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The Overlooked Science of Genealogical Ancestry

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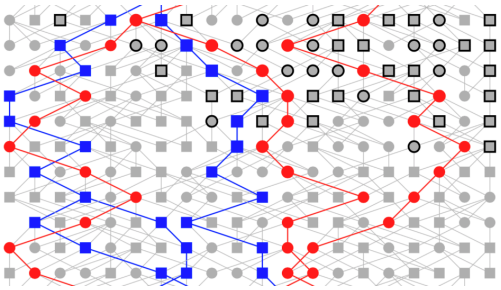


Theological questions are raised by evolution, but genealogical science has been overlooked. In the age of genomes, new information is reshaping our understanding, but the critical theological questions arise from genealogies, not genetics. Instead of rethinking Adam, perhaps we should rethink the debate?

Genetic data is being collected at an increasing rate. From this data, the population size of our ancestors at different times can be estimated. It appears that populations sizes never dipped down to a single couple in the last 200,000 years, the point at which *homo sapiens* arise (https://dx.doi.org/10.1101/gr.6023607). No mathematical model, other than evolution, has been demonstrated consistent with this data. A single mathematical theory that explains the data, and it seems to contradict our understanding of Scripture.

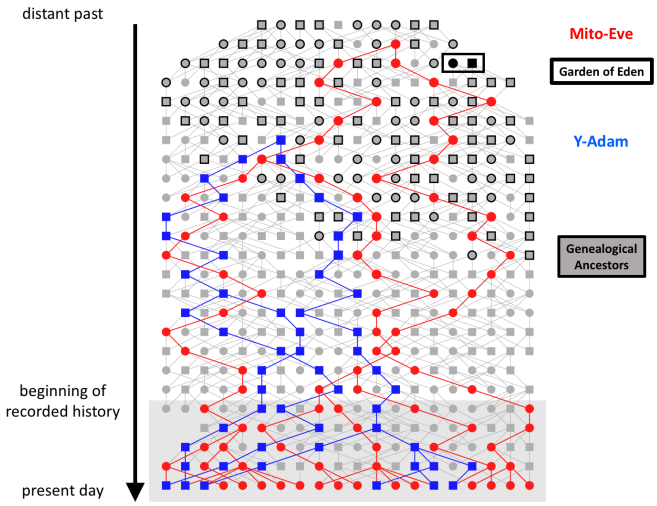
This new information cannot be ignored, and the debate has grown. How much does evolution press on theology? Were Adam and Eve real people from whom all mankind descends? At the center of the controversy is Paul, who seems to think Adam was real and is our genealogical ancestor (Romans 5:12). Does evolution prove Paul was wrong?

On both sides of the debate, most are convinced that evolution itself requires a large revision of the "traditional" interpretation of Adam. Unfortunately, this conclusion rests on an incomplete understanding of science, and false-equivalences between concepts in theology and science. Surprisingly, the science most relevant to the question at hand is almost totally *overlooked* by just about everyone. This overlooked science is important, because it limits out how evolution presses on theology.

Instead, *consistent with the genetic evidence* (see Figure), it is possible Adam was created out of dust, and Eve out of his rib, about 6,000 years ago in a divinely created garden where God might dwell with them, the first beings capable of a relationship with Him. Perhaps their fall brought accountability for sin to all their descendants. Leaving the Garden, their offspring blended with their neighbors in the surrounding towns. In this way, they became genealogical ancestors of all those in recorded history. Adam and Eve, here, are the single-couple progenitors of all mankind.

Even if it is false or unnecessary, **nothing in evolutionary science unsettles this story**. So, evolution presses in a very limited way on our understanding of Adam and Eve, only suggesting (alongside Scripture[1]) that their lineage was not pure.

As we will see, evolution gives no reason to doubt, as Jack Collins puts it, that Adam and Eve sit at the "headwaters" of all mankind. Genomes give no reason to doubt, as John Walton puts it, "Adam and Eve are historical figures—real people in a real past."



Genealogical ancestry is not genetic ancestry. Illustrating the story in the text, we show a cartooned pedigree, a genealogy, from past (top) to present (bottom). Squares and circles denote men and women, respectively, with lines indicating parentage. Red and blue individuals are those in the genetic lineages to a single ancestor, Mito-Eve and Y-Adam, respectively. In contrast, every individual with a black border is a common genealogical ancestor of all those in recorded history (grey box). The Scriptural Adam and Eve (the black box and square) are created from the dust and a rib less than 10,000 years ago, have no parents, are in the Garden of Eden (black box), and are genealogical ancestors of everyone in history. This story is entirely consistent with the genetic data.

An erratum to the *Sapientia* article: In discussing the illustrative scenario, the text it says 6,000 years and the figure says 10,000. If "recorded history" is the key time point, then the date should be 10,000 in both places. If "when Paul wrote Romans" is the key point, then it could be either 6,000 or 10,000 years.

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1. there are several verses that suggest Adam's lineage is not pure (Genesis 4:13-18; 6:1-6). Moreover, Scripture never claims Adam and Eve were alone, without people outside the Garden. For further discussion, see John Walton, *The Lost World of Adam and Eve*.

Is Adam Important?

To this thesis, a common response by many theologians is to argue that Adam is not really necessary any way, and our faith is not threatened if Paul is wrong about Adam. I am sympathetic to this objection, but this misses my point entirely. My purpose here is not to argue what is affirmed by Scripture. **Rather, I aim to correctly delimit what is known by science.** Make the theological case against Adam if you are so inclined, but do not blame evolution. The science here has nothing to do with him.

In what do I agree? The Christian faith is grounded in the Resurrection of Jesus, not Adam. In full view of many different versions of Adam, the early Church defined itself around the historicity of Jesus, not of Adam. Our confession of Jesus, and He is the cornerstone. We start from Jesus, not even knowing of Adam (Act 17), because our entry point is the Empty Tomb. A better view of Romans 5:12, where Paul speaks of Adam, is that Paul is using Adam as an explanatory contrast to a expound a Jesus clearly understood by other means. It is not as if we need to know Adam to know Jesus, as some seem to think.

Why can we disagree with Paul? Clearly, he believed the sun moved around the earth, like every other learned person at the time believed. The key reason we are okay with disagreeing with him here is that he never *teaches* this in Scripture. Even if he were to have drawn a theological analogy to geocentrism (Paul did not, but the Psalmist does) *in order to make* a theological point, he still would not be *teaching* geocentrism. Rather he would be explaining a true theological point from his limited starting point. We would take the theological point as authoritative, while disagreeing with him about geocentrism. Paul's understanding of Adam could fall in the same theological class as geocentrism. My point, however, is that Adam does not fall in the same scientific class as geocentrism, because science does **not** unsettle a genealogical Adam.

An immediate objection to this concerns the Resurrection. Paul also reasons from the Resurrection to theological points, so what guards against using this logic to deny the Resurrection? This question is concerning only if we forget the central teachings of the New Testament, repeated in several places. Paul teaches this physical event is the core of the Christian faith, independent of the theology he reasons from it (I Corinthians 15:1-14). One must conclude from these passages (and others like it) that Paul and the entire early church are teaching that Jesus bodily rose from the dead; this event, in fact, is the Gospel. This affirmation is the cornerstone of their faith, *independent of the theological implications that follow from it.* While Paul does not teach geocentrism and we can debate if he taught Adam, he clearly taught the Resurrection.

Once again, this detour to theology misses the point. My purpose here is not to argue the theology one way or another for Adam. **Instead, I aim to precisely delimit what *evolution* does and does not say concerning theology.**

Regardless of the theological case for or against a historical Adam, science itself does not unsettle Paul's belief that Adam was a real person from whom we all descended. Therefore, any case against a historical Adam must come on its own, independent of evolution, and without claiming the authority of science.

Genealogies are not Genetic

Genetic ancestry is not *genealogical* ancestry. Incorrectly equating genetic and genealogical ancestry confuses entirely the theological implications of evolution.

First, *genetic* and *genealogical* ancestry are different concepts that follow different rules. They just work differently. *Genealogical* ancestry, therefore, does not track with (1) most recent common ancestors (MRCA), (2) mitochondrial Eve, (3) Y-Chromosome Adam, and (4) our genetic ancestors. To reiterate, these commonly referenced ancestries are different types of *genetic* ancestry are wholly different than *genealogical* ancestry (DOI 10.1016/j.itbi.2009.08.006 and DOI 10.1016/j.tpb.2015.02.002).

Second, Scripture might make *genealogical* claims, but it certainly does not make any direct *genetic* claims. We only discovered genetics recently, thousands of years after Scripture was written. It is not surprising, therefore, that the science of genetic ancestry presses in only a limited way on theology, by suggesting (along with Scripture) that there were people outside the Garden. To understand if Paul's understanding of a genealogical Adam is correct, we must look to *genealogical* ancestry, not *genetic* ancestry.

Three Surprises in Genealogies

What does the science of *genealogical* ancestry tell us?

We are need of a major rethink. Not of Adam, but we to rethink the assumptions that have shaped the theological debate to this point. Perhaps traditional accounts are not nearly as in conflict with evolution as we imagine.

We have been arguing about *genetic* ancestry for years now, without even considering *genealogical* ancestry. Our intuitions are off, so genealogies will behave in surprising ways.

The first surprise is that a large group of people are *genealogical* ancestors of all living human. We can build our intuition about this by consider a group of grandchildren that share the same grandfather. The grandfather is their common genealogical ancestor, but so also is every ancestor of the grandfather. If we consider the distant ancestors shared by their parents, we find even more genealogical ancestors. Unlike genetic ancestors (like Y-Chromosome Adam or MRCA), genealogical ancestors are very numerous.

The second surprise is that a universal *genealogical* ancestor (of all living humans) might have been *very* recent, situated as recently as 3,000 years ago. We can build our intuition about this by counting back generations while simultaneously tracking the total population and the number of ancestors we expect. First, we have two parents, then four grandparents, then eight great-grandparents. The number of ancestors appears to increase *exponentially* as we go back, however the number of people in past generations either stays *constant* or even *decreases exponentially* as we go back. How is this possible? It turns out that, very quickly, all our lines begin to cross and our genealogies collapse together (https://doi.org/10.1017/S0001867800009587). The first universal genealogical ancestor appears quickly, in just a few thousand years, but we find millions more genealogical ancestors stretching back to the first moment

homo sapiens appear, and even more before. Even in a global context, only tiny amounts of migration give us universal genealogical ancestors just 3,000 years ago (https://doi.org/10.1038/nature02842). Informally extrapolating this to all humans in recorded history, common ancestors might be situated more recently than 10,000 years ago. There are some caveats this data; it depends on precise details about migration around the globe and whether specific populations were *totally* isolated for very long periods of time.

The math here is important. Common *genetic* ancestors (like Y-Chromosome Adam) appear in about 2N generations, where N is the population size. But universal *genealogical* ancestors appear in log N generations, much quicker that we expect. The time to *genetic* versus *genealogical* ancestors starts to diverge quickly too, in about 10 to 15 generations. This explains why, for example, Y-Chromosome Adam appears 200,000 to 300,000 years ago, but a universal common ancestor might arise just 3,000 years ago. Intuition calibrated by *genetics*, therefore, will misguide us entirely regarding *genealogies*.

The third surprise is that *genealogical* ancestors far enough back are not usually *genetic* ancestors; most *genealogical* ancestors leave no genetic trace in our genome. They are genetic ghosts "who are simultaneously (i) genealogical ancestors of *each* of the individuals at the present, and (ii) genetic ancestors to *none* of the individuals at the present" (http://doi.org/10.1016/j.tpb.2015.02.002). Consequently, genealogical relationships are "essentially unobservable" in genetic data past about 10 generations (http://doi.org/10.1016/j.tpb.2015.10.008 and http://doi.org/10.1101/gr.115972.110).

Consequently, it seems impossible for genetic and archeological science to rule out the small amounts of migration and mixing that would admit common ancestors less than 10,000 years ago. The existence of recent genealogical ancestors does not mean that Adam and Eve must be recent too; perhaps they were in the distant past. If we situation Adam as far back as the rise of modern humans, about 200,000 years ago, then we *know* he was our genealogical ancestor.

Adam, therefore, is in genetic science's blind spot. It is hard to even conceive how science could possibly rule out Paul's genealogical Adam. There is no reason to doubt that Adam was a real person to whom we all trace our lineage.

Theological "Humans" in Science

Another important distinction must be made. "Human" in science and "human" in theology are not the same concepts. Equating these terms, once again, leads to confusion.

In science, "human" is defined as *anatomically modern* humans, *homo sapiens*. This is a matter of practicality because there is no way of detecting the breath of God and His Image on us. We cannot locate Adam in history, let alone determine who descends from him. Science can, however, ask if ancient bones look like those of modern humans. Alongside anatomy, paleoanthropologists identify several milestones. Roughly speaking, 200,000 years ago we first appear, 80,000 years ago we left Africa and spread across the globe, 10,000 years ago we discovered agriculture, and 6,000 years ago began recorded history.

At which point did we become the "mankind" of Scripture? And when and how did we receive God's Image? Are Neanderthals and other hominids part of mankind too? Science cannot and does not say.

In the most expansive definitions, the "mankind" of Scripture includes other hominids, like Neanderthals, Denisovans, and Nadeli. In the most restrictive definitions, the "mankind" of scripture might include only recent humans in recorded history. Which is the correct mapping between science and theology? We have neither experiment nor revelation to tell us.

In theology, we might define "human" as "Adam's descendants" or "God-Imaged and Fallen beings." If we care to think this way, the references to cities and farming in Genesis might situate the Garden less than 10,000 years ago, with the rise of civilization without any other hominids around. Or we might mirror the scientific definition (even though it be without grounding) and think of humans as all those anatomically like us. Which of these definitions is correct? Without experiment nor revelation to tell us, how could we know?

However, to demonstrate that evolutionary science rules out a genealogical Adam, we must first demonstrate (1) an indisputable correspondence between theological "mankind" and some scientifically defined group and (2) that there is no universal genealogical ancestor of this group of humans. As we have seen, this is just not possible. There is no definitive way to connect theological "humans" to a scientifically-defined group, nor is there a way to rule out a genealogical ancestor of this group.

Therefore, it is inconceivable that science could tell us that Paul is wrong about Adam. Why then would we think that evolution requires a large revision of our understanding of Adam?

Outside the Garden

What about those outside the Garden? Were they "human" too? This question raises understandable concern about some of the scenarios just presented. We do not want to settle into a view of origins that justifies racism by dehumanizing indigenous groups who might have been isolated from the rest of us. This history of racism is real and these theological concerns must be dealt with head one.

Scientifically, remember that if Adam is our genealogical ancestor, then we are justified in believing *all* those alive today are his genealogical ancestors too. Even those populations who have been isolated *genetically* for very long periods are not provably isolated *genealogically*. Remember, most genealogical ancestors are ghosts, and leave no genetic trace. It is very hard to believe there was no mixing over these large periods, and even a *single* immigrant is enough to bring everyone into the same lineage.

Theologically, we could also let Romans 5:12 guide our understanding. Perhaps the Fall also brought "death to all mankind" by bringing accountability (God's Image, knowledge of good and evil, and a sinful nature) to humans outside the Garden. In this sense, Adam might function jointly as both a *representative* of all humans, and the eventual *genealogical* ancestor of all of us too. Paul would not be wrong, and our understanding of the cosmic consequences of the Fall would be enriched.

This problem also disappears if Adam is a hominid ancestor in our very distant past, well before modern humans arise. In this scenario,

we will be outside the window in which genetic can estimate population sizes. Far enough back, perhaps 500,000 years ago or earlier, it is possible that Adam and Eve are a sole couple inside a Garden, without others outside. In this scenario, Adam falls into science's blind spot in a different way.

The status of those outside the Garden is important to consider. The mystery is in choosing the correct solutions out of many that seem to work equally well. Which one is correct? We do not know for sure, but the difficulty is an abundance of solutions.

Rethink The Debate

I wonder why so many are convinced that evolution forces us to rethink Paul's understanding of Adam. Consistent with the genetic evidence, Adam might have been a real person to whom we all trace our ancestry. Nothing in science disputes this.

How, then, did we get here? One might point to anti-evolutionism, but this is not the culprit here. Even theistic evolutionists have missed the science and theology. Against their own interests, they present a version of evolution unacceptable to many Christians. I cannot be sure, but I wonder if the culprits are incuriosity and ambivalence.

Faced with the questions in the Church, perhaps too many answered with: "we do not know and do not care." Maybe we needed more empathy, to care for *others* concerns enough to carefully understand and delimit the scientific account.

I, however, found a beautiful mystery. We do not know all the details; a very large number of scenarios are consistent with science and Scripture. What are the details? How could we know?

Facing a grand mystery, I fall into the worship of creative curiosity.

I fall into the "theologized fiction" of C.S. Lewis. Instead of clinging to a fragile theology unsettled by intelligent aliens, *The Space Trilogy* "imagined out loud" a vision of Jesus in a universe with life on other planets. Instead of grasping at fine-tuning arguments, *The Chronicles of Narnia* embraced the multiverse with a vision of Jesus too. "I am in your world," said Aslan. "But there I have another name. You must learn to know me by that name. This was the very reason why you were brought to Narnia."

Our generation needs fearless creativity. Come let us worship with curiosity, imagining new stories of Adam that give a clear vision of Jesus to our scientific world.

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