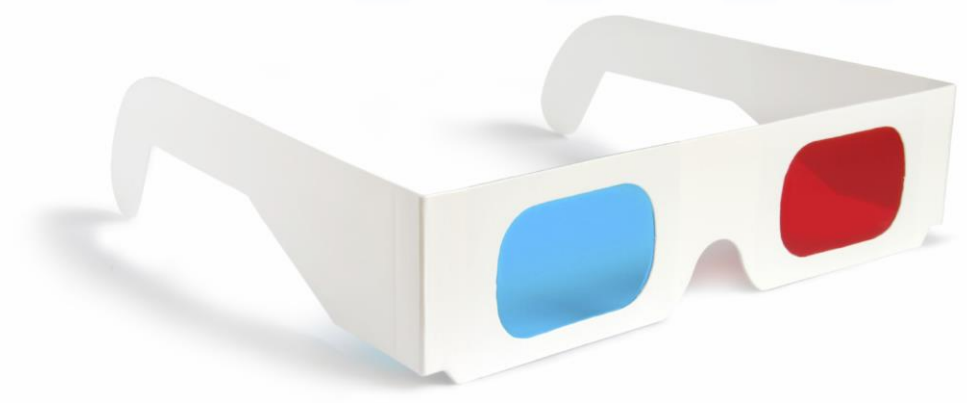
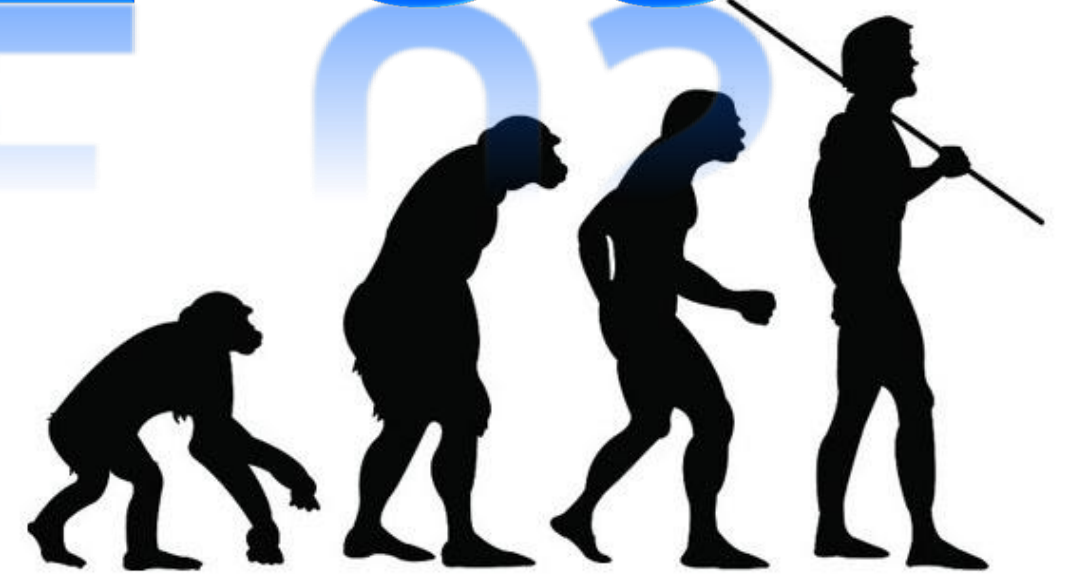


THE DINOSAURS INSIDE US

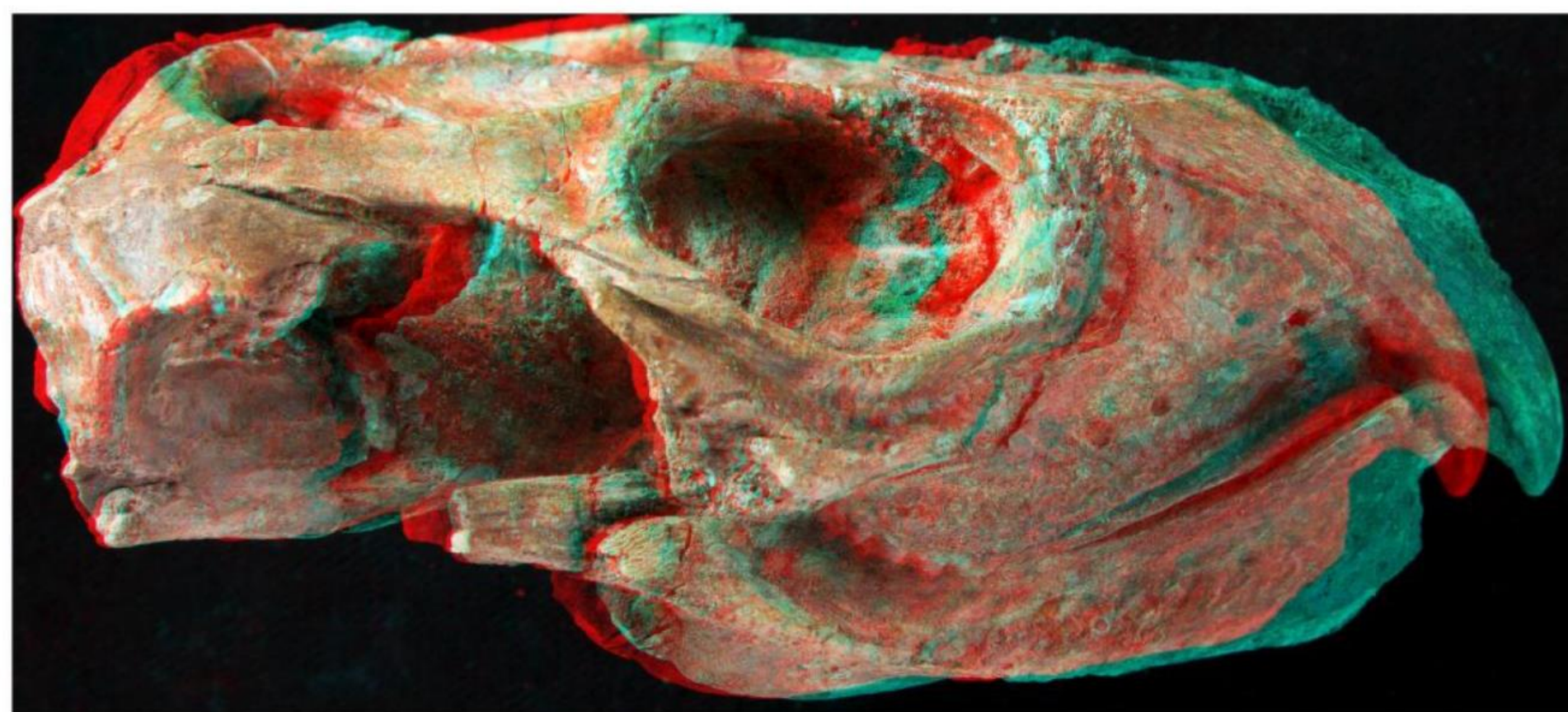


AND OTHER FREAKY FACTS!

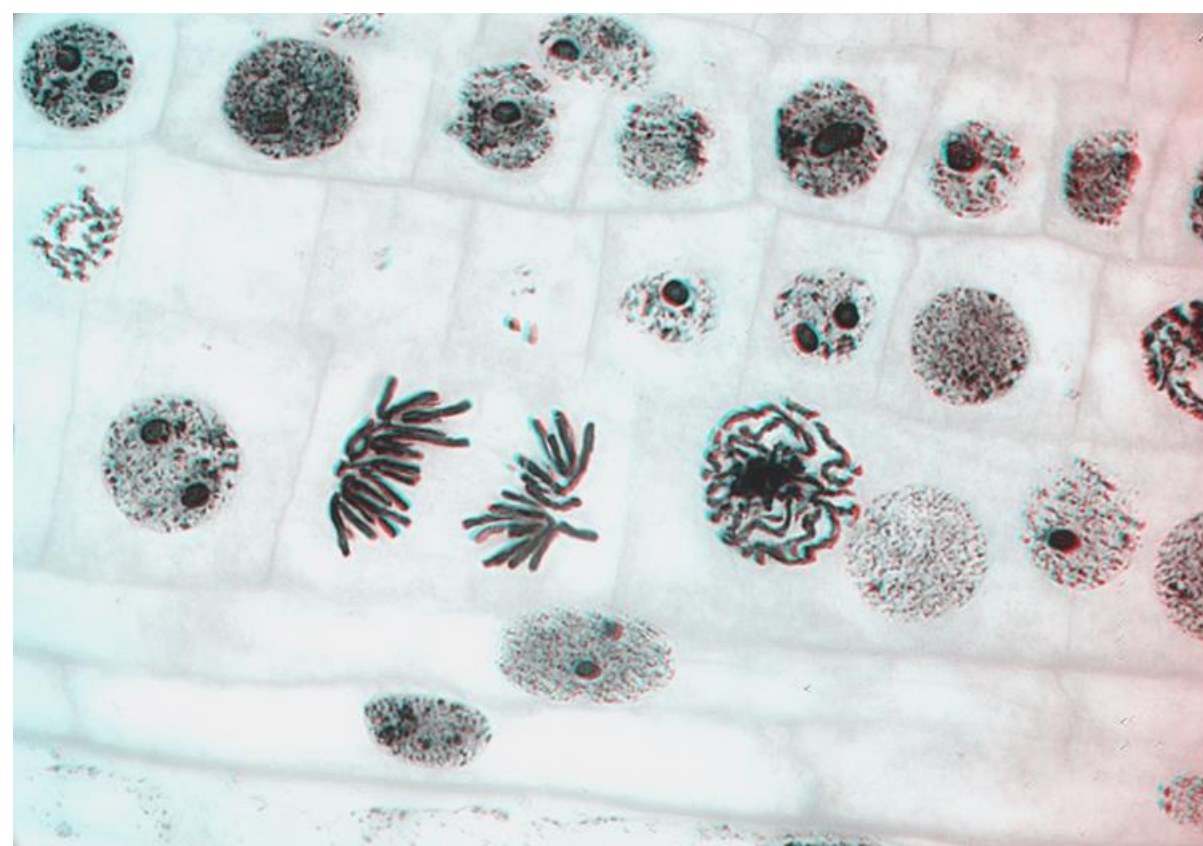


Did you know?

- **Fossils** are the preserved remains or traces of organisms from the remote past.
- Fossils are can be found in **living things**
- Dinosaur fossil bones may contain soft tissue, including cells, preserved for many millions of years!



Plant and animal cells contain DNA. Thick bundles of DNA called **chromosomes** are found in the nucleus of cells.

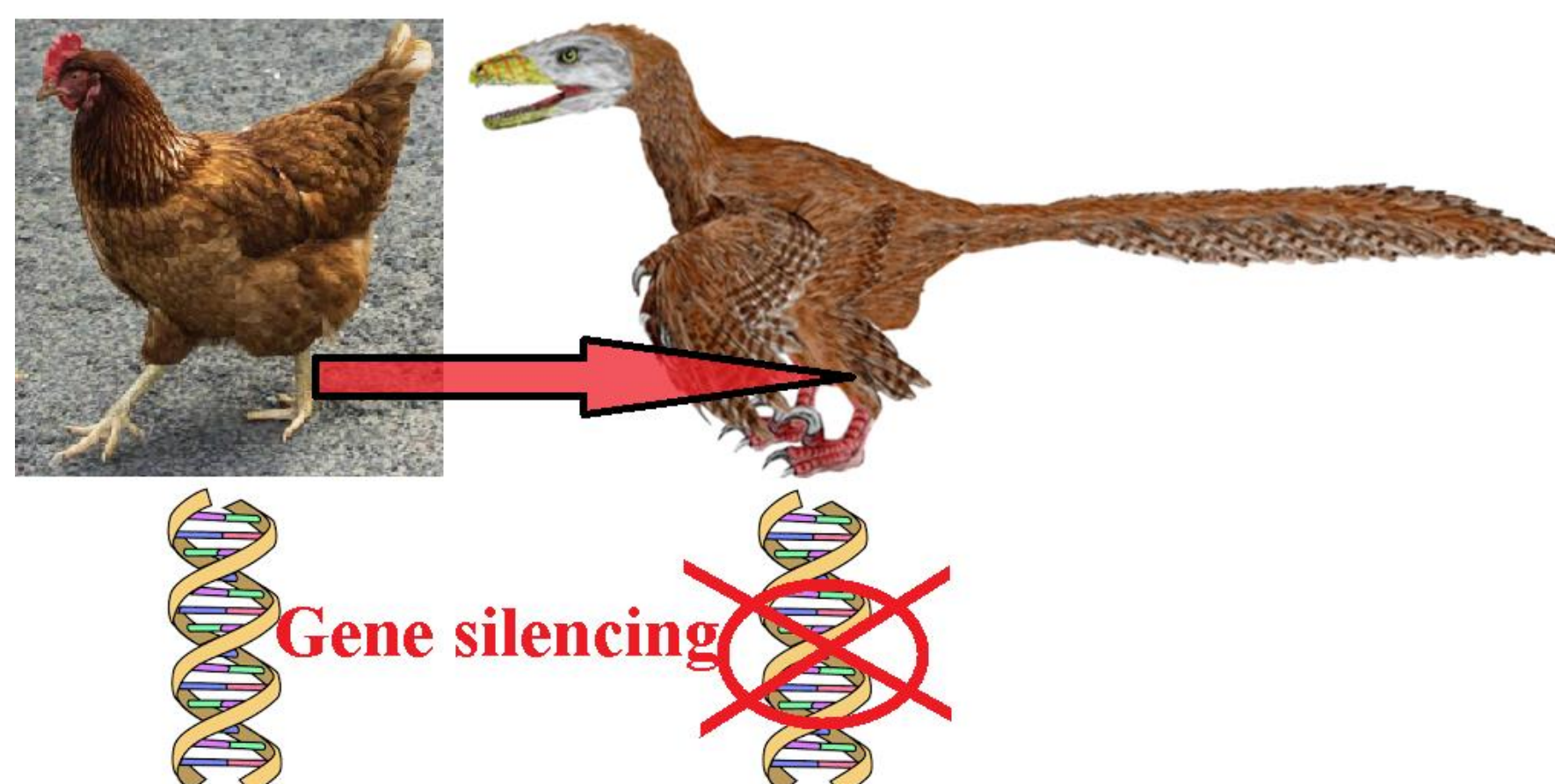


The DNA in chromosomes (the thick threads in the cells above) stores information not just to build the cell, but the entire set of instructions (the **genome**) to make the whole plant or animal.

The DNA from just one cell could, in theory, be used to reproduce the entire living thing it came from. Finding preserved tissues, that might include cells, in dinosaur fossils is a new area of research.

But there is another source of ancient fossil DNA...in the genomes of living things we see today!

Reversing evolution - birds to dinosaurs



A dinosaur-like lower leg was created on a chicken by Brazilian researcher João Botelho. He found that when a maturation gene called Indian Hedgehog was “switched off” or silenced the resulting chickens kept a tubular fibula as long as the tibia and connected to the ankle, just like a dinosaur.

Prior to this Botelho had managed to undo the evolution of the perching toe of birds, to produce a non-twisted, non-opposed toe, as in dinosaurs, and another lab at Yale obtained a dinosaur-like snout by altering gene expression in embryonic chickens.

De-extinction?

De-extinction, also called resurrection biology, is the process of resurrecting species that have died out, or gone extinct.

Scientists and governments are now planning for the controlled de-extinction of plants and animals.

One bird of interest in New Zealand is the Moa; part of its genetic code is embedded in the image below:

```
taattaaacg tateccaca aaataaatta atcggaggagg agaaggaggg ggaagaaga  
agaatcaatg agacatctct actaaagaag ccccccccta ccccccccta ctataatcgt  
attaaatgta ttatagtaca ttccctgcat tggctcatat ccaacacac atcagtgca  
atcgaagacc ataatctat cacttatata cctaaagtgc acacagaga ggtgaaggta  
ccgtactgt tcaaatctgc cttaacctct attctctgta tacaaatct ctatgcagtgc  
gtatcagatg gatttttga ttccccctct cagagaacac cagacaccc gtgcataaac  
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cagactaac tatgacata ggaatataa tctataaagc agtaattatg aagcccttc  
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tcagcaacca acaagattg aggtatgc ctcacagc actagattt aagcgcagc  
aggttaacag aggtctaac tctcttgc aataatcaa tgaattgat ctcctgtgc  
atgcaccaa actataac tctcagac cacaatctc gcaactgg tctcattt  
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cataatcac cttacttat cctatatac cgtgtacc atcttagtg cagtgctt  
cgttggtca ttgcgttac ttaacctgt cgcagacgga gtaaacctc tcataaaga
```

In 2013, as part of a "Lazarus Project" to bring the Australian gastric-brooding frog back from extinction, scientists succeeded in producing early stage cloned **embryos** containing the DNA of the frog, which died out 30 year ago. Gastric-brooding frogs were unique in incubating their young in their stomachs.

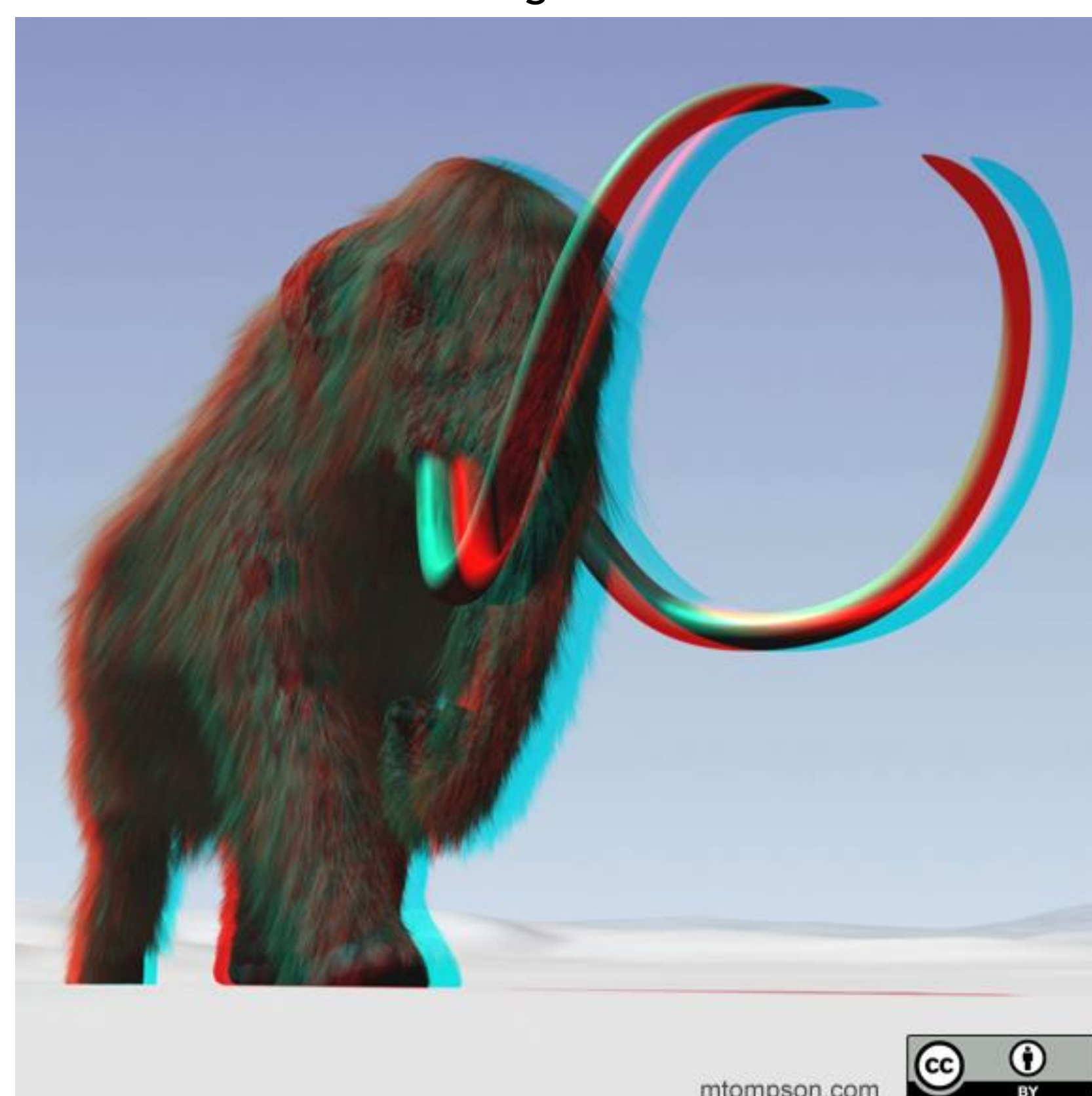
In 2016 the International Union for Conservation of Nature issued its first official set of guidelines on resurrecting extinct species.

"Are we doing it to create a zoo or recreate nature?" asked co-author Benjamin Halpern.

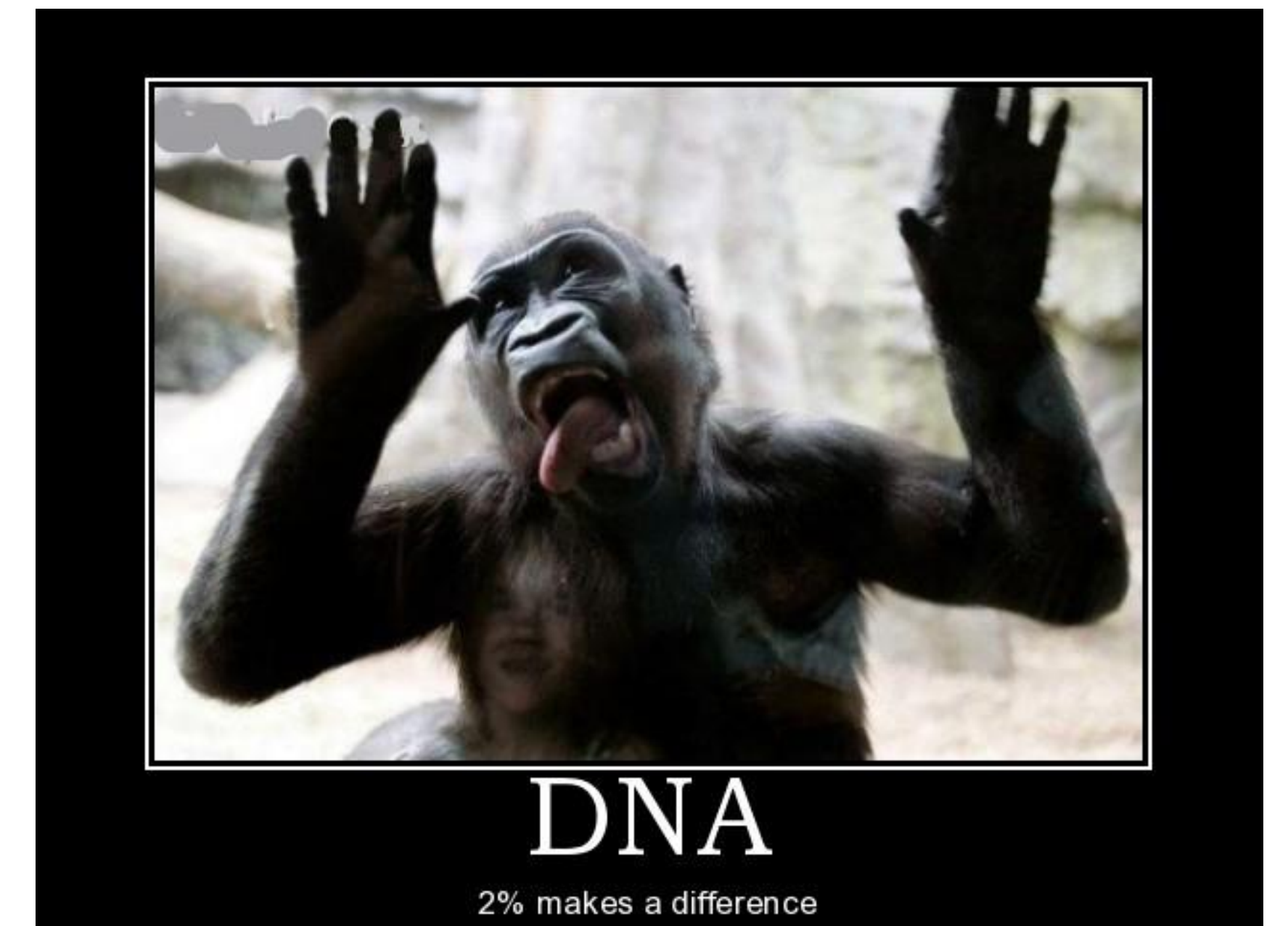
Two of the recommendations for restoring ecological function through de-extinction included:

- Resurrecting recently extinct species rather than those that disappeared thousands of years ago. These creatures may fit more seamlessly into their ecosystems because there has been less time for change to occur.
- Choosing animals whose ecological jobs are truly irreplaceable.

In 2013 researchers from around the world gathered at a TEDx DeExtinction event to discuss progress and plans to 'de-extinct' animals and plants. Possible candidate species included the woolly mammoth, dodo, Cuban red macaw and New Zealand's giant moa.



Viruses made us human

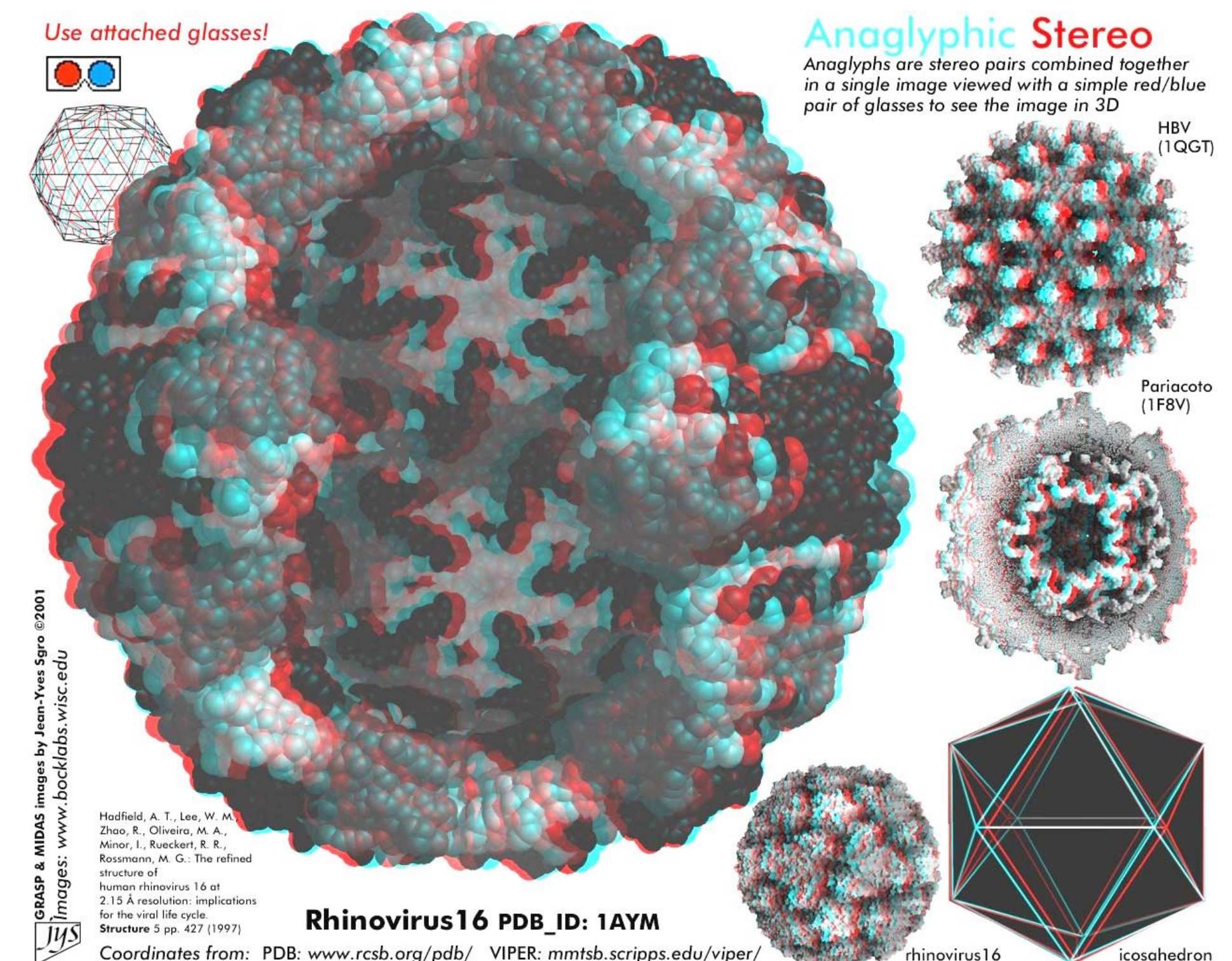


It is often mentioned that human DNA is 98% similar to chimpanzee DNA. The 2% difference is important!

If you think your DNA is all human, think again. Nearly 8% of the mammalian genome is made up of vestiges of ancient viral infections, or **endogenous retroviruses**.

New research reveals the ancient viral DNA switches on genes responsible for initiating an immune response. When removed, the innate immune system -- a first-responder to infection by pathogens including viruses -- does not function properly. The study shows that viral DNA provides novel and useful functions in our body by helping us fight infections (see the 3D anaglyph below).

Genes inherited from ancient retroviruses are also essential to the placenta in mammals. Scientists have now revealed a new aspect of this astonishing story: ancient viral genes in our DNA may also be responsible for the more developed muscle mass seen in males.

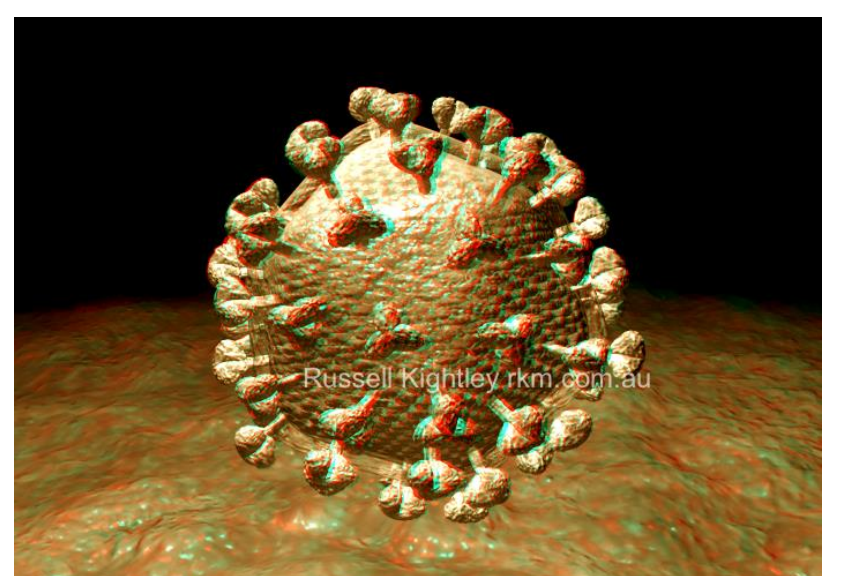


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