Did Humans Evolve?

Alan R. Rogers

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History of evidence on human evolution

1859–1920 Comparative anatomy and embryology convince most scientists that humans evolved; essentially no hominin fossils

1920–1950 Hominin fossils discovered but misinterpreted


Misconceptions about hominin fossils

▶ There are no fossils intermediate btw apes and humans.
▶ Fossils are irrelevant because we don’t know they were our ancestors.

Recall the whale Rodhocetus

▶ Had many anatomical feature that today are found only in whales.
▶ Does not mean it was ancestral to modern whales.
▶ Means it was related to them. (Shared an ancestor.)
▶ Had legs: its ancestor was a land mammal.
▶ The ancestor of Rodhocetus (which was also an ancestor of modern whales) was a land mammal.

Conclusion: Rodhocetus tells us that modern whales derive from land mammals whether or not they derive from Rodhocetus. We approach human fossils in the same way.

Fossil hominin skulls

25 Kya 40 Kya 46 Kya

100 Kya 120 Kya 250 Kya

More hominin skulls

300 Kya 300 Kya 600 Kya

1.5 Mya 1.65 Mya 1.75 Mya
Hominins of late Pliocene, ∼2 Mya

- Had brains and bodies the size of modern chimps.
- Yet walked upright, as we do.
- Yet had curved fingers and long, powerful arms—adaptations for climbing.
- Large brow ridges, like an ape.
- Used flaked stone tools.

Intermediate, by any sensible definition.

Hominins of middle Pleistocene, ∼500 Kya

- Taller, with larger brains.
- Body proportions more like ours
- Yet brains were still smaller than ours.
- Large brow ridges, like an ape.

Intermediate, by any sensible definition.

Species names

- Humans like to group things into categories.
- Then we minimize differences within categories, exaggerate those between.
- This is why I have avoided grouping fossils into species.

Homo habilis (∼1.9–1.8 Mya)

- Originally named as a single species.
- Later split into 2 species
- Or maybe 3.
- Australopithecus or Homo?

Controversy demonstrates how truly intermediate these fossils are.
How anti-evolutionists view of hominin fossils

- There is a vast divide between ape and human.
- Each fossil is either unambiguously ape or unambiguously human.

In view of this, they ought to agree about which is ape and which is human.

How different anti-evolutionists classify hominin fossils into “ape” (A) and “human” (H).

<table>
<thead>
<tr>
<th>Creationist Publications</th>
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<tbody>
<tr>
<td>Specimen</td>
</tr>
<tr>
<td>ER 1813</td>
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<td>Java</td>
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Key: ?, couldn’t decide or changed mind.


Traces of shared ancestry

- Evolutionary history: species change and split
- Leaves a characteristic pattern in DNA: nested hierarchy
- Saw this in whales, artiodactyls, vertebrates, etc.
- Is it also true of humans, apes, primates, mammals?

Could unrelated species share transposons by chance?

- Same transposon in 2 unrelated species exceedingly unlikely.
- In 3? verging on a miracle.
- In 4, 5, or 6? No way!

Data provide strong evidence of common ancestry.
Could nested hierarchy arise by chance?

Transposon blocks:

<table>
<thead>
<tr>
<th>Species</th>
<th>Transposon</th>
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<tbody>
<tr>
<td>Human</td>
<td>○ • • • •</td>
</tr>
<tr>
<td>Bonobo</td>
<td>• • • • •</td>
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<td>Chimp</td>
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<td>Gorilla</td>
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<td>Orangutan</td>
<td>○ ○ • • •</td>
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<tr>
<td>Gibbon</td>
<td>○ ○ ○ • •</td>
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</tbody>
</table>

# of transposons: 1 7 30 15 20

Key: • present; ○ absent

Had these transposons inserted into random species, they would not have formed a nested hierarchy.

Pseudogenes: genes that no longer work

- Genes have a recognizable structure: promoter, start codon, exons, introns, splice sites, stop codon.
- If any of this breaks, the gene no longer makes protein.
- Our genomes are littered with such broken genes.

Vitamin C (ascorbate)

In a recent lecture I told you about the ψGULO pseudogene.

If we don’t need the enzyme, why do we carry the (broken) gene?

Why do other species share this broken gene?

Our copy is broken in several places. In several of these, precisely the same break occurs in other species. Why?

Summary

- There is a rich fossil record documenting the transition from ape to human.
- Skeptics of evolution cannot agree which fossil is ape and which human.
- Evidence of nested hierarchy pervades biology, including human biology.
- Pattern especially clear for transposons.
- To explain pattern without evolution requires compounded miracles.
- Pseudogenes make evolutionary sense; make no sense otherwise.