



# Evidence and Evolution

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<https://peacefulscience.org/articles/evidence-and-evolution/>



Recently, several curious religious leaders privately asked me to explain the genetic evidence supporting evolution. They found out about me through my work with the [Science for Seminaries Program](#). After several emails and conversations with these open-minded leaders, I decided to summarize my response here. In particular, be sure to check out the links to Dr. Dennis Venema's more complete explanations of the evidence for the general public: common ancestry and genetic similarity (parts [1](#), [2](#), [3](#), and [4](#)), synteny (parts [1](#) and [2](#)), pseudogenes (parts [1](#) and [2](#)), egg yolk (parts [1](#), [2](#), [3](#), and [4](#)) and hominid evolution ([hominid genetics](#)<sup>1</sup> and [chromosome 2](#)).

In my opinion, the most compelling and theologically important evidence for evolution is the genetic evidence for the "common descent of man:"<sup>2</sup> the scientific hypothesis that humans evolved from a shared ancestor with the great apes (chimpanzees, gorillas, and orangutans). **Within the framework of mainstream science, strong evidence for the common descent of man exists, but when taking God into account it is not definitive.** This is not a religious statement. It does not presume that evolution is true. And it does not end all our disagreements. And it should not be controversial.

Before summarizing the evidence supporting the common descent of man, I want to start with a story. This story is meant to reduce the fear some feel when encountering evidence that might contradict their understanding of the Bible, and is designed to show that scientific evidence is not definitive. This is the story of the scientist, the theologian, and the 100 year-old tree.

Let us imagine that God creates a fully grown tree today, and places it in a forest. A week later, a scientist and a theologian encounter this tree. The theologian believes that God is trustworthy and has clearly communicated to him that this tree was created just a week ago. The

This article is directed at religious leaders that hope to engage with mainstream science in a non-combative, creative and productive way. The controversy over science in this article is considered elsewhere, but my real interest is in how I might respond theologically to what I see so clearly in science. Please consider responding to my theological question here.

1. This link is not from Dr. Venema.

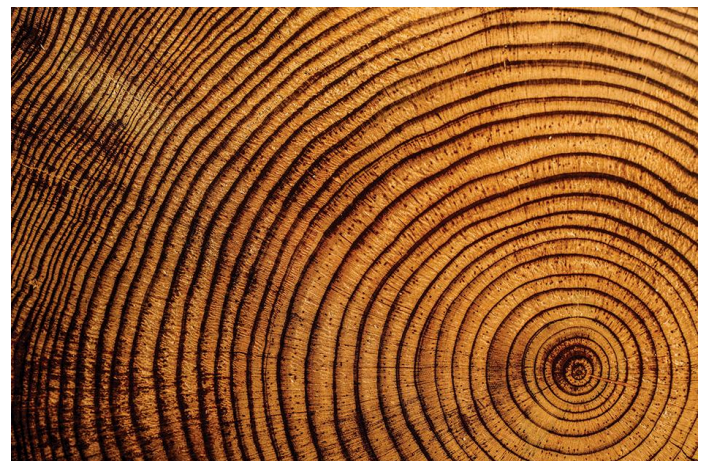
2. This is different than "universal common descent, the notion that all life shares a single common ancestor. Instead, the common descent of man focuses on the relationship with humans and apes.

scientist bores a hole in the tree, and counts its rings. There are 100 rings, so he concludes that the tree is 100 years old. Who is right? In some senses, both the scientist and the theologian are right. God created a one week old tree (the true age) that looks 100 years old (the scientific age). Moreover, it would be absurd for the theologian to deny the 100 rings that the scientist uncovered, or to dispute the scientific age of the tree. Likewise, the scientist cannot really presume to disprove God. Instead, the theologian should wonder why God would not leave clear, indisputable evidence that this 100 year-old tree is just a week old.

I tell this story because it might encourage some religious thinkers to fearlessly acknowledge the very strong genetic evidence for human evolution, even if they ultimately disagree with the common descent of man. **Currently, it appears that, for some reason, God chose to create humans so that our genomes look as though we do, in fact, have a common ancestor with chimpanzees.** If we allow for God's intervention in our history, it is possible we do not share a common ancestor with apes. Adding God into the picture, anything is possible. Still, even if evolution is wrong, God did create us to appear as if we do have a common ancestor with apes.

What is the evidence for human common ancestry with apes?

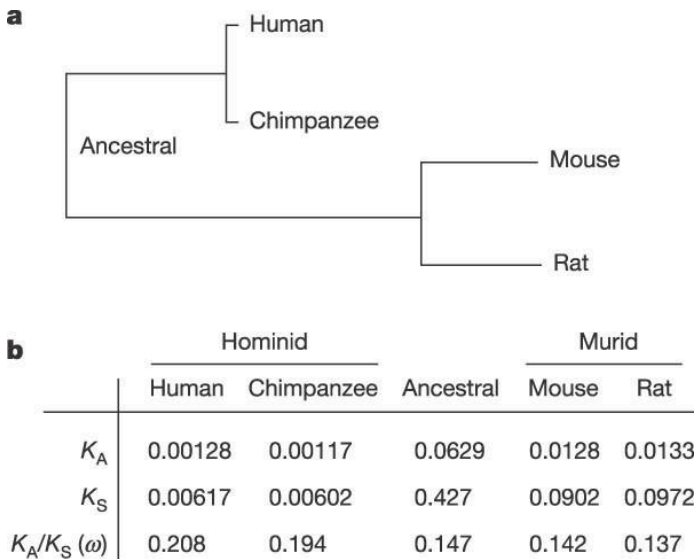
The strongest evidence is a series of stunningly discoveries in the details of human and ape genomes. This enables to scientists to perform the equivalent of a [DNA sibling test](#) between us and apes, but even more comprehensive.



This shows a trunk with several rings, each of which usually corresponds to a year of growth.

As makes sense in light of common ancestry, human and chimpanzee genomes are extremely similar (greater than 98% similarity in coding regions), much more similar than we would expect without common descent.<sup>3</sup> Remarkably, just as predicted by the fossil record and the rate at which our genomes change, humans are about 10 times more genetically similar to chimpanzees than mice are to rats.

In fact, if “microevolution” (a concept many religious leaders affirm)<sup>4</sup> can explain the similarity between rats and mice,<sup>5</sup> it is reasonable to infer it explains the similarity between humans and chimpanzees.



This remarkable figure from the first chimpanzee genome paper in 2005 [DOI: 10.1038/nature04072](https://doi.org/10.1038/nature04072), illustrates that humans are about 10 times more similar to chimpanzees than mice are to rats. Horizontal (but not vertical) length plots the genetic differences. By amino acid sequence (Ka), the comparison is 0.245% vs. 2.61% difference. By codon difference (Ka + Ks), the comparison is 1.219% vs. 18.74%. A different or better analysis would adjust these percentages, but not by much. Common ancestry predicts this by recognizing that genomes are better explained by evolutionary history than readily observable differences between species.

3. A common lawyerly objection to this evidence is that these similarities are “equally” explained by common “design.” As scientists, our response to this objection is data. Many modern creationists think that the genetic evidence shows that mice and rats share a common ancestor, even though they are 10 times less different than humans are to chimpanzees. **Starting from the genetic evidence, why is it hard to believe chimpanzees and humans are related (<1.5% codons different), when we readily accept mice and rats are related (>15% different)?** A similar pattern arises with whatever overall measure of genome similarity we choose. Of course, on the outside, not looking at our genomes, humans are very different than chimpanzees, much more different than mice are from rats. Common ancestry (in conjunction with neutral theory) predicts this discrepancy between function and genetics by recognizing that genomes are better explained by evolutionary history than readily observable differences between species; mice and rats are more different because they changed more quickly (because of their shorter generation time) for a longer period of time than humans and chimpanzees. **What design principle can explain why humans are 10 times less different than chimpanzees than mice are than rats? No one knows.** This is one reason that even overall genome similarity is considered very strong evidence for common descent. Common descent explains patterns in overall genome theory that no other known theory, not even design, can explain.

4. This is consistent with the “Orchard of Life” model that evolution is allowed within groups of the same “kind.” For example, one creation group writes “Rats may actually share ancestry in the same created kind as mice.” Follow these links at your own risk. They are all to sites that I cannot endorse.

Genetically, humans and apes are the same “kind.” We do not even need to accept “molecules-to-man” “macroevolution” to appreciate the compelling evidence for common ancestry of humans and chimpanzees. Maybe this evolutionary story is false (just like the 100 rings in the tree), and it is certainly incomplete, but it is by far the best scientific explanation of our origins.

This is just the beginning of the evidence in our genomes for common ancestry. In addition to overall similarity, there are several more precise and independent patterns clearly detectable in our genomes, all of which are predicted by the hypothesis of common ancestry but not otherwise expected. In particular, I recommend these carefully explained blog posts about common ancestry and genetic similarity (parts 1, 2, 3, and 4), synteny (parts 1 and 2), egg yolk (parts 1, 2, 3, and 4), and pseudogenes (parts 1 and 2) at BioLogos. Each of these patterns is an independent test for common ancestry, and by all these tests we clearly look as though we are related to chimpanzees through a common ancestor. This result was predicted by scientists, using the common ancestry hypothesis, and confirmed over the last decade.

Not only do human genomes look like genetically modified chimpanzee genomes, there are also several even more closely related but extinct non-humans, e.g. Neanderthals and Denisovans (see the featured image of the human child with a recreated Neanderthal). For a long time, some religious leaders have hypothesized that Neanderthals are just modern humans with diseases and Denisovans are wishful fictions based only on tiny bone fragments that are likely human. Remarkably, we can now sequence the genetic material in Neanderthal and Denisovan remains, and test if they are just modern humans or not. Confirming the predictions of scientists, these genomes look like sibling species, not modern humans (see [hominid genetics](#), [chromosome 2](#) and [mtDNA](#)).

All this evidence, and more, is why scientists say that we share a common ancestor with the great apes. It is as if they bored a hole into the tree, counted the rings, and concluded it was 100 years old. Of course, adding God back into the picture, anything could have happened. An omnipotent God could have created us 6,000 years ago. For some reason, however, He created us to look as if we are uncommonly intelligent apes, more closely related to chimpanzees than mice are to rats, as if we share a common ancestor with them.

So how does the theologian respond to this account?

Denying or ignoring the evidence serves no one. The theologian could look for an overlooked genetic signature that shows that humans were created in a special creative act of God or he could look for errors in the scientific analyses. Still, even if he found standing for quibbles here and there, the overall picture would remain the same and the evidence against common ancestry, at best, would be subtle and debatable. Even if the experts are wrong, they certainly are not ignorant. Human and chimpanzee genomes are very similar, and currently appear consistent with common descent.

5. I only mention rats and mice here, but many very similar organisms (that are the same “kind”) are just as different in their genomes as mice and rats. I leave finding more examples to the readers. Send me what you find. The common pattern: divergence time, mutation rate, and mutation mechanisms explain genome structure better than organism similarity.

Ultimately, even if errors in the scientific account are uncovered, the theologian is left with an important question: **why didn't God make it clear and obvious, in our genomes, that humans did not evolve from apes?** It would have been very easy for God to design humans with genomes that were obviously different than apes, and clearly not a product of evolution. From some reason, He did not. He did not even make us as different from chimpanzees as mice are from rats. Why not?

Perhaps, the theologian could consider the great Dietrich Bonhoeffer's assertion, "A god who let us prove his existence would be an idol." If God exists, maybe He makes Himself known another way.

Some might be concerned that God made us to look like genetically modified apes, as if we were merely the dust of the earth. Scientifically, this certainly seems true, and it seems senseless for religious leaders denying this evidence. Of course, the scientific account is not the whole story. It is an open theological question how to complete the scientific account, and theological debate surrounding this question is important and engaging. One thing all should agree on; we humans are certainly more than just apes.

## Answers to Common Questions

### Why won't you debate the science?

My purpose here is not to argue about the science. I am not interested in that debate. There are several other website devoted to arguing and explaining the reason why mainstream science has settled on evolution, and they can better serve the curious or argumentative reader.

### Doesn't design-reuse explain why humans and chimps are similar?

At a high level, just looking at the >98% similarity between humans and chimp coding regions, design is a plausible explanation.



This human and this orangutan toddler have very similar genomes, more similar than rats are to mice, that look like the product of evolution from a common ancestor. This is not the whole story, of course. Humans are so much more than that of which we are made.

However, design does not explain why humans and chimps are 10 less different than mice are from rats. Adding the information about mice and rat similarity into the analysis is a type of "positive control" that clarifies how we should interpret this data. This control makes clear that this data is consistent with common descent.

Of course, this data is consistent with design too (because God can do anything). However, I have yet to hear what design principle explains this. For example, the commonly invoked "design reuse" does not explain why the human-chimp similarity is so clearly above the positive control. Currently, I do not believe there is any design principle that explains this, though I am happy to be corrected. My critics do not provide an explanatory design principle, even when asked about it. Without even invoking the rule of methodological naturalism, which would be justified, this is strong grounds from rejecting the design argument according to the rules of mainstream science. Remember, science looks for explanations of patterns. Common descent provides an explanation, but design does not.

To be clear, overall genetic similarity (expressed as a percent) is just one line of reasoning, and only one type of evidence. I point to several additional, **independent** lines of evidence. For example, synteny and egg yolks are entirely independent signatures in our genomes for common ancestry. **We even know plausible (and even verified) biochemical mechanisms underlying most of these signatures.** This evidence is definitive using the rules of mainstream science.

Of course God can do anything, but it does not appear that leaving clear evidence against the common descent of man is one of His design goals. Why not?

### Could creation-by-modification explain this data?

There are some creationists that argue God periodically create new species by special creation in a particular way: by copying their genomes, tinkering a bit, and instantiating a new species. This possibility is raised by Reasons to Believe (RTB).

Depending on the exact manner in which God does this type of special creation, it is possible that this could explain the data. God would have to be creating us from lower species, using transformations of our genomes that are readily understandable by known biochemical mechanisms (like point mutations, chromosome fusions, neutral drift, and transposons). Is this possible? Absolutely. Perhaps it is even true. But why would God do this? Why would He choose a creative mechanism that is so easily understood through the lens of common ancestry? Why was evidence against evolution not part of His design goals? Maybe the theologians can help us here.

Evidentially speaking, this type of progressive creation might be no different than common descent, and could produce the genomes we see today. I would note, anyone who adopts this model is tacitly agreeing that evidence for common descent (without progressive creation) is strong, so strong that they have chosen a creation model to be consistent with it.

This leaves us, again, with the theological question. God could have made us to have genomes that were obviously inconsistent with common descent. He did not. Why not?

## References

- <http://scienceforseminaries.org>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/evolution-basics-genomes-as-ancient-texts-part-1>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/evolution-basics-genomes-as-ancient-texts-part-2>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/evolution-basics-genomes-as-ancient-texts-part-3>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/evolution-basics-genomes-as-ancient-texts-part-4>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/signature-in-the-pseudogenes-part-1>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/signature-in-the-pseudogenes-part-2>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/vitellogenin-and-common-ancestry-does-biologos-have-egg-on-its-face>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/vitellogenin-and-common-ancestry-understanding-synteny>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/vitellogenin-and-common-ancestry-reading-tomkins>
- <http://biologos.org/blogs/dennis-venema-letters-to-the-duchess/vitellogenin-and-common-ancestry-tomkins-false-dichotomy>
- <http://biologos.org/blogs/archive/a-geneticists-journey>
- <http://biologos.org/blogs/archive/denisovans-humans-and-the-chromosome-2-fusion>
- <http://www.dnatestingforpaternity.com/sibship-test.html>
- <http://www.talkorigins.org/faqs/homs/mtDNA.html>
- <https://www.biblegateway.com/passage/?search=Matthew+12%3A39-42%2CMatthew+16%3A4%2CMark+8%3A>
- <http://creationpacifism.org/what-is-creation-pacifism>
- <https://amazon.com/dp/0842345523/>
- <http://www.christianitytoday.com/ct/2003/aprilweb-only/4-14-41.0.html>
- <http://www.reasons.org/articles/bible-and-brains-explain-human-chimp-similarities>
- <http://swami.wustl.edu/more-than-apes>
- <http://www.reasons.org>
- <http://www.evolutionplanet.com/2009/07/deception-in-creationist-orchard.html>
- <https://answersingenesis.org/natural-selection/speciation/speciation-yes-evolution-no>
- <https://answersingenesis.org/mammals/rats-no-evolution>