Evidence for Evolution- Chromosomal Fusion

In this article I'm noting down a vastly summarized piece of evidence that supports the Theory of Evolution. For more information see the links at the bottom.

The Theory of Evolution argues that we share a common ancestor with chimpanzees, then gorillas, then orangutans like so:

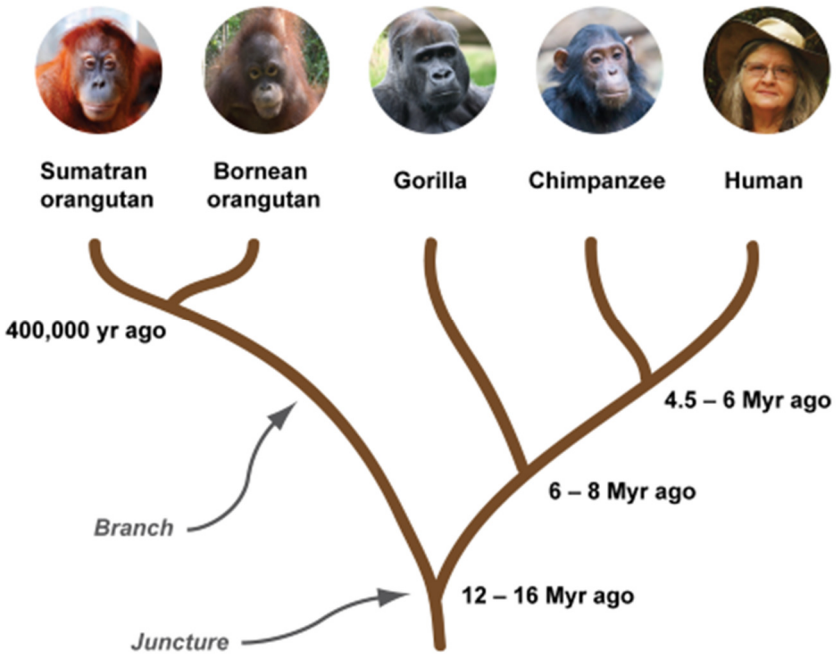

fig.1

To test this claim / hypothesis scientifically, we should find *genetic* similarities between them and ours (that's what **common ancestory** means). Like so in fig.2.

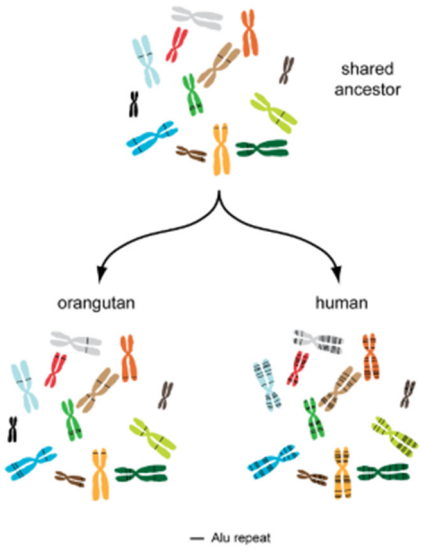

fig.2

Great! So let's see how this compares by looking first at the basic level of genetics: the number of chromosomes with the other primates:

- Human (Homo): **46** chromosomes (23 pairs)
- Chimp (Pan): 48 chromosomes (24 pairs)
- Gorilla (Gorilla): 48 chromosomes
- Orangutan (Pogo): 48 chromosomes

We see here that there is a **TRUE POTENTIAL** to disprove evolution: we have 2 fewer chromosomes than the other modern primates ...

So where did the pair of chromosomes go, one may ask ? If evolution happened and we share a common ancestor with other primates we should be able to give a reasonable, testable and falsifiable explanation for this:

1) Could it just **lose 1 whole chromosome pair** through the lineage?

- No, that would be lethal ! Every chromosome contains vital DNA for the organism.

2) The common ancestor has 46 chromosomes and carry a split chromosome

- No, chimps, gorillas, orangutans all carry 48 chromosomes and are all the most similar to us genetically.

3) The claimed common ancestors all having 48 chromosomes, could 1 pair of chromosomes have fused into 1 chromosome?

- If this happened, we should **observe** this fusion and **test** if this is in fact a fusion (that it's a non-random occurrence).
- A fusion occurrence is, by the way, totally compatible with the notion of producing fruitful offspring (but this is a different study all together).

-> IF WE DON'T OBSERVE A PLAUSIBLE FUSION, HUMAN EVOLUTION AS PROPOSED THROUGH A COMMON ANCESTOR WITH THE CHIMP IS DISPROVED AND THEREFORE REFUTED.

So how do we go about testing this? First of all, let's briefly introduce some basic DNA terminology. DNA is made up from base-pairs: A-T , T-A , C-G and G-C. A always to T, and C always to G. Basically the whole genome (whole DNA of an organism) is made up of these 4 letters. The letters correspond to molecules which are exactly the same in all living beings on earth. A stands for Adenine for example.

DNA being a double helix of base-pairs, are rolled up around specific molecules (**Histones**) into tight pakackages (**Nucleosomes**). These coil up to form what we call **chromosomes**. Like so:

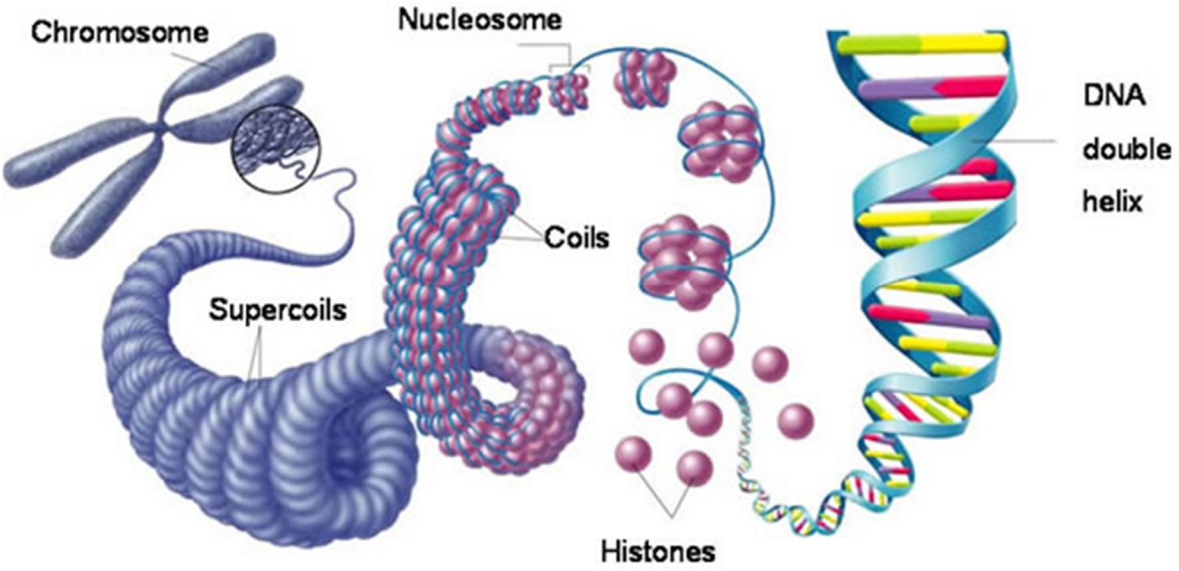

fig.3

Chromosomes form an 'X', the X consists of 2 identical chromatids being held together by a **centromere (green in fig.4)**. Chromosomes contains little regions of valuable information (DNA code) which are called **genes (blue in fig.4)**. Centromeres are used during cell splitting to easily split the chromosome in 2 exact copies, 1/2 for each cell. After splitting, the chromatid generates another identical chromatid for future splitting.

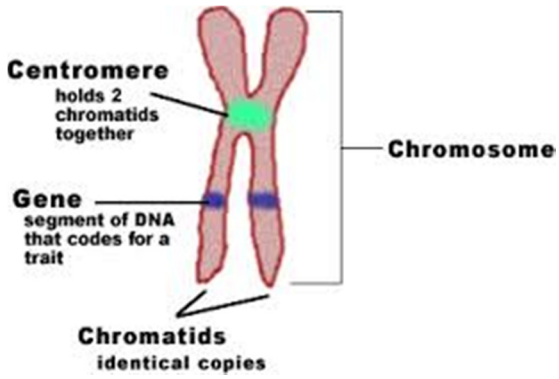

fig. 4

In summary: Chromosomes are marked (with DNA code) to signify different parts of a chromosome: genes, centromeres but also the chromosome endings called **telomeres.** See fig.5

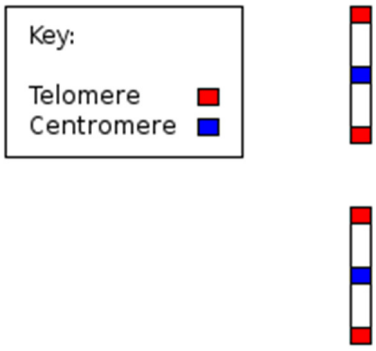

fig.5

Telomeres are a repetition (in humans up to 2500 times) of code "TTAGGG" or "AATCCC" to signify the chromosome endings. It's important to stress *the fact that telomeres are supposed to be found in the endings of chromosomes, not somewhere else.* The same applies to centromeres, where they should only be situated where the chromatids join together.

Going back to the common ancestor claim, if a pair chromosome got fused we would find a human chromosome, similar to fig.6, with a fused area on the chromosome containing telomere code (where they shouldn't belong) and the rest containing DNA code corresponding to centromeres on the predictable 'height' or base number.

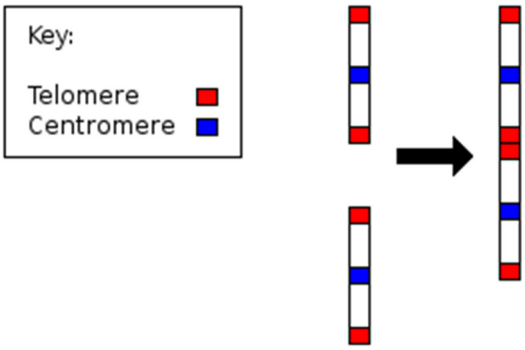

fig.6

We can sequence the whole genome of chimpanzees and humans and compare them, letter by letter and guess what.
We found the chromosome, it's human chromosome #2 that is a result of fusion between chimp chromosome #2A and #2B. To illustrate which chromosomes see fig 7. [3]

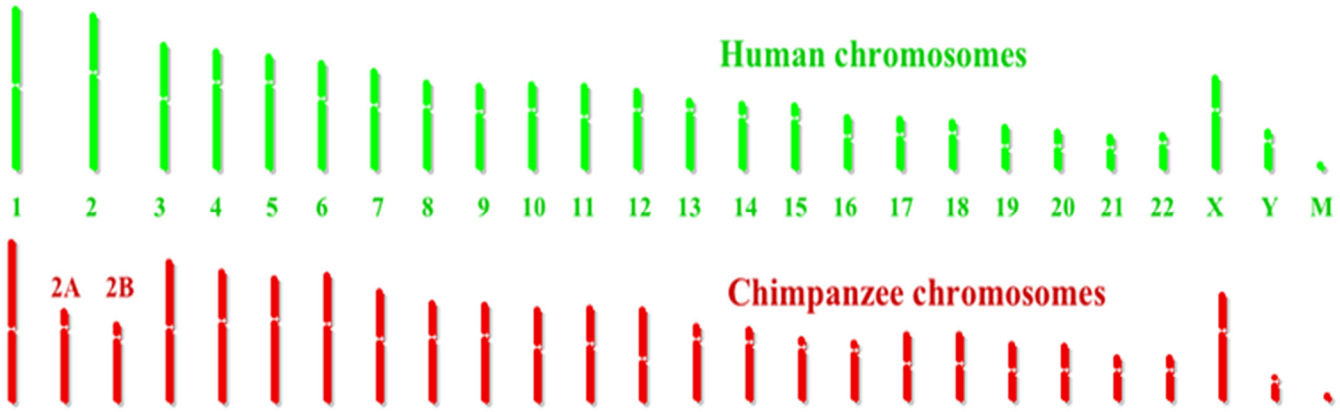

fig.7

Ofcourse, not only do the telomeres and centromeres correspond to each other, the **genes** on the chimp chromosomes (2A and 2B) ALSO correspond to chromosome #2 as a result of fusion. An illustration of this is depicted in fig.8.

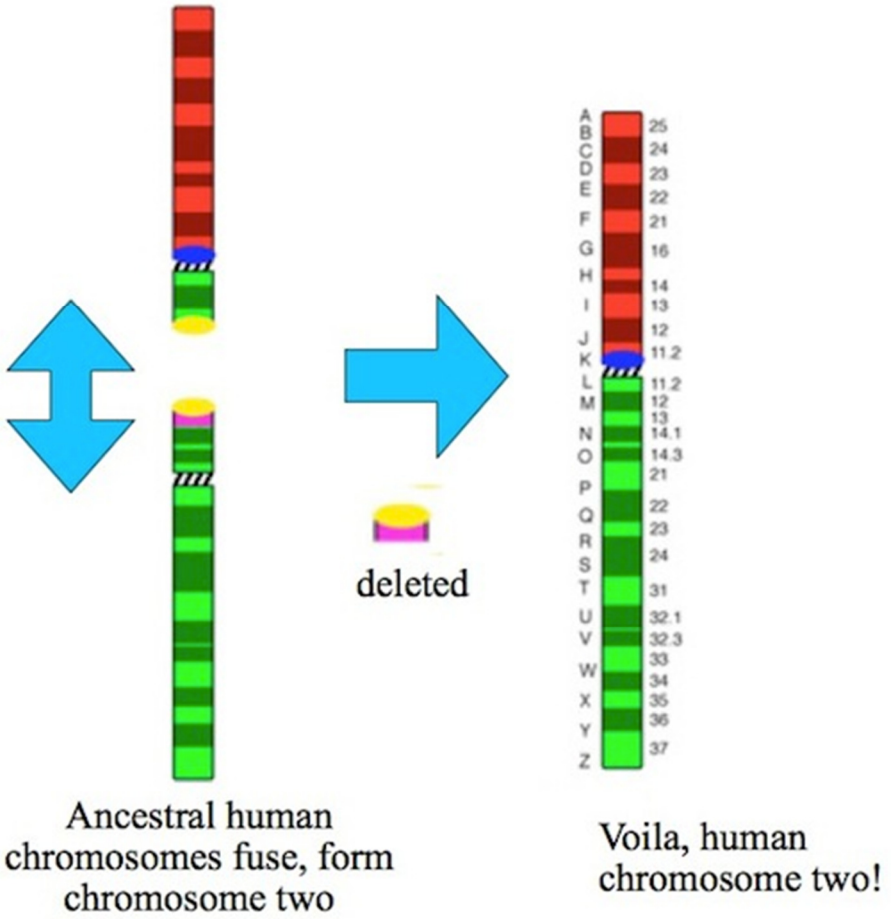

fig.8

These telomeres, centromeres and genes are not located merely by visually comparing chemical coloration of the chromosomes like in fig.9 but by exact, letter-to-letter comparison between human and chimp DNA.

Apart from the 48 and 46 chromosome difference (which is accounted for by proposing fusion and verifying it) the human DNA is for 96% identical to the chimp DNA, where 4% is making us humans all unique. This supports the Theory of Evolution instead of being evidence against it.

fig.9

Summary:

The Theory of Evolution claims humans and chimpanzees to have a common ancestor, which would mean their DNA is [very] similar to each other. Just like parents' DNA is similar to their children, but less similar to a person in Asia and even less similar to a primate with a common ancestor, we should find these similarities between other primates which would **support** the claim of common ancestry.

This claim would largely be true (96% identical DNA) if not for the chromosome difference between chimps (48 chromosomes) and humans (46 chromosomes). However the theory of evolution, claiming common ancestry, predicts a fusion between chromosomes. This fusion is found by letter-to-letter comparison between the human and chimp DNA *confirming the claim* that human chromosome #2 is a result of fusion between common ancestor chromosome #2A and #2B. The identification of the fusion comes from identifying telomeres and centromeres where they don't belong 'naturally' (but would so if fusion happened) and genes corresponding [almost] exactly to the chimp's chromosomes #2A and #2B.

This is of course only one piece of dense evidence for the Theory of Evolution which claims among others a common ancestry between humans, chimps and the other primates.

Sources / further reading:

https://youtu.be/d4r2J6Y5AqE (30-35 min)-
http://blogs.discovermagazine.com/loom/2012/07/19/the-mystery-of-the-missing-chromosome-with-a-special-guest-appearance-from-facebook-creationists/#.VkYAt_kvciU
[3] http://www.nature.com/nature/journal/v434/n7034/abs/nature03466.htm