

# Science, Theology, and Monogenesis

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*Abstract.* Francisco Ayala and others have argued that recent genetic evidence shows that the origins of the human race cannot be monogenetic, as the Church has traditionally taught. This paper replies to that objection, developing a distinction between biological and theological species first proposed by Andrew Alexander in 1964.

## I.

The object of this paper<sup>1</sup> is to explore a question within the general topic of anthropogenesis on which theology and the natural sciences have seemed to many to give contradictory answers. That question is whether the human race had its origin in a single pair of human beings. I will apply to this problem the scholastic adage, *when faced with a contradiction, make a distinction*, and will argue that the apparent contradiction is not in fact real. I will address three questions in turn. First, what account of man's origins has traditionally been given by theology? Second, what account is given by natural science? And third, how can the apparent conflict that arises in the answers to the first two questions be resolved?

## II.

Theologians discussing the question of human origins have traditionally distinguished three logically-possible alternatives. These alternatives can be clarified by distinguishing two questions.

The first is whether man came into being in one single place or independently at several distinct places. These two possible accounts of anthropogenesis have been called monophyletism and polyphyletism, respectively.

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<sup>1</sup>By agreement between the *American Catholic Philosophical Quarterly* and St. Andrew's Biblical Theological Institute, this paper is published here, and will also be published in Russian translation in *Theology of Creation* (Moscow: St. Andrew's Biblical Theological Institute, forthcoming).

The monophyletic answer to the first question raises a second: Was there a single original human couple from whom all future men are descended, or can the origin of the human race only be traced to an original group of more than two people? These alternatives have been given the names “monogenism” and “polygenism,” respectively.<sup>2</sup>

The traditional Christian preference for monogenism (and the consequent rejection of polyphyletism altogether) has had two grounds. For some Christians, the defense of the thesis is based directly on certain passages of Scripture. In the Catholic tradition, however, much more emphasis has been placed on monogenism as the only view consistent with the doctrine of Original Sin.

*Passages in Scripture That Suggest Monogenism Directly.* There are, of course, passages in both the Old and the New Testaments that suggest a monogenetic origin for the human race. Although *Genesis* 1 is silent on the matter, the story of *Genesis* 2–4 is presented as the story of the first two human beings. The reference in *Wisdom* 10:1 to “the first-formed father of the world” suggests the same.

In Paul’s sermon to the Athenians (*Acts* 17:26) we find the following line: ἐποίησέ τε ἐξ ἑνὸς πᾶν ἔθνος ἀνθρώπων κατοικεῖν ἐπὶ πᾶν τὸ πρόσωπον τῆς γῆς.<sup>3</sup> The text does not explicitly say from one what, and two ways of understanding the text have been proposed. One possible understanding would be “from one man.” Some manuscripts, however, as well as some of the early Fathers, complete the phrase, not with “man” but with αἵματος—“blood.” “From one stock” would be sufficient for the point St. Paul is making, namely the unity of man against the claims of the Greeks to be autochthonous and thus radically distinct from their neighbors, the “barbarians.”

*Monogenesis and Original Sin.* Catholic theology, in its traditional support of monogenesis, places less emphasis on those passages than it does on monogenesis as the only view consistent with the doctrine of Original Sin.

Pope Pius XII in his encyclical *Humani Generis* wrote:

For the Christian faithful cannot maintain the thesis which holds that either after Adam there existed on this earth true men who did not take their origin through natural generation from him as from the first parent of all, or that “Adam” signifies a number of first parents. Now it is in no way apparent how such an opinion can be reconciled with that which the sources of revealed truth and the documents of the magisterium of the Church propose with regard to original sin, which proceeds from a sin

<sup>2</sup>Of course the question, whether there was a first couple, can only arise within monophyletism; a polyphyletic account of man’s origins must be polygenetic.

<sup>3</sup>“He made from one every nation of men to live on all the face of the earth” (RSV-CE).

actually committed by an individual Adam and which, through generation, is passed on to all and is in everyone as his own.<sup>4</sup>

What relation did he see between these two ideas?

An exposition of the doctrine of Original Sin<sup>5</sup> can begin with what G. K. Chesterton once called “the only part of Christian theology which can really be proved,”<sup>6</sup> namely:

(P1) All men now live in a state of original sin—suffering from difficulty in distinguishing right from wrong, disposition to injustice, weakness in the face of difficult goods, and concupiscence.<sup>7</sup>

But the doctrine says slightly more than that. “The human race,” as Cardinal Newman put it, “is implicated in *some terrible aboriginal calamity*. It is out of joint with the purposes of its Creator.”<sup>8</sup> The heart of the doctrine, thus, comes in the explanation of P1:

(P2) God intended that man should live in a state of original justice.<sup>9</sup>

(P3) The first human beings frustrated God’s intention by a freely chosen act, the original sin.

Both P1 and P3 are called original sin, being distinguished in Latin by the terms *peccatum originale originans* for P3 and *peccatum originale originatum* for P1. What exactly is the relationship between the original sin of our ancestors and the state of original sin in which we all (even infants too young ever to have committed any actual sin of their own) find ourselves?

The *locus classicus* on this question is St. Paul’s *Epistle to the Romans* (at 5:12), where he writes:

<sup>4</sup>Pius XII, *Humani Generis*, sec. 37, *Acta Apostolica Sedis* 42 (1950): 561–77.

<sup>5</sup>Cf. *Catechism of the Catholic Church* (CCC), 396–421.

<sup>6</sup>G. K. Chesterton, *Orthodoxy* (London: Bogley Head, 1908), chap. 2.

<sup>7</sup>The specification comes from St. Thomas Aquinas, *Summa theologiae*, Ia-Iae, qu. 85, art. 3.

<sup>8</sup>John Henry Newman, *Apologia pro Vita Sua* (London: Longman, Green, 1864), chap. 3; emphasis added.

<sup>9</sup>The *Catechism* characterizes original justice as follows: “The first man was . . . established in friendship with his Creator and in harmony with himself and with the creation around him. [He] would not have to suffer or die. . . . [He] was unimpaired and ordered in his whole being because he was free from the triple concupiscence that subjugates him to the pleasures of the senses, covetousness for earthly goods, and self-assertion, contrary to the dictates of reason” (§§374–377). Ludwig Ott, in his *Fundamentals of Catholic Dogma*, trans. Patrick Lynch (Cork: Mercier, 1955), Bk II, §18, judges that the inclusion of immortality among the preternatural gifts is *de fide* and freedom from irregular desires is a doctrine proximate to faith. Although many theologians interested in elaborating the doctrine have held that they include also freedom from suffering and infused natural and supernatural knowledge, Ott judges that these can only be called widely-held theological opinions, the *magisterium* never having formally affirmed them.

Διὰ τοῦτο ὥσπερ δι' ἑνὸς ἀνθρώπου ἡ ἁμαρτία εἰς τὸν κόσμον εἰσῆλθεν καὶ διὰ τῆς ἁμαρτίας ὁ θάνατος, καὶ οὕτως εἰς πάντας ἀνθρώπους ὁ θάνατος διῆλθεν, ἐφ' ᾧ πάντες ἥμαρτον.<sup>10</sup>

This passage clearly emphasizes the harm that Adam's sin has done to us all. That is to say, it posits an historically real original sin (*peccatum originale originans*) in order to explain the state of original sin (*peccatum originale originatum*) which afflicts each human being from his first moment of existence. Whatever one makes of this passage, the teaching of the Church was clearly articulated at the Council of Trent (1545–1563)—the guilt of this sin is inherited by us all. The Council went on to say:

the sin of Adam is in its origin one, and being transfused into all by propagation, not by imitation, is in all men and proper to each.<sup>11</sup>

This gives us what we need to see the force of Pius's argument. If

(P4) "One by origin" means "committed as one act;" and

(P5) "By propagation" means "through biological descent;" and

(P6) Man's origins were polygenetic (or polyphyletic);

it would follow that

(P7) Adam's contemporaries (and perhaps some of their descendants) would have been men free from original sin.

Since the denial of P7 is clearly intended by the Council of Trent, and P4 and P5 always seemed to be reasonable interpretations of what the Tridentine Fathers intended, Pope Pius rejected P6 as incompatible with the doctrine of original sin.

*Theological Conclusion.* This Catholic account of original sin, then, if not the text of *Genesis 2–4*, has seemed to many to require a monogenetic account of the origins of the human race.<sup>12</sup>

<sup>10</sup>"Therefore as sin came into the world through one man and death through sin, and so death spread to all men because all men sinned" (RSV-CE).

<sup>11</sup>*Decree Concerning Original Sin*, 3. Heinrich Denzinger, original editor, *Enchiridion symbolorum definitionum et declarationum de rebus fidei et morum*, 39th ed. (Freiburg: Herder, 2001), 1510–6, at 1513. Cf. CCC, 419.

<sup>12</sup>It should be noted, however, that Pope John Paul II's comments on evolution in his Address to the Pontifical Academy of Sciences of 22 October 1996, though they followed Pope Pius XII's encyclical on many points, were silent on the question of monogenesis. A 2004 study prepared by the International Theological Commission entitled *Communion and Stewardship: Human Persons Created in the Image of God* is pointedly non-committal, referring to "the emergence of the first members of the human species (whether as individuals or in populations)" (*International Theological Commission: Texts and Documents, vol. 2: 1986–2007*, ed. Michael Sharkey and Thomas Weinandy [San Francisco: Ignatius Press, 2009], 319–52, para. 70; see also para. 63).

## III.

In scientific thought about anthropogenesis we can distinguish two arguments against monogenesis. The first is a more general, presumptive argument about what a Darwinist should expect about the origin of any particular species. The second is a more focused argument based on certain facts about the human race.

*The Presumption against Monogenism.* For the scientist, the question of the origin of man is just a particular instance of the general problem of the origin of species. Species originate by descent with modification from previously existing species, and Darwin's biogeography, in particular, emphasizes single centers of creation [formation] at the origin of each particular species,<sup>13</sup> a view that gained additional support as Darwinism was synthesized with Mendelism in the 1940s. Darwin himself suggests a monophyletic anthropogenesis in the *Descent of Man*.<sup>14</sup>

To be sure, Carleton Coon suggested in *The Origin of Races* that:

Over half a million years ago, man was a single species, *Homo erectus*, perhaps already divided into five geographic races or subspecies. *Homo erectus* then evolved into *Homo sapiens* not once but five times as each subspecies, living in its own territory, passed a critical threshold from a more brutal to a more *sapient* state.<sup>15</sup>

Some of these races, Coon thought, made the transition as much as 200 thousand years ago (kya) before others did.

Coon's ideas on this point did not win general acceptance. At about the same time, Theodosius Dobzhansky expressed the Darwinian orthodoxy when he wrote with particular reference to man what he could have written about any species:

Mankind, *Homo sapiens*, is a single biological species. It could not have arisen by the coalescence of two or several ancestral populations, no matter how much parallel development they may have undergone.<sup>16</sup>

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<sup>13</sup>Charles Darwin, *On the Origin of Species* (London: Murray, 1859), chap. 11 ("Geographical Distribution"): "the view of each species having been produced in one area alone, and having subsequently migrated from that area as far as its powers of migration and subsistence under past and present conditions permitted, is the most probable."

<sup>14</sup>Charles Darwin, *Descent of Man* (London: Murray, 1871), chap. 6.

<sup>15</sup>Carleton S. Coon, *The Origin of Races* (New York: Knopf, 1962), 657.

<sup>16</sup>Theodosius Dobzhansky, *Mankind Evolving* (New Haven: Yale, 1962), 183. A direct exchange between Coon and Dobzhansky appeared in "Two Views of Coon's *Origin of Races* with Comments by Coon and Replies," *Current Anthropology* 4 (1963): 360–7.

To which of the two versions of monophyletism mentioned above, however, does Darwinism lend support? In fact, neo-Darwinism implies a strong presumption in favor of polygenism. There are, to be sure, species all the members of which seem to be descended from a very few ancestors. In the case of the golden hamster, for example, the number of ancestors seems to have been three.<sup>17</sup> General biological considerations do not absolutely rule out a monogenetic origin for any particular species. Nevertheless, Dobzhansky emphasizes the unlikelihood of only a single human individual or couple evolving from a prehuman population:

Since species differ in numerous genes, a new species cannot arise by mutation in a single individual, born on a certain date in a certain place. . . . Species arise gradually by the accumulation of gene differences, ultimately by the summation of many mutational steps which may have taken place in different countries and at different times. And species arise not as single individuals but as diverging populations, breeding communities and races which do not reside at a geometric point, but occupy more or less extensive territories.<sup>18</sup>

Within the limits of polygenism, however, paleoanthropologists have proposed two distinct accounts of exactly how the human race emerged from the prehuman population which preceded it—multiregionalism and one or another form of uniregionalism (a view popularly called “Out of Africa”).<sup>19</sup> On either account, *Homo erectus* was, by about 1.8 million years ago (mya), widely dispersed through the Old World. The two accounts differ on the exact relation between *Homo sapiens* and that earlier population.

Milford Wolpoff and others have argued, on the basis of both paleontological and genetic evidence, that *Homo sapiens* emerged from that single, genetically unified but geographically dispersed *Homo erectus* population with the transition to *Homo sapiens* occurring throughout its geographical range.<sup>20</sup>

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<sup>17</sup>Rupert E. Billingham and Willys K. Silvers, “Skin Transplants and the Hamster,” *Scientific American* 208 (1963): 118–27, at 118–9.

<sup>18</sup>Dobzhansky, *Mankind Evolving*, 180–1. Darwin had made the same point: “in the majority of cases, namely . . . I believe that during the slow process of modification the individuals of the species will have been kept nearly uniform by intercrossing; so that many individuals will have gone on simultaneously changing, and the whole amount of modification will not have been due, at each stage, to descent from a single parent” (*On the Origin of Species*, chap. 11).

<sup>19</sup>For a recent survey, see J. H. Relethford, “Genetic Evidence and the Modern Human Origins Debate,” *Heredity* 100 (2008): 555–63.

<sup>20</sup>Milford Wolpoff et al., “Modern Homo Sapiens Origins: A General Theory of Hominid Evolution Involving the Fossil Evidence from East Asia,” in *Origins of Modern Humans: A World Survey of the Fossil Evidence*, ed. F. H. Smith and F. Spencer (New York: Liss, 1984), 411–84. Also Milford Wolpoff, “Multiregional Evolution: The Fossil Alternative to Eden,” in *The Human*

Although the geographical dispersion of the ancestral population through much of the Old World might make this hypothesis seem to be polyphyletic, its emphasis on the genetic unity of the population, manifested by the flow of genes from one end of the population to the other, makes the theory in a meaningful sense monophyletic, however much it might otherwise blur the distinction.

Multi-regionalism, however, remains very much the minority view in paleoanthropology, the dominant view being rather that *Homo sapiens* originated more locally and more recently—in East Africa some 200 kya. On this view, a small part of that human population left Africa about 60 kya, replacing *Homo erectus* populations wherever they encountered them and then extending their range throughout the world.

Multi-regionalism is inherently polygenetic; uniregionalists are polygenists for the reasons expressed by Dobzhansky above.

*The Argument against Monogenism.* Monogenetic origin would limit the amount of genetic variation within a species. It would thus be similar in its effects to a population bottleneck.<sup>21</sup> The two concepts themselves differ in two respects. First, monogenetic origin is committed, as the existence of a bottleneck is not, to a population minimum of exactly two individuals. Second, the bottleneck thesis asserts, and monogenesis denies, the existence of an earlier, larger population. Arguments that there could not have been a bottleneck will (practically speaking) constitute objections to monogenesis, though arguments that there was a population bottleneck will be consistent with the further claim that origins were poly- and not monogenetic. Monogenism, then, represents one version, and the bottleneck thesis a similar but distinguishable version, of the idea that all living human beings are descended from a relatively small number of ancestors. Discussion of whether there ever was a population bottleneck in the course of hominid evolution and, if there was, when and of what size is, in fact, on-going among paleoanthropologists. Weijun Xiong argues that there was none.<sup>22</sup> John Hawks argues that although there may have been one around 2 mya (about the time of the expansion of *Homo erectus* out of Africa), there could not have been one since then.<sup>23</sup> Stanley H. Ambrose argues for a bottleneck

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*Revolution: Behavioral and Biological Perspectives on the Origins of Modern Humans*, ed. P. Mellars and C. Stringer (Edinburgh: Edinburgh University Press, 1989).

<sup>21</sup>Biologists use this phrase to refer to the sudden collapse of an established population followed, after a few generations of minimal population, by re-establishment of a large population.

<sup>22</sup>Weijun Xiong et al., "No Severe Bottleneck during Human Evolution," *American Journal of Human Genetics* 48 (1991): 383–9.

<sup>23</sup>John Hawks et al., "Population Bottlenecks and Pleistocene Human Evolution," *Molecular Biology and Evolution* 17 (2000): 2–22, at 16–8.

caused by the Mount Toba volcanic eruption about 71 kya (just before the final expansion of *Homo sapiens* out of Africa).<sup>24</sup>

None of the defenders of a bottleneck, however, argue for any form of monogenism. Indeed, Francisco Ayala recently offered an argument against it based not on general presumptions applicable to all species but on some particular facts about human genetics which, he argues, place a minimum size on any such bottleneck.<sup>25</sup>

This argument is based on variation in the DRB1 gene in the human population. This gene, one of one hundred or so that make up the human leukocyte antigen complex, is very old. The fact that thirty-two of the fifty-nine variants found in man are also found (in similar, though not identical form) in chimpanzees shows that these variants arose before the phylogenetic divergence of chimpanzee and man, some 6 mya.

Since no individual can carry more than two such variants, the *absolute* minimum human population in every generation after the evolution of man from a common human-chimpanzee ancestor is sixteen. (The other twenty-seven variants could have arisen from later mutations.)

This genetic diversity precludes very narrow population bottlenecks as well as very long-lasting ones,<sup>26</sup> as such bottlenecks are too small to transmit the observed range of variation to succeeding generations. Maintenance of sixty variants requires a long-term mean human population of 100,000. All that does not, however, preclude short-lived bottlenecks as long as they are not too small.

So the question is, how small can a bottleneck be, and how long can it last if it is to maintain the level of diversity actually observed in the DRB1 gene? Ayala calculates that the minimum bottleneck sufficient to maintain that level of diversity (and then to return to the mean population size) is about 4,000 synchronously reproducing individuals, or perhaps slightly less. That suggests an actual population of some 15,000–20,000 individuals.

Ayala's work has not won universal acceptance. Henry A. Erlich and others have objected that the human leukocyte antigen complex, being subject to strong

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<sup>24</sup>Stanley H. Ambrose, "Late Pleistocene Human Population Bottlenecks, Volcanic Winter, and Differentiation of Modern Humans," *Journal of Human Evolution* 34 (1998): 623–51.

<sup>25</sup>See Francisco J. Ayala, "The Myth of Eve: Molecular Biology and Human Origins," *Science* 270 (1995): 1930–6; and, with A. A. Escalante, "The Evolution of Human Populations: A Molecular Perspective," *Molecular Phylogenetics and Evolution* 5 (1996): 188–201. Ayala reported the results of this work to a meeting of the US Catholic Bishops in 1998. See Francisco Ayala, "Evolution and the Uniqueness of Humankind," *Origins: CNS Documentary Service* 27 (1998): 565–74.

<sup>26</sup>Despite the suggestions of some scientists and many popularizers, the evidence for a "mitochondrial Eve" shows only that there is a single woman who can be found in the purely matrilineal line of all people now living. It does not show that that woman was the only purely matrilineal ancestor of all people who ever lived or that she was the only woman of her generation. Similarly, *mutatis mutandis*, for a "Y-chromosomal" Adam.

positive selection, is ill-adapted to the reconstruction of human population history.<sup>27</sup> But, other estimates of the size of the bottleneck, based on other data, fall into this same range.<sup>28</sup>

*Scientific Conclusion.* For reasons that subsequent analysis will make clearer, we might divide the logical possibilities within monophyletism into three rather than into two. Monogenesis remains as a logical possibility, though one that seems inconsistent with the scientific evidence. We might, however, distinguish within polygenism those accounts which posit more than one initial couple, but nevertheless a very small number of individuals (say, a single tribe or social group), from Ayala's population of several thousand individuals who collectively constitute the origins of the human race.

Natural science, then—or, to speak more precisely, genetics—leads to the conclusion that although man probably came into being at “one place,” the size of that place is only probably a relatively small place (say, East Africa), and could be as large as (nearly) the entire Old World.<sup>29</sup> The population size might be small, but only relatively so—probably at least a few thousand; surely not a single couple.

Further, there is no scientific evidence in favor of the sudden origin of the human species; indeed to the extent that humanity is characterized by a cluster of genotypic, phenotypic, or behavioral-cultural traits, there is a theory-based presumption against it.

It seems, therefore, unlikely (on the basis of scientific evidence) that there was a single first couple which emerged alone from a biologically prehuman population to become the ancestors of all later human beings. Modern science suggests not a monogenetic, but a polygenetic, origin for man.

#### IV.

*Resolution.* Two diverse modes of knowing, one based on the data of observation and the other on the data of revelation, seem to lead, as I said at the outset, to contradictory conclusions—the one favoring a polygenetic, the other a monogenetic, account of man's origins. What options are available to the Christian who is committed to taking theology seriously, but who does not want to run afoul of St. Augustine's famous injunction:

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<sup>27</sup>H. A. Erlich et al., “HLA Sequence Polymorphisms and the Origin of Humans,” *Science* 274 (1996): 1552–4.

<sup>28</sup>See, e.g., Henry C. Harpending et al., “The Genetic Structure of Ancient Human Populations,” *Current Anthropology* 34 (1993): 483–96.

<sup>29</sup>The unity of place is really the unity of the gene pool, which allows gene flow through the entire population.

Usually even a non-Christian knows something about the earth, the heavens, and the other elements of this world . . . and this knowledge he holds to be certain from reason and experience. . . . If [non-Christians] find a Christian mistaken in a field that they themselves know well and hear him maintaining foolish opinions about our books, how are they going to believe those books concerning the resurrection of the dead, the hope of eternal life and the kingdom of heaven, when they think that their pages are full of falsehoods on facts which they themselves have learnt from experience and the light of reason?<sup>30</sup>

*Attempted Revisions of the Doctrine of Original Sin.* In recent years, some theologians (to be discussed shortly) have defended a non-monogenist reading of *Genesis* and (independently) a revised understanding of original sin. These views have been adopted for reasons not entirely, and sometimes not at all, logically grounded in concerns about the compatibility of theological doctrine with the discoveries of modern science.

In interpreting *Genesis*, they rightly emphasize, one must take full account of the literary genre of the text that one is reading. The fact that *Genesis* 2 is not a modern historical or scientific treatise, they say, makes it wrong to see in it any historical facts at all and *a fortiori* the existence of a first human couple, ancestors of us all. *Genesis* 2 emphasizes several themes—the relation of man to God (creature to Creator), man's unity of origin, and the relation of man and wife. Significantly, it is only in dealing with the last of those themes that the text even prefers a singular interpretation for the words אָדָם and חַוָּה, 'ādām and ḥavāh, which can otherwise be read as “the man” and “the source of life.”

Of these themes, it is the unity of the human race that is of greatest relevance to the topic here under consideration, and for several reasons the existence of an historical first man may not be necessary to that claim.

First, while the author certainly intends to teach the primordial unity of man, the way he teaches is influenced not by the details of history (“wie es eigentlich gewesen war”) but by the modes of expression most intelligible to his audience. In that context, Karl Rahner emphasizes:

the tendency of the Oriental mind to think in concrete and personalistic terms and to see the foundation of every sociological unit in a single king or ancestor.<sup>31</sup>

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<sup>30</sup>*The Literal Meaning of Genesis*, trans. John Hammond Taylor, S.J. (New York: Paulist Press, 1982), I.19 (§39).

<sup>31</sup>K. Rahner, S.J., “Theological Reflections on Monogenism,” in *Theological Investigations* vol. I, trans. Cornelius Ernst, O. P. (Baltimore: Helicon, 1961), 34–5. See also Rahner, “Evolution and Original Sin,” *Concilium* 26 (1967): 61–73; and Rahner, “Erbsünde und Monogenismus,” in Karl Heinz-Weger, *Theologie der Erbsünde* (Freiburg: Herder, 1970).

The fact of unity itself can be conceived in various ways and common descent from an original group is not the most plausible account of that unity. The unity of a biological species is most naturally expressed in terms of the gene pool in which it shares. Emphasis on the *humanity* of the species in question would point rather to such social facts as culture and language, which play a crucial role in man's being man, and these can exist only in a human group. Finally, the unity of goal (in man's case, God-directedness) is a better candidate for the source of unity than is unity of biological descent.

Second, the account of the exile of Cain (*Gen* 4:14–17) assumes the existence of other men in the world without giving an account of their creation. This inconsistency should serve to emphasize the fact that the intent of the Protohistory of *Genesis* 1–11 is not to provide a positivist narrative history, but to relate a *mythos*—a story in which, as Edward Yarnold put it, “a truth too deep for straightforward expression is formulated in symbolic terms.”<sup>32</sup>

Critics' objections to the traditional understanding of the doctrine of original sin are based to a significant extent on other considerations, recognition of which can be organized by reference to three of the key ideas mentioned above, here slightly reformulated:

(P3.1) The explanation of the *peccatum originale originatum* is inherited guilt for the *peccatum originale originans*.

(P4.1) The *peccatum originale originans* was one act.

(P5.1) The *peccatum originale* is propagated through biological descent.

Some revisionists have objected to the very idea of a *peccatum originale originans*. They raise two objections to this concept.

First, they say that the idea of original justice is implausible or at least untrue. Some critics claim that the concept is incompatible with science,<sup>33</sup> a point to which I will return later. Others reject the idea as inconsistent with their anthropology. Duffy objects that “it is difficult to imagine a world created for development and the becoming of freedom where evil is not a structural component.”<sup>34</sup> This, of course, puts pressure on certain passages of *Genesis* 2–4. “The garden is the dream,” Duffy replies, “not memory.”<sup>35</sup>

Second, they object to the very idea that anyone could inherit guilt for the sins of their ancestors.

<sup>32</sup>Edward Yarnold, *Theology of Original Sin* (Notre Dame: Fides, 1971), 34–5.

<sup>33</sup>E.g., Jerry D. Korschmeier, *Evolution and Eden* (Mahwah, NJ: Paulist Press, 1998), 44.

<sup>34</sup>Stephen J. Duffy, “Our Hearts of Darkness: Original Sin Revisited,” *Theological Studies* 49 (1988): 597–622, at 619. See also Joan Acker, H.M., “Creationism and the Catechism,” *America* 183 (2000): 6–9: “Modern theology regards these evidences of finiteness [sc., ignorance, pain, disease, and death] as necessary parts of created life, just as natural as birth.”

<sup>35</sup>Duffy, “Our Hearts of Darkness,” 619.

The effect of such revisions puts some pressure on the very term “original” sin.<sup>36</sup> Rejection of the idea of an historical real *peccatum originale originans* occurred earlier in the thought of Protestant theologian Reinhold Niebuhr, whose views were well-summarized by his student Langdon Gilkey in the following terms:

all ‘literal’ elements of the story are now gone. . . . Adam and Eve are now for him symbols of the human condition, not any longer causes of that situation. The Fall thus has ceased to point to a historical event in the past and has become a symbol, a description of our perennially disrupted state, and one that discloses to us the deepest levels of that state.<sup>37</sup>

Among Catholics, Edward Yarnold, for example, *defines* original sin as follows:

The sin of the world is a collective will in which I am a partner, a pressure on the individual in which I share and to which I contribute. The sin of the world is original sin.<sup>38</sup>

Less radical, and more in consonance with the *Catechism of the Catholic Church*, which continues to rely on the story of Adam and Eve in its exposition, though without explicitly requiring acceptance of their historical existence, are objections to P4.1 and P5.1.

The Council of Trent teaches that original sin is spread by propagation, not imitation, which requires that a line be drawn between the two concepts. P5.1, the traditional interpretation of the canon, understands “propagation” to mean “biological descent” and “imitation” to mean “learned through social contact with other human beings.” Some revisionists have proposed to draw the line between the two concepts differently, restricting the concept of imitation to voluntary acts and extending the concept of propagation to include habits or attitudes that are spread from one generation to the next by socialization. Duffy writes:

Being situated in and participating in the “sin of the world” is not in the first instance a conscious decision. It is “non imitatione.” For sin works its shaping influence before one is capable of moral decision.<sup>39</sup>

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<sup>36</sup>“There is reason to feel uneasy with the term ‘original sin,’ however venerable it may be. At best the term is derivative and stretches analogy to the breaking point” (Duffy, “Our Hearts of Darkness,” 619).

<sup>37</sup>Langdon Gilkey, *On Niebuhr: A Theological Study* (Chicago: University of Chicago Press, 2002), 134.

<sup>38</sup>Yarnold, *Theology of Original Sin*, 77.

<sup>39</sup>Duffy, “Our Hearts of Darkness,” 615–6.

Since the spread of the *peccatum originale originatum* (or the sin of the world) is a problem distinct from the rejection of the existence of any *peccatum originale originans*, this revision of P5.1 is made by some, including Duffy, who also reject P3.1.

Perhaps most modest, in the sense of retaining as much as any critic of the traditional account, are the objections to P4.1, the unity of the act that constituted *peccatum originale originans*. One might say a common end in the action of a group would be sufficient to establish the necessary unity of the action. In any case the *peccatum originale originans* having clearly been committed by two individuals (Adam and Eve) in the story as presented in Scripture without thereby losing the kind of unity imputed to it at Trent, there is no reason to think that it would lose its unity had it been committed by a whole group of individuals, perhaps with some one individual (“Adam”) as its moral head, but not as its genealogical common ancestor.

Unfortunately, however, Ayala’s population of thousands creates as great a problem for such a solution as it does for monogenesis. Twenty individuals might be understood to be engaged in a common act of disobedience. Thousands, at least thousands of cavemen, probably cannot. And even if we were to consider the possibility of a smaller population, another problem that confronts theories of a collective original sin is the problem of the small children. A group of any significant size will contain children below the age of reason, who are not capable of committing any sin. What would be their relation to original sin? Original sin is in all human beings. These children could not have participated in the commission of the original sin. It cannot, according to the Council of Trent, have been infused into them by imitation when they attain the age of reason. It cannot have been transfused into them by propagation, as they would have been conceived in the pre-lapsarian world.

Of course if any of those revisionist understandings of original sin are viable, the problem disappears. I do not intend here to argue in any detail that they are false. I will limit my concern about these approaches to mentioning that they put pressure on the orthodox understanding (if not the very practice) of infant baptism. Duffy acknowledges as much, writing:

It is no longer possible to give pride of place to baptism as a clean transference from a “before” that is totally graceless and sinful to an “after” that is graced and wholly renovated. . . . At best, then, baptism is initiation into a community affording an environment for intelligent and reasonable growth and intensification of a graced relationship already active.<sup>40</sup>

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<sup>40</sup>Ibid., 620. One might ask whether the “before” was ever understood to be “totally graceless.” Note also in this connection Korsmeyer’s comment that “one of the best reasons for infant baptism is that it reminds the community of the complete gratuitousness of God’s love, in that it

It is sufficient to my purpose to show that these revisions are not needed in order to accommodate the facts of paleoanthropology. They must stand, if stand they can, on other grounds.

*A Distinction and a Resolution.* Fortunately, another solution is available.

The foundations of this solution were laid by Andrew Alexander, C.J., who defended some years ago the idea that “while it is true that all men are descended from Adam, the race nevertheless had a broad origin.”<sup>41</sup> What underlies Alexander’s analysis is a distinction, which he never makes in exactly these terms, between man as a theological species and man as a biological species. One should distinguish from both of these, as Alexander does not do, what might be called the philosophical species.

The biological species is the population of interbreeding individuals.

The philosophical species is the rational animal, i.e., a natural kind characterized by the capacity for conceptual thought, judgment, reasoning, and free choice. St. Thomas Aquinas argues that a certain kind of body is necessary for rational activity, but is not sufficient for it. Rational activity requires, in addition the presence of a rational soul, something that is more than the power of any bodily organ, and that therefore can only come into being, in each individual case, through a creative act of God.<sup>42</sup>

The theological species is, extensionally, the collection of individuals that have an eternal destiny. The *Catechism of the Catholic Church* says “God created man in his image and *established him in his friendship.*”<sup>43</sup> Human rationality is probably a necessary prerequisite to such friendship. It is not clear, however, that the offer of such friendship is a logical consequence of rationality. Presumably, the offer (an offer which in itself makes the species theologically distinct) is a separate, free act of God, perhaps required by His goodness, but not in any stronger sense necessary. In any case the two human attributes are at least conceptually distinct from one another.

The distinction between the biological species concept and the theological one is important, since they are not necessarily co-extensive. Two individuals, one theologically human and the other not, would remain members of the same biological species as long as they were capable of producing fertile offspring. While it would certainly be a theological error to exclude any members of the biological species now living from the philosophical or theological species man

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is given to humans before we are capable of doing anything by ourselves” (Korsmeyer, *Evolution and Eden*, 69).

<sup>41</sup>Andrew Alexander, C.J., “Human Origins and Genetics,” *Clergy Review* 49 (1964): 344–53, at 350–1.

<sup>42</sup>*Summa theologiae*, Ia, qu. 90.

<sup>43</sup>CCC, par. 396; emphasis added.

(i.e., to hold that they lacked rational souls, or that they were not among those to whom God had offered His friendship), there can be no theological objection to the claim that some one (or two) members of a prehistoric, biologically (i.e., genetically) human species were made sufficiently different from the others that they constituted a new theological species, e.g., by being given a rational soul and an eternal destiny.

In Alexander's account, the material condition of this ensoulment was the appearance of a suitable body (rendering the account compatible with the demands of hylomorphic philosophy), which he interprets genetically as the result of a final crucial mutation. This mutation, he suggested, crossed a philosophically or theologically critical threshold, but did not establish biological barriers to reproduction, i.e., did not give rise to a new biological species (a new population of organisms incapable of interbreeding with the remainder of the larger population among which they appeared). If the gene carrying the new trait were dominant, the trait would spread quickly and not only the theologically prehuman stock (those homozygous for absence of the new gene), but even the old allele itself might disappear. Thus all theological men who ever lived, as well as all biological men alive today would be descended from a common first (theological) man and woman in a manner consistent with our knowledge of population genetics.

I think that Alexander's distinction between the biological species (the population of beings capable of interbreeding) and the philosophical and theological species "human being" is the key to the solution of this problem, but that his emphasis on genetics (a crucial mutation) may be misplaced. It creates for him the necessity to posit a not impossible but extremely unlikely co-occurrence of exactly two instances of the same mutation (one in a man and one in a woman) at roughly the same time.

The hylomorphic philosophy, which fits so naturally the relation of body and soul implicit in the Bible, requires a body adapted to the powers which the soul brings. A rational soul could not be the form of a piscine, or even a simian, body. Still a rational soul, being more than the power of any bodily organ, cannot be the necessary form of any kind of body, and *a fortiori* not of a human one. So, Alexander's association of mutation and hominization is too close. A certain bodily form (and *a fortiori* a certain mutation) may be necessary for hominization, but it is not sufficient, as Alexander surely would acknowledge. Hominization requires the presence of a created rational soul. The mutation itself, therefore, in fact bears a looser connection to hominization than it does in Alexander's account.

There is an alternative use of Alexander's distinction which does the work of reconciliation without entailing the problems that his view faces. That account can begin with a population of about 5,000 hominids, beings which are in many respects like human beings, but which lack the capacity for intellectual thought.

Out of this population, God selects two and endows them with intellects by creating for them rational souls, giving them at the same time those preternatural gifts the possession of which constitutes original justice. Only beings with rational souls (with or without the preternatural gifts) are truly human. The first two theologically human beings misuse their free will, however, by choosing to commit a (the original) sin, thereby losing the preternatural gifts, though not the offer of divine friendship by virtue of which they remain theologically (not just philosophically) distinct from their merely biologically human ancestors and cousins. These first true human beings also have descendants, which continue, to some extent, to interbreed with the non-intellectual hominids among whom they live. If God endows each individual that has even a single human ancestor with an intellect of its own, a reasonable rate of reproductive success and a reasonable selective advantage would easily replace a non-intellectual hominid population of 5,000 individuals with a philosophically (and, if the two concepts are extensionally equivalent, theologically) human population within three centuries. Throughout this process, all theologically human beings would be descended from a single original human couple (in the sense of having that human couple among their ancestors) without there ever having been a population bottleneck in the human species.

This scenario accommodates both the genetic evidence and theological doctrine (if that it be) of monogenesis because it does two things. First, it distinguishes between true (i.e., intellectual) human beings and their genetically human-like, but non-intellectual, relatives. Second, it recognizes that the theological doctrine of monogenesis requires only that all human beings have the original couple among their ancestors, not that every ancestral line in each individual's family tree leads back to a single original couple. They (and we) can also have even the several thousand hominid ancestors which Ayala says the genetic evidence requires.

This theory is monogenetic with respect to theologically human beings but polygenetic with respect to the biological species. Thus, the distinction resolves the contradiction.

*Objections and Replies.* Let me briefly consider four questions, all sources of possible objections.

First, is this idea offensive to pious ears? Of course it may well be a consequence of my view that our earliest ancestors were sinners for continuing to interbreed with the pre-human beings who, if not of a different biological species, were not fully human beings either.<sup>44</sup> The sin involved would be more

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<sup>44</sup>Of course it should be noted that these matings were fertile, even if the relationship between the individual mates would be incapable of having any *personal* dimension.

like promiscuity—impersonal sexual acts—than like bestiality. But the idea that our first ancestors were sinners can hardly be an *objection* to this theory. It is an idea supported by all four of the great episodes of the human proto-history of *Genesis*—the Fall, Cain’s slaying of Abel, the Deluge, and the Tower of Babel. The *Catechism of the Catholic Church* puts it as follows: “After that first sin, the world is virtually inundated by sin.”<sup>45</sup>

Second, would it not have been unjust of God to give to Adam and Eve the gift of a rational soul, a gift which would make them fully human (and immortal), with the additional prospect of eternal happiness with God in Heaven, while leaving in an animal state their siblings and cousins, who also (on my account, though not on Alexander’s) had a bodily constitution sufficient to sustain rational activity?<sup>46</sup> I think not. A theology in which the existence of a Chosen People is a central theme in salvation history can surely accommodate the existence of a Chosen Couple. God did not owe Adam and Eve’s cousins a rational and therefore immortal soul.<sup>47</sup> The hominization of Adam and Eve was a free gift. Since Alexander called his article “Human Origins and Genetics,” I might highlight the point at which my idea differs from his by calling my account “Human Origins and Grace.”

Third, is there a point in human pre-history at which there could have been a being that was both the first rational human being and the ancestor of all other human beings? It is not a necessary truth that there could have been such an ancestor. If rationality had appeared independently in two places among human beings (as did wings among animals), it would not be true that there was such a human being (just as there is no being that both had wings and is the common ancestor of all other winged animals).

The *terminus post quem* would be the point at which there had first evolved an animal body capable of the brain activity prerequisite for rational thought. Without a better understanding of the relation between brain and mind, it is difficult to say anything interesting about when that might have been. One might suppose that Australopithecines (at 400 cm<sup>3</sup>) had a brain capacity too small for rational thought, though some have attributed to *Australopithecus garhi* (2.6 mya) the manufacture of the Oldowan pebble (Mode One) tools. The earliest members

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<sup>45</sup>CCC, para. 401.

<sup>46</sup>For a defense of the idea that there is a bodily basis for such activity, see St. Thomas Aquinas, *Summa theologiae*, Ia, qu. 75, art. 2, ad3: “The body is necessary for the action of the intellect, not as its origin of action, but on the part of the object; for the phantasm is to the intellect what color is to the sight.”

<sup>47</sup>Indeed the very idea that God owes an intellectual soul to those cousins risks incoherence—how could God owe it to some being to make it not exist and to make another being exist in its place? In giving that cousin an intellectual soul, he would make it a different *kind* of being and *a fortiori* a different individual.

of our genus (e.g., *Homo habilis*) had brains slightly larger (400–600 cm<sup>3</sup>) and clearly manufactured pebble tools. *Homo erectus*, which emerged about 1.8 mya had a larger brain capacity (850–1,100 cm<sup>3</sup>) and developed the more advanced (Acheulean) techniques of tool manufacture, which seem to require thinking ahead during the manufacturing process.

The *terminus ante quem* is the point at which the evidence of rationality appears in the archeological record. Identifying that time, however, is complicated by the fact that it is not always easy to determine what behavior would require rationality (as defined above). Apes, porpoises, parrots, and crows, for example, have each in their own way displayed great skill at learning and problem-solving, without showing that they actually apprehend concepts, the classical threshold of rationality. So, for example, it is hard to say whether the manufacturers of Oldowan pebble tools (*Homo habilis* or possibly even *Australopithecus garhi* 2.6 mya) had the power of reason or, whether in their tool manufacture at least, they were more like New Caledonian crows, which show a remarkable ability to adapt natural objects to their own needs but who clearly lack the power of conceptual thought. If Mode One technologies do not require rationality, do the Mode Two technologies of *Homo erectus* require it?

It is also important to remember that an identifiable *terminus ante quem* might be much later than the date of the first rational human being. The first rational human beings may not have left any physical trace of their rationality. Maybe they were talkers rather than doers or maybe they made their tools out of wood and bone rather than out of flint. Even if they did make artefacts that lasted, there is no certainty that those artefacts would later actually be found by paleoanthropologists.

It is beyond the scope of this paper to do more than to show that no scientific evidence raises insuperable problems for the thesis that the common ancestor of all rational beings was itself a rational being. In fact, both uni- and multiregionalist accounts of human origins can accommodate such a rational common ancestor.

Good evidence that *Homo erectus* or Neanderthals had the capacity for rational thought (as a minority of paleoanthropologists have argued, especially with respect to Neanderthals, that there is) would provide reason for placing the appearance of the first theologically human beings before the first African emigration (in which a population of *Homo erectus* left Africa, nearly 2 mya).<sup>48</sup> The fact that paleontologists distinguish *Homo erectus* as a species distinct from

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<sup>48</sup>It would not be strictly necessary since the fact that multiregionalism postulates a population in which novel genes can spread through the entire population makes it compatible with the idea that eventually, every member of the biological species would have among its ancestors the first theologically human beings.

*Homo sapiens* is irrelevant to the question of whether they are philosophically or theologically distinct species.

Absent such evidence of rationality, later dates for hominization would be plausible. Two particular possibilities commend themselves, though there is no strong reason to prefer them to some intermediate date.

The more remote would be immediately subsequent to the rise of *Homo sapiens* (so, perhaps as early as 200 kya), placing theologically human beings completely within an only slightly larger biological species, excluding *Homo erectus* and (whatever his exact relation to those two species) Neanderthals. Such a recent origin for theological humanity would fit most easily into (though it does not logically imply) the uniregionalist (or recent African) theory of human origins.

The most recent possible date (the *terminus ante quem*, really) would be the time of the final African emigration some 60 kya. This coincides closely with the appearance in the archeological record of a variety of artefacts that seem clearly to require rationality, of which Cro-Magnon art is only the most spectacular example.

Fourth, is this account excessively dualistic, making the soul something different from the form of the human body that it was declared to be at the Council of Vienne (1311)?<sup>49</sup> A full investigation of this question would require a more detailed exposition of the relation between human body and rational soul than space allows, but I think that the answer is “no.” Adam’s non-intellectual cousins would have had a sensitive soul sufficient to engage in all the acts of image apprehension and manipulation of which other animals are capable, without the power to abstract from those images the concepts that distinguish human from animal cognition. That the human intellectual soul makes possible both the image-manipulation that we share with animals and the power of abstracting concepts from the images we acquire or form is a fact on any Thomistic anthropology. My anthropology is, therefore, no more dualistic than any other Thomistic account.

## V.

The primary purpose of this paper has been to show that there is no real contradiction between a theologically conservative (monogenist) account of anthropogenesis and the scientific insights of evolutionary biology and modern genetics. The appearance of contradiction that has been asserted in recent years is based on a failure to make an important distinction. This fact should

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<sup>49</sup>“The rational or intellectual soul is *per se* and essentially the form of the body” (Council of Vienne, Constitution “Fidei Catholicae.” Denzinger, *Enchiridion symbolorum*, 900–4, at 902).

remind us of the importance of patience in the face of apparent contradictions. Contradictions are sometimes to be resolved not by the rejection of one of the apparently contradictory theories but by the recognition of just such a previously overlooked distinction.

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