

Study Reveals Archaic Humans May Be Our Relatives

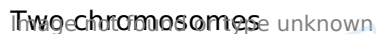
Description

Humanity is characterized by a distinctive array of cultural and genetic attributes that differentiate us from our ancient ancestors. Recent research indicates that several critical divergences may date back to an earlier period than previously believed, suggesting a closer relational dynamic between modern and archaic humans, including our extinct kin.

"Our findings advocate for the understanding that Modern and Archaic populations represent variants of an overarching human species, each having independently developed mutations and cultural advancements," writes a research team led by biologist Luca Pagani from the University of Padova, Italy.

The study meticulously examined genomic data derived from Neanderthal and Denisovan fossils alongside modern human samples, focusing on essential chromosomal rearrangements and genetic variations.

One significant alteration they explored is the [translocation](#) of the human PAR2 (pseudoautosomal region 2), a crucial exchange at the extremities of the X and Y chromosomes. This translocation occurred relatively recently in primate evolutionary history, enhancing reproductive success and genetic stability in males—traits vital for the longevity of any species.

Two chromosomes

Representation of human sex chromosomes, with PAR2 visible at the chromosomal tips. ([Kelkar et al., PLOS ONE, 2009/CC BY 2.5/Wikimedia Commons](#))

Coupled with the major reorganization leading to the formation of human [chromosome 2](#), these alterations distinguish humans from their ape and chimpanzee relatives. Tracing the lineage of today's Y chromosome reveals its last common ancestor emerged a little over 300,000 years ago, long postdating our divergence from Neanderthals.

A pivotal inquiry arises: did the transformations within the PAR2 region that heralded modern human evolution occur before or after the separation of Neanderthals and humans?

The researchers mapped genomic data against key evolutionary milestones: 1) a population bottleneck approximately 900,000 years ago; 2) the branching event leading to Neanderthals, Denisovans, and modern humans around 650,000 years ago; and 3) the genetic reintegration of Neanderthals into modern human populations about 350,000 years ago.

Genetic analysis

Illustration of genetic disparities among human species. (Pagani et al., *bioRxiv*, 2024)

The authors contend, "If one seeks a moment that signifies the inception of the human lineage, it encompasses the chromosome 2 fusion and the PAR2 translocation." They also highlighted mutations in the Y chromosome's PAR2 absent from the X chromosome, which elucidates the timing of the translocation event's common ancestor.

Significantly, the analysis revealed that the PAR2 alteration predates Event 2, the widely accepted timeline



for the divergence of Neanderthals and modern humans. Consequently, crucial genetic traits that characterize us may extend back further into history than previously acknowledged.

By synthesizing various genetic lines of evidence, the researchers assert that we can nuancedly categorize the attributes defining 'modern humans' within an evolutionary context.

In summary, the origins of traits that distinguish us as humans likely trace back nearly a million years. Since that period, multiple cycles of population expansion and contraction, alongside significant cultural influences, have contributed to our distinct separation from Neanderthals and Denisovans.

The research indicates functional variations across 56 genes distinguishing modern humans from our ancient relatives, emerging soon after Event 2; most of these traits, particularly those related to cranial and cognitive functions, were not reintroduced to Neanderthals during their interbreeding with *Homo sapiens* in Event 3.

This may result from population dynamics or sociocultural structures, prompting renewed contemplation concerning the extent of our divergence from Neanderthals. While this study does not provide unequivocal answers addressing our distinctions or delineating human species classifications, it intimates that our shared heritage with archaic humans is more substantial than traditionally perceived, warranting a reassessment of these distinctions.

Although still pending peer review, the study is accessible on the preprint server [bioRxiv](https://www.biorxiv.org/).

Vocabulary List:

1. **Divergence** /dɪˈvɜːr.dʒəns/ (noun): The process or fact of diverging or differing.
2. **Translocation** /ˌtrænz.ləʊʃən/ (noun): The act of moving something from one place to another especially in genetics.
3. **Advancement** /ədˈvæns.mənt/ (noun): An improvement or development in a particular field.
4. **Reintegration** /ˌriː.ɪn.tɪˈɡreɪ.ʃən/ (noun): The process of incorporating something back into a system.
5. **Heralded** /ˈher.əldɪd/ (verb): To signal the approach of or to proclaim.
6. **Nuanced** /ˈnuː.ɑːnst/ (adjective): Characterized by subtle differences or distinctions.

Comprehension Questions

Multiple Choice

1. According to the text, what does recent research suggest about the divergences between modern and archaic humans?



- Option: They date back to a later period than previously believed
- Option: They confirm no relation between modern and archaic humans
- Option: They indicate a complete separation between the two groups
- Option: They are still not fully understood

2. What is the significance of the translocation of the human PAR2 region mentioned in the text?

- Option: Enhancing reproductive success and genetic stability in males
- Option: Enhancing reproductive success and genetic stability in females
- Option: Leading to the extinction of modern humans
- Option: Causing chromosomal abnormalities

3. When did the researchers suggest the inception of the human lineage occurred?

- Option: During the population bottleneck approximately 900,000 years ago
- Option: During the genetic reintegration of Neanderthals into modern human populations about 350,000 years ago
- Option: During the branching event leading to Neanderthals, Denisovans, and modern humans around 650,000 years ago
- Option: During the chromosome 2 fusion and the PAR2 translocation

4. What did the analysis reveal about the PAR2 alteration in relation to the timeline of Neanderthal and modern human divergence?

- Option: It postdates the divergence of Neanderthals and modern humans
- Option: It predates the divergence of Neanderthals and modern humans
- Option: It coincides with the divergence of Neanderthals and modern humans
- Option: It has no relation to the divergence of Neanderthals and modern humans

5. According to the text, what traits distinguish modern humans from their ancient relatives?

- Option: Physical appearance only
- Option: Genetic variations only
- Option: Cultural advancements only
- Option: Functional variations across 56 genes

6. What conclusion can be drawn from the text regarding the extent of divergence between modern humans and Neanderthals?

- Option: There is no substantial evidence of divergence
- Option: The divergence is significant based on genetic and cultural traits
- Option: Modern humans are identical to Neanderthals
- Option: The divergence is solely based on physical appearance



True-False

7. The research suggests that the PAR2 alteration occurred after the separation of Neanderthals and humans.
8. Neanderthals and modern humans shared most of the genetic traits defining modern humans.
9. The study conclusively states that ancient humans did not contribute to the modern human gene pool through genetic reintegration.
10. The PAR2 alteration in human evolution coincides with the branching event leading to Neanderthals, Denisovans, and modern humans.
11. The text suggests that a population bottleneck occurred before the genetic reintegration of Neanderthals into modern human populations.
12. The study provides definitive answers on the distinctions and classifications of human species.

Gap-Fill

13. The fusion of chromosome 2 and the translocation of the PAR2 region are considered significant moments in the inception of the human lineage, occurring about _____ years ago.
14. The research mapped genomic data against key evolutionary milestones, including a population bottleneck approximately _____ years ago.
15. Modern humans are characterized by functional variations across _____ genes that distinguish them from their ancient relatives.
16. The research indicates that the PAR2 alteration predates the widely accepted timeline for the divergence of Neanderthals and humans, which occurred approximately _____ years ago.



17. According to the text, the divergence of Neanderthals and modern humans dates back to about _____ years ago.

18. The analysis of the Y chromosome revealed that its last common ancestor emerged over _____ years ago.

Answer

Multiple Choice: 1. They date back to a later period than previously believed 2. Enhancing reproductive success and genetic stability in males 3. During the chromosome 2 fusion and the PAR2 translocation 4. It predates the divergence of Neanderthals and modern humans 5. Functional variations across 56 genes 6. The divergence is significant based on genetic and cultural traits

True-False: 7. False 8. False 9. False 10. False 11. True 12. False

Gap-Fill: 13. 300,000 14. 900,000 15. 56 16. 650,000 17. 350,000

Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What is the act of refraining from indulging in something?

- Option: Sobriety
- Option: Deteriorate
- Option: Renewed
- Option: Exacerbation

2. Which term is related to mental processes such as thinking learning and understanding?

- Option: Self-efficacy
- Option: Divergence
- Option: Catalyze
- Option: Perception

3. Which word means to burst or break out suddenly?

- Option: Susceptible
- Option: Accelerates
- Option: Erupted
- Option: Advancement



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4. What term describes something that has subtle differences or shades of meaning?
- Option: Reintegration
 - Option: Heralded
 - Option: Nuanced
 - Option: Intrigue
5. What term is used to describe an observable fact or event?
- Option: Elusive
 - Option: Catalyze
 - Option: Altered
 - Option: Phenomenon
6. Which word refers to finding something for the first time?
- Option: Paleontological
 - Option: Discovery
 - Option: Excavation
 - Option: Trackway
7. What term means happening by chance rather than intention?
- Option: Interactions
 - Option: Fortuitous
 - Option: Translocation
 - Option: Advancement
8. What term describes the back-and-forth action or influence between two or more entities?
- Option: Interaction
 - Option: Susceptible
 - Option: Divergence
 - Option: Altered
9. Which word describes something that is difficult to capture or achieve?
- Option: Elusive
 - Option: Catastrophic
 - Option: Heralded
 - Option: Accelerates
10. What term refers to the state of being sober or abstaining from alcohol?
- Option: Erupted
 - Option: Sobriety
 - Option: Translocation
 - Option: Advancement



Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. Leaving a machine unused for a long time can cause it to _____.
12. The use of fertilizers _____ the growth of plants.
13. In plants the movement of sugars within the phloem is called _____.
14. Technological _____ has revolutionized the way we communicate.
15. The earthquake had a _____ impact on the city causing massive destruction.
16. After the conflict there was a _____ effort to rebuild the war-torn country.
17. The new scientific discovery was _____ as a major breakthrough in the field.
18. The stress of the situation led to an _____ of her existing health issues.
19. The program aims to support the _____ of ex-convicts into society.
20. The movie's plot was filled with twists and turns that added an element of _____.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. Certain individuals may be more to allergies due to genetic factors.
22. The artist's style showed a clear from traditional painting techniques.
23. The new regulations aimed to innovation in the industry.
24. The experimental treatment the DNA of the cells.
25. The archaeological team conducted an extensive of the site.
26. The fossilized footprints formed an ancient through the mud.
27. Building can help individuals tackle challenges with confidence.
28. Individuals may have different of the same event based on their background.



29. The migration patterns of birds are a natural studied by biologists.

30. Nutrients are transported within the plant through the process of .

Answer

Multiple Choice: 1. Sobriety 2. Perception 3. Erupted 4. Nuanced 5. Phenomenon 6. Discovery 7. Fortuitous 8. Interaction 9. Elusive 10. Sobriety

Gap-Fill: 11. Deteriorate 12. Accelerates 13. Translocation 14. Advancement 15. Catastrophic 16. Renewed 17. Heralded 18. Exacerbation 19. Reintegration 20. Intrigue

Matching sentence: 1. Susceptible 2. Divergence 3. Catalyze 4. Altered 5. Excavation 6. Trackway 7. Self-efficacy 8. Perception 9. Phenomenon 10. Translocation

CATEGORY

1. Sci/Tech - LEVEL5

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