the highly polymorphic gene HLA-DRB1. The HLA-DRB1 gene is said to trace back perhaps some forty million years, well before the *Homo/Pan* split, and there are presently over six hundred such alleles in humans. That there were *so many* alleles was the basis of one of the first arguments that attempted to explicitly “disprove” Adam and Eve’s existence. I will focus on one of the most famous of these studies, one by geneticist Francisco J. Ayala published in 1995.²⁰ Ayala analyzed DNA sequences derived from this locus and argued, based on his analysis, that there must have been at least thirty-two HLA-DRB1 lineages at the time of the *Homo/Pan* split in order to account for current diversity.²¹ From this he inferred that “no fewer than 16 individuals could have lived at any given time” during or since the divergence of the hominin lineage.²² He further claimed that, because of population dynamics, the number of individuals needed to guarantee the continuation of thirty-two alleles would probably have been far greater.²³ Ayala maintained that “the long-term effective size of human ancestral populations ... must have been about 100,000 or more individuals” and that “the minimum possible number of individuals at a bottleneck is at least 4000.”²⁴ He held that a “bottleneck” of just two individuals could not have existed at the time of *Homo/Pan* split or at any time thereafter.²⁵

But estimates and inferences are only as good as the data and the assumptions that are used. In a study published in 1998, Tomas Bergström *et al.* examined a different portion of the same gene—one not susceptible to frequent mutations.²⁶ That later study concluded that only seven HLA-DRB1 lineages existed at the time of the *Homo/Pan* split.²⁷ Moreover,

and Existence of an Effective Population Size”, 1061–1070 ; J. HAWKS, “From Genes to Numbers: Effective Population Sizes in Human Evolution”, 9-30.

²⁰ F. J. AYALA, “The Myth of Eve: Molecular Biology and Human Origins”, 1930-1936.

²¹ *Ibidem.*

²² *Ibidem*, 1931; Ayala here estimates the split as occurring some six million years ago, but see footnote 11 above.

²³ *Ibidem.*

²⁴ F. J. AYALA, “Response to H.A. Erlich et al.: HLA sequence polymorphism and human origins”, 1554.

²⁵ F. J. AYALA, “The Myth of Eve: Molecular Biology and Human Origins”, 1931.

²⁶ T. BERGSTRÖM *et al.*, “Recent Origin of HLA-DRB1 Alleles and Implications for Human Evolution”, 237-242.

²⁷ *Ibidem*, 237-238.

Ayala's estimated effective population size of one-hundred thousand was replaced by an estimate of only ten thousand.²⁸

Still later, a 2007 study published by Jenny von Salomé of Bergström's group, using more complete sequence data, found that only four allelic lineages of HLA-DRB1 predate five million years ago, while a few more arose at or shortly after that time.²⁹ If only four lineages of HLA-DRB1 need to be passed on, just two mating hominins could do it: the timing of the appearance of the additional alleles, if close to five million years ago, appears problematic since that much genetic material could not pass through a single mating pair.

We have witnessed a remarkable devolution of the HLA-DRB1 story: Ayala's estimate of thirty-two ancestral alleles falls to just the seven inferred by Bergström, and then to only four that predate the *Homo/Pan* split, according to von Salomé. Having so dramatically reduced the number of alleles to be explained at the beginning of the hominin clade inherently reduces the number of alleles that must be explained at each and every point going forward in time. Indeed, the surprising fact is that most variants of HLA-DRB1 are less than five-hundred thousand years old, a time well after the appearance of the first representatives of the genus *Homo*.³⁰

We know little about the way the human genome actually works, even though it has now been completely sequenced. As a consequence, any estimates about numbers of lineages or times of divergence must be treated as provisional. Unknown selection effects, non-random mating, or variations in recombination or mutation rate may affect any estimate of the time of the most recent common ancestor of humans. Given this inherently tentative nature of such estimates and given the decisive downward trend in claims of the number of ancient alleles evident in the genetic studies examined above, it is reasonable to say that the "bottleneck objection" to Adam and Eve is not definitive.

The burden of proof rests upon those who make dogmatic claims that our first parents are impossible. Not *improbable*, but *impossible*. Any claim that two sole first parents are simply impossible is not the stuff of serious science, but of polemics, since it exceeds the inherent limitations of legiti-

²⁸ *Ibidem*, 241.

²⁹ J. VON SALOMÉ *et al.*, "Full-length sequence analysis of the HLA-DRB1 locus suggests a recent origin of alleles", 261–271.

³⁰ *Ibidem*.

mate natural science. In his book, *A Brief History of Time*, physicist Stephen Hawking insists: “Any physical theory is always provisional, in the sense that it is only a hypothesis: you can never prove it. No matter how many times the results of experiments agree with some theory, you can never be sure that the next time the result will not contradict the theory. On the other hand, you can disprove a theory by finding even a single observation that disagrees with the predictions of the theory.”³¹

Philosophy and logic affirm that what most conceive to be the essential method of natural science, inductive reasoning, cannot produce an universal conclusion with objective certitude. While once men thought all swans to be white, the finding of a black swan in Australia demonstrated the inherent limitation of that inductive inference. Inductive reasoning can licitly infer that something may be highly probable, but it can never apodictically assert that something is impossible.

Because of this limitation, methods of using inductive reasoning rely on a process of elimination wherein all alternatives are fully known and exhaustive. But exhaustive exclusion of possibilities is hardly applicable to natural events taking place deep in the recesses of the past, where no direct observations can be made, and where scientific evaluations may include unverifiable assumptions. Indeed, what some deem *impossible* from their perspective, others may deem *improbable*, but *possible*—in fact, *necessary*—given what many view as rational evidence supporting biblical teaching regarding a literal Adam and Eve, and the ease with which an omnipotent God can make the improbable become actual.

III. Explaining present genetic diversity through possible interbreeding

Christian philosophy demonstrates God’s existence, while Christian revelation mandates Adam and Eve’s existence. These facts make reasonable the conviction that a first mating pair of true humans exists.

The Bergström and von Salomé genetic studies argue against the necessity of a large hominin population size (ten thousand or more) at the time of their divergence from the panin group. Nonetheless, five to seven alleles appear to be at least five million years old, and still need to be accounted for. This appears to be too much genetic material to pass through a single

³¹ S. HAWKING, *A Brief History of Time*, 15-17.

mating pair. Given the uncertainties that affect these estimates, further research might demonstrate the possibility of a single first pair of true humans. However, present genetic studies have not yet demonstrated such a possibility. Still, these concerns can be addressed by a relatively simple additional approach to the “Adam and Eve problem,” one that scientific skeptics cannot deny—namely, interbreeding.

I need to consider the possibility of possibly-needed added genetic material coming from rare biological interbreeding—occurring after the Fall—between a few co-existing sub-human hominins and Adam and Eve’s genuinely human descendants. I also need to consider this matter because the interbreeding hypothesis has already entered peer-reviewed publication. Theologian Earl Muller, S.J., briefly mentions it in the 2009 *Supplement* to the *New Catholic Encyclopedia*.³² Philosopher Kenneth W. Kemp directly proposes it in the *American Catholic Philosophical Quarterly*.³³

Three points must be admitted in any such discussion: (1) interbreeding may appear possible in theory, but not be so in reality, (2) if interbreeding did occur, it might have been very rare for reasons I will elaborate later, and (3) given the constantly changing landscape of contemporary molecular biology, interbreeding may ultimately turn out to be entirely unnecessary in order to render rationally credible a single pair of biblical first parents.

In terms of an assumed evolutionary process, the first true human being would have appeared in what is actually a subhuman population. This first true human is Adam, whose spiritual soul was directly created by God. His body would have arisen using subhuman primate generative faculties, yet would be itself creatively transformed in its entirety because of its instantaneous activation by a God-created human spiritual soul. God’s exact method used to effect Adam and Eve’s origin in such a subhuman population is irrelevant to the present discussion. What matters is how to account for today’s genetic diversity, while (1) hypothetically assuming that the then existing genetic diversity could not have passed through Adam and Eve alone, and yet, (2) affirming that this first true human couple would still be the sole human progenitors of the entire human race.

If Adam and Eve’s descendants even *incidentally* interbred with subhumans, sufficient variation in genetic material would easily have been introduced into the human population, thus rendering moot the concern that

³² E. MULLER, S. J. “Evolution”, 322.

³³ K. W. KEMP, “Science, Theology, and Monogenesis”, 217-236.

Adam and Eve alone could not have provided the needed genetic diversity. While biologists may legitimately speculate as to how many such “unions” need to have occurred in order to enrich sufficiently the gene pool of early true man, it would be a serious error to presume that God directly intended such bestial acts, or that they were widespread. Certainly the later downward revised estimates by Bergström and von Salomé of the number of ancient HLA-DRB1 alleles compared to Ayala’s suggest the possibility of less interbreeding, not more, and even the possibility of none at all.

I need now to determine whether this additional approach to resolving the claims made by some molecular biologists against the possibility of a literal Adam and Eve is biologically, philosophically, and theologically reasonable.

Biologically, virtually no discernible differences might have existed between the first true human beings and the subhumans. Certainly, there is no way to prove that they would have been so genetically diverse initially as to preclude successful interbreeding.

Philosophically, no insurmountable obstacle to such interbreeding appears demonstrable. Biologists would adjudge all members of this primate population to be part of the same biological species. Still, in truth, two distinct philosophical natural species would be present: (1) subhuman primates, and (2) true humans with bodies that might be initially indistinguishable from subhuman primates. While the biological species concept is based upon accidental differences between organisms, such as morphology or reproductive isolation, the philosophical natural species concept is based on essential differences revealed by the presence or absence of natural powers or faculties.³⁴ Thus, true man would be in an essentially distinct and superior natural species as compared to subhuman primates. Subhuman primates, who lived at the time of Adam and Eve, would belong to the animal species possessing all sense faculties, but lacking intellectual powers. True human beings would have all such sense faculties, but also the spiritual faculties of intellect and will.

In keeping with an assumed evolutionary scenario, regardless of the biological species designation assigned to genuinely human descendants of the first true human beings, all such individuals would still belong to the same philosophical natural species. Thus, if Adam and Eve appeared sometime

³⁴ D. BONNETTE, *Origin of the Human Species*, third edition, 27-39. See also E. GILSON, *The Philosophy of St. Thomas Aquinas (Le Thomisme)*, 154; THOMAS AQUINAS, *Summa contra gentiles*, IV, 11.

around the early Middle Pleistocene period, all of their genuinely-human, spiritual-souled descendants, even if they are given such biological species designations as *Homo erectus*, *Homo Neanderthalensis*, or *Homo sapiens*, would still constitute but a single philosophical natural species: true man.

Given the biological virtual identity between the subhuman population and the first members of the genuinely human species, the possibility of rare successful procreative acts cannot be ruled out. Such acts could introduce enough genetic diversity to provide the data found by molecular biologists in modern human populations.

Still, speaking philosophically, what of the diversity of substantial forms (souls) between these two philosophical natural species? Would that not prevent procreation of genuinely human offspring? While God must provide the human soul needed to place the offspring of such sexual unions into the human species, one can reasonably argue that the superior human form of the genuinely human parent would, because of its essential superiority, actively determine matter's penultimate disposition toward that which comes to be through procreation.³⁵ While the infused soul alone determines matter's ultimate disposition, this most proximate potency of matter, determined by the genuinely human parent, could decide which form is properly apt to actuate the matter of the offspring.³⁶ Hence, in any sexual union of genetically virtually identical bodies, the organism produced could be expected to be informed by the superior substantial form — that which is possessed by the genuinely human parent. The offspring of such unions would arguably be true human beings, presuming, of course, God's cooperative creative act in providing the human soul — a cooperative act that He provides each time any human being is procreated.

Hence, no philosophical objection to an interbreeding solution appears evident.

Does Christian theology pose any inherent obstacles to this hypothesis? Certainly, sexual relations with subhumans would constitute a grave moral evil, a gross perversion of human nature. Such sporadic, illicit sexual relations would have taken place after the Fall, when sin entered the world

³⁵ THOMAS AQUINAS, *In duodecim libros metaphysicorum Aristotelis expositio*, VII, 2, 1278.

³⁶ A. M. WOODBURY, S.M., *Cosmology* (Sydney, N.S.W.: Aquinas Academy, unpublished manuscript, 1949), 68. See also D. BONNETTE, "The Philosophical Impossibility of Darwinian Naturalistic Evolution," 63-65.

through the Original Sin of the first human, Adam.³⁷ Random, isolated acts would suffice to account for the needed genetic diversity proposed by various research papers. Since God might permit, but would never intend, unnatural acts, suggestions that such bestiality occurred on a large scale — as if it were a central part of the divine plan for human origins — are entirely unwarranted.

In any case, true humans would have sought sexual union and marriage with their own kind, and such interbreeding would have been both limited in scope and would have tended to terminate quickly. The inherent superiority of human intellection gave these true human beings an overwhelming survival advantage, enabling them gradually to replace subhuman primate populations throughout the world.

Genesis' patriarchal genealogies are now generally recognized not to be continuous and the number of generations recounted is considered indeterminate.³⁸ Hence, scripturally speaking, some form of interbreeding could have taken place at any time prior to the appearance of Abram in chapter eleven. Realistically speaking, events of this sort most certainly would have taken place hidden deep in the recesses of primeval times, immediately after Adam and Eve. Regardless of when interbreeding might have taken place, it need not be the mass interbreeding of some proposals. Even rare successful matings would have served to enrich the gene pool so as to account for the genetic diversity that we observe today.

Properly understood, the small-scale interbreeding hypothesis that I examine here upholds two doctrinally critical points: (1) theological monogenism, since all true human beings after Adam and Eve would be their descendants, and (2) the passing on of Original Sin to each human being would take place through natural propagation, not imitation. Moreover, this hypothesis appears to pass *prima facie* all biological, philosophical, and theological criteria.

IV. Conclusion

Two approaches to resolving the Adam and Eve “bottleneck problem” have been considered. (1) Upon re-examination of current research, claims

³⁷ *Catechism of the Catholic Church*, 401.

³⁸ W. H. GREEN, “Primeval Chronology”, 105-123.

that too much genetic diversity existed at the time of the *Homo/Pan* split to allow for a very narrow population bottleneck since that time turned out not to be definitive. (2) Some limited form of interbreeding appears possible and may have actually occurred.

A synthesis of these approaches may offer a realistic solution. As noted earlier, correcting for Ayala's excessive estimate of the number of ancient HLA-DRB1 alleles constitutes a substantial reduction in the amount of genetic material that must be explained at every point going forward, until the Middle Pleistocene period, when allelic diversification exploded. This fact alone suggests that few unplanned incidents of interbreeding would be needed to account for the presently observed genetic diversity (assuming any such acts are needed at all). Anatomically modern hominins, with larger cranial capacities and exhibiting clearly intellective behavior — such as making “artistic” stone hand axes or controlled use of fire — appear, possibly for the first time, in or around the *early* Middle Pleistocene period. If so, Adam and Eve would have had to have appeared at least by then.

According to the above-hypothesized evolutionary scenario, the theological, philosophical, and scientific criteria for Adam and Eve's literal existence can finally be simultaneously satisfied: (1) Theologically, the first two genuinely human parents from whom we all descend will have appeared somewhere around an early Middle Pleistocene time frame. (2) Philosophically, this particular hominin population is associated with artistic stone artifacts and controlled use of fire that constitutes what is possibly the first unequivocal evidence of an intellective, spiritual human soul. At the same time, (3) scientifically, it now appears credible that the presently observed genetic diversity can be compatible with the presence of a single mating pair of true human first parents in such an early Middle Pleistocene period either because future genetic studies reveal such compatibility, or else, some form of rare interbreeding introduced the needed additional genetic material after Adam committed Original Sin. Should even more ancient signs of intellective activity be verified, the hypothetical population and time frame for Adam and Eve's appearance would have to be appropriately adjusted to fit the facts.

Again, we must recall that the burden of proof against the possibility of Adam and Eve rests upon the skeptic, not the believer. Recall that the believer has philosophical and theological grounds for his conviction. Given the inherent radical tentativeness of all scientific studies, widespread dog-

matic claims about the alleged “scientific impossibility” of our first parents remain premature and ill-founded even prescinding entirely from the hypothesis of limited interbreeding.

The Genesis account of Original Sin by an *individual* Adam is borne witness through two thousand years of Christian miracles, singularly instanced in the resurrection of Jesus Christ, the Redeemer promised by God after the Fall. This is the foundation for belief by Christians that two literal first parents, Adam and Eve, actually existed at the beginning of human history.

Regardless of how literally or figuratively one may read Genesis itself, thus is established the rational credibility of a literal Adam and Eve — a credibility which comports perfectly with what philosophy demonstrates about the need for a first true human being, and what theology teaches about the first true humans being the biblical Adam and Eve, from whom all true human beings are biologically descended.

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