New genetic data shows humans and great apes diverged earlier than thought

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Male silverback Gorilla in SF zoo. Image: Wikipedia.

(Phys.org) -- In trying to figure out when humans and apes diverged, researchers have had to rely on fossil evidence and the rates of mutations that occur when both groups propagated their species. The problem is, up till now, most of that data can from the analysis of human genetic evidence which was then applied to both humans and apes, which could of course have led to errors as it's based on guessing that mutation rates in apes are the same as humans. Now, to get around that problem, a team of researchers has gathered genetic data from both chimpanzees and gorillas and has found, as they describe in their paper published in the *Proceedings of the National Academy of Sciences*, that it appears that the two diverged some time earlier than has been thought.

To calculate when a species diverged, researchers look at the average age of members of the species when they give birth and mutation rates. The older the average age, the more time it takes for mutations to cause changes. Insects that produce offspring in a matter of months, for example, can adapt much more quickly to environmental changes than large animals that produce offspring many years after they themselves are born. To find such data for both chimps and gorillas, the research team worked with many groups in Africa that included studies of the animals that totaled 105 gorillas and 226 chimps. They also looked at fossilized excrement that contained DNA data. In so doing they found that the average age of giving birth for female chimps was 25 years old. They then divided the number of mutations found by the average age of birth to get the mutation rate. In so doing, they found it to be slower than humans, which meant that estimates based on it to calculate divergence times were likely off by as much as a million years.

The end result of the team's research indicates that humans and chimps likely diverged some seven to eight million years ago, while the divergence of gorillas (which led to both humans and chimps) came approximately eight to nineteen million years ago. To put the numbers in perspective, humans and Neanderthals split just a half to three quarters of a million years ago.

The team suggests their research model could also be used to find the divergence points of other species as well, so long as a genetic record can be obtained.

More information: Generation times in wild chimpanzees and gorillas suggest earlier divergence times in great ape and human evolution, *PNAS*, Published online before print August 13, 2012, doi: 10.1073/pnas.1211740109

Abstract

Fossils and molecular data are two independent sources of information that should in principle provide consistent inferences of when evolutionary lineages diverged. Here we use an alternative approach to genetic inference of species split times in recent human and ape evolution that is independent of the fossil record. We first use genetic parentage information on a large number of wild chimpanzees and mountain gorillas to directly infer their average generation times. We then compare these generation time estimates with those of humans and apply recent estimates of the human mutation rate per generation to derive estimates of split times of great apes and humans that are independent of fossil calibration. We date the human–chimpanzee split to at least 7–8 million years and the population split between Neanderthals and modern humans to 400,000–800,000 y ago. This suggests that molecular divergence dates may not be in conflict with the attribution of 6- to 7-million-y-old fossils to the human lineage and 400,000-y-old fossils to the Neanderthal lineage.