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

1950– Detailed fossil record of human evolution.

1970– Genetic evidence on human evolution.

Misconceptions about hominin fossils

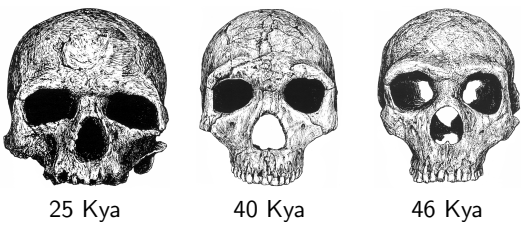
- There are no fossils intermediate btw apes and humans.
- Fossils are irrelevant because we don't know they were our ancestors.

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.

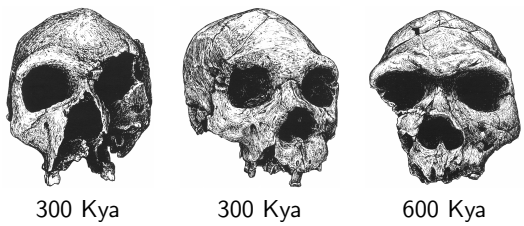
Fossil hominin skulls



25 Kya 40 Kya 46 Kya

100 Kya 120 Kya 250 Kya

More hominin skulls



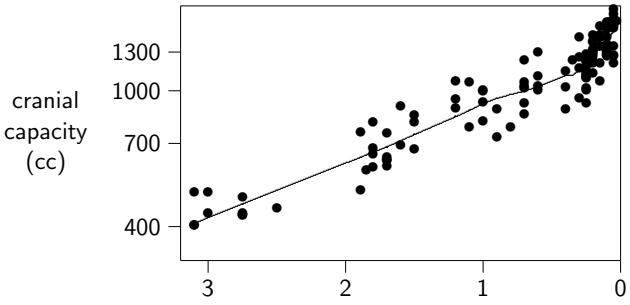
300 Kya 300 Kya 600 Kya

1.5 Mya 1.65 Mya 1.75 Mya

Still more

1.8 Mya 1.9 Mya 2.5 Mya

2.6 Mya



Cranial capacities of fossil hominins. Each symbol represents a single skull.

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).

	Creationist Publications						
Specimen	1	2	3	4–7	8–9	10–11	12
ER 1813	A	A	A	A	A	A	H
Java	A	A	H	A	A	H	H
Peking	A	A	H	A	H	H	H
ER 1470	A	A	A	H	H	H?	H?
ER 3733	A	H	H	H	H	H	H
WT 15000	A	H	H	H	H	H	H

Key: ?, couldn't decide or changed mind.

James Foley, `www.talkorigins.org`, 2008

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?

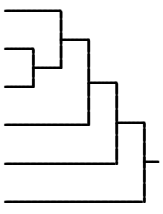
Transposons

- Stretches "junk" DNA
- Copy/paste into random spots in genome.
- Exceedingly unlikely to insert in same spot twice.
- Exceedingly unlikely ever to be lost.
- Those who share a transposon share an ancestor.
- *All* descendants of that ancestor share the transposon.

Transposon data and tree for humans and apes

Species	Transposon blocks				
Human	○	●	●	●	●
Bonobo	●	●	●	●	●
Chimp	●	●	●	●	●
Gorilla	○	○	●	●	●
Orangutan	○	○	○	●	●
Gibbon	○	○	○	○	●
# of transposons	1	7	30	15	20

Key: ●,present; ○,absent



Could unrelated species share transposons by chance?

Species	Transposon blocks				
Human	○	●	●	●	●
Bonobo	●	●	●	●	●
Chimp	●	●	●	●	●
Gorilla	○	○	●	●	●
Orangutan	○	○	○	●	●
Gibbon	○	○	○	○	●
# of transposons	1	7	30	15	20

Key: ●,present; ○,absent

- 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?

Species	Transposon blocks				
Human	○	●	●	●	●
Bonobo	●	●	●	●	●
Chimp	●	●	●	●	●
Gorilla	○	○	●	●	●
Orangutan	○	○	○	●	●
Gibbon	○	○	○	○	●
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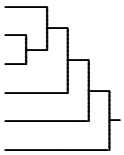

- Suppose that 1 transposon *did* insert into 2 species, 7 into 3 species, etc.
- How likely is it that these transposons would fit onto a tree?
- With whales, prob was ≈ 0 with 17 transposons.
- Our data have 73!

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.