Human Evolution: Crash Course Big History #6

Crash Course: Big History
https://youtube.com/watch?v=UPggkvB9_dc
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Hi, I'm John Green. Welcome to Crash Course: Big History Project where today we're going to talk about the Planet of the Apes films - What's that? Apparently, those were not documentaries.
But there was an evolutionary process that saw primates move out of East Africa and transform the earth into an actual planet of the apes... The apes are us.

And then *we* made a movie and then some prequels and some sequels and some reboots and now sequels to the reboots.
Man, I can't wait until I get to see the 2018 reboot of this episode of Crash Course: Big History I hear they get James Franco to play me.

(Intro)

0:42 So we're about halfway through our series and after five episodes involving no humans whatsoever today we are finally gonna get some people.
Mr. Green, Mr. Green! Why are we already at humanity, I mean if we're covering 13.8 billion years shouldn't humanity come in like, the last two seconds of the last episode? I mean humans are totally insignificant compared to the vastness of the universe, like we should be checking in on how Jupiter's doing.
Fair point, me from the past; Jupiter by the way, still giant and gassy.

There's two reasons why we focus a little more on humanity in Big History; the selfish reason is that we care about humans in big history because *we* are humans.
We are naturally curious to figure out where we belong in the huge sequence of events beginning with the big bang. Secondly, humans represent a really weird change in the universe. I mean, so far a we know, we are one of the most complex things in the cosmos.

Whether you measure complexity in terms of biological and cultural building blocks or networks or connections, I mean, we're kind of amazing! Now I realize that many of our viewers will be offended by our human-centric bias, but humans are amazing. I mean, we invented the internet and we invented animated GIF and we invented Dr. Who and *then* we invented Tumblr, a place where all of these things can come together!
So 65 million years ago, catastrophe wiped out the dinosaurs and we saw the adaptive radiation of a tiny shrew-like ancestor of humans that would look more at home like, next to a hamster wheel than in your family album. Let's set the stage in the Thought Bubble.

So the slow waltz of plate tectonics continued to pull Eurasia and the Americas apart expanding the Atlantic Ocean, primates colonized the Americas, and separated by the vast Atlantic, continued their separate evolution into the new world monkeys - which is not a band name, although it should be.

Then around 45 million years ago, Australia split from Antarctica and while mammals out-competed most marsupials in the Americas (except animals like possums, Australia saw an adaptive radiation of marsupials. This, of course, meant that later, 100,000 years ago when the Americas were having their share of mammoths and sabre-tooth tigers, Australia was having a spell of gigantic kangaroos, marsupial lions, and wombats the size of hippos.

Then, somewhere around forty million years ago, India, which had been floating around the southern oceans as an island, smashed into the Eurasian continent with such force that it created the world's tallest mountain range, the Himalayas.
Meanwhile, in Africa, Primates continued to evolve and twenty-five to thirty million years ago, the line of the apes diverged from the old-world monkeys and no, neither you, nor a chimp, is a monkey, nor did we evolve from the monkeys that are around today - those are like our cousins.

Moreover, we did not evolve from chimpanzees, the chimpanzee is a cousin as well, not an uncle. We are not more highly evolved than they are; Instead, our lines of descent split off from a common ancestor of chimpanzees about seven million years ago. Then chimpanzees further split into a separate species, the Bonobos. Knowing about this common ancestry tells us a lot about our shared traits with other primates.

For instance, we all have fairly large brains, relative to our body mass, we have our eyes in the front of our heads from the days when we hung out in trees and depth perception was an excellent way of telling how far away the next tree branch was so as to prevent us from plummeting to our deaths, and we also have grasping hands, to make sure that, you know, that you could hold onto the branch in question. Primates also have hierarchies, social orders whether male or female led, that determine who gets primary access to food, mates, and other benefits. Thanks Thought Bubble!

So, our closest evolutionary cousins, the chimpanzees, can tell us a thing or two about shared behaviors. For one thing, while all primates have a hierarchy of alphas and betas, humans and chimps, who share 98.4 percent of their DNA, are the most prone to team up together and launch a revolution against the alpha male. We're also the most prone to ganging up, roaming our territory, and beating up unsuspecting foreigners of the same species, and not for direct survival reasons.

Chimpanzees have been observed finding a lone chimp male from another group and kicking, hitting, and tearing off bits of his body and then leaving the helpless victim to die of his wounds, and humans definitely bear this stamp of our lowly origin, where indeed, the imperfect step-by-step process of evolution made us highly intelligent, but still, with prefrontal cortex's too small, and adrenal glands maybe too big.

Aggression and blood lust are definitely part of our shared heritage, and, looking at more recent human history, does that really surprise anyone? Contrast that behavior, for a moment, with the more peaceful Bonobos, who are female-led, and when a male in her group gets a bit pushy, the females are prone to gang up and teach him a lesson - when it comes to inter-group encounters in the wild, the male Bonobos seem tense around strangers at first, until usually, the females in each group cross over and just have sex with the newcomers, completely diffusing the tension. Talk about make love, not war - Bonobos are hippies.
While our common ancestor with chimpanzees around seven million years ago was more suited to living in forests and seeking refuge from danger by climbing trees, climate change in East Africa made things colder and drier, and many forests were replaced by woodlands and wide-open savanna. Life in the savanna meant our ancestors needed to run from predators rather than climbing trees, so our line shifted away from the bow-legged stance reminiscent of chimpanzees, and developed bipedalism, where our locomotion came from legs that were straight and forward-facing.

There's still some debate about when bipedalism first began, but we know that by the first australopithecines around four million years ago, our evolutionary line was bipedal, this also freed up our hands.

Australopithecines were not very tall, standing only just above a meter, or just above three-and-a-half feet, and had brains only a little bigger than modern chimpanzees. They were largely herbivores with teeth adapted for grinding tough fruits and leaves. Australopithecines may have communicated through gestures and primitive sounds, but their higher larynx meant that they couldn't make the range of sounds required for complex language. There was probably a lot of pointing and grunting going on. Kinda like me, before six am.

By 2.3 million years ago, homo habilis arrived on the scene. They weren't much taller than australopithecines, but they had significantly larger brains - though still a lot smaller than later species. Excitingly, homo habilis is known to have hit flakes off of stones to use them for cutting. Now, lots of species use tools, for instance chimpanzees use sticks for fishing termites out of the ground, they use rock hammers and leaf sponges and branch levers and banana leaf umbrellas. A lot of these skills don't seem to arise spontaneously, just because of the intelligence of individuals, but, like in the case of termite fishing, chimpanzees pass the information on by imitation - primate see, primate do.
In a way, this social learning is sort of cultural, yet, succeeding generations of chimpanzees don't accumulate information, tinker with it, and improve upon it, so that after 100 years, chimpanzees are owners of highly efficient and wealthy termite fishing corporations. Similarly, as impressive as homo habilis stone-working abilities are, we see very little signs of technological improvement over the thousands and thousands of years that habilis existed. Same goes for homo ergaster erectus, who was around 1.9 million years ago.

Homo ergaster erectus had an even bigger brain, was taller, and they even seemed intelligent and adaptable enough to move into different environments across the old world. They may have even begun our first clumsy attempts at fire, which is vital for cooking meat and vegetables, opening up opportunities for more energy and even more brain growth.

But still, there's not much sign of technological improvement, their tools got the job done, if it ain't broke, don't fix it.
Yet 1.78 million years ago, we do see homo ergaster creating a wide new range of teardrop hand axes in Kenya. By 1.5 million years ago, these teardrop axes had rapidly become common, and had improved quality and were shaped with a flat edge into multi-purpose picks, cleavers, and so forth.

Archaeologists see this as the first possible sign of tinkering and improvement of technology that may have been transmitted by social learning - a faint glimmer of something new. Why is this important? Well, humans didn't get to where we are because we're super-geniuses. It's not as if we invented the Xbox One out of the blue one day, it was an improvement upon the Xbox 360 which was an improvement upon earlier consoles, arcade machines, computers, and backward onto the dawn of video games.

In the same way, we didn't just invent our modern society by sudden inspiration, it's the result of 250,000 years of tinkering and improvement. This is where accumulation matters - it's called collective learning, the ability of a species to retain more information with one generation than is lost by the next. This is what has taken us, in a few thousand years, from stone tools to rocket engines to being able to have the Crash Course theme song as your ringtone. Progress!

If there was collective learning in homo ergaster, it was very slow and very slight. This may have been due to limitations on communication, abstract thought, group size, or just plain brain power. But over the next two million years, things started to pick up. Homo antecessor, Homo Heidelbergensis and the Neanderthals developed the first systematically controlled use of fire in hearths, the first blade tools, the earliest wooden spears, the earliest use of composite tools, where stone was fastened to wood, all before homo sapiens were ever heard of, around 250,000 years ago.

The Neanderthals even moved into colder climates, where they were compelled to invent clothing, they used complex tool-manufacture to produce sharp points and scrapers and hand-axes and wood handles, and they improved their craft over time.
Well, evolution by natural selection is a sort of learning mechanism that allows a species to adapt generation after generation, with a lot of trial and error, and death - collective learning allows for tinkering, adaptation, and improvement on a much faster scale with each generation and across generations without waiting for your genes to catch up.

Anatomically similar homo sapiens have been around for about 250,000 years, and throughout that time, we've been expanding our toolkit from stone tools to shell fishing to trade and actual fishing, mining, and by 40,000 years ago we had art, including cave images, decorative beads and other forms of jewelry, and even the world's oldest known musical instruments - flutes carved from mammoth ivory and bird bones.

All this stuff came about as a result of collective learning. As long as you have a population of potential innovators, who can keep dreaming up new ideas and remembering old ones and opportunity for those old innovators to pass their ideas onto others, you're likely to have some technological progress.
These mechanisms are still working today - we've got over seven billion potential innovators on this planet, and almost instantaneous communication, allowing us to do so many marvelous things including teach you about Big History on the internet.

So life for early humans was pretty good, like foraging didn't require particularly long hours - the average work day for a forager was about six-and-a-half hours. When you compare that to an average of nine-and-a-half hours for a peasant farmer in medieval Europe, or the average of nine hours for a typical office worker today, foraging sounds downright leisurely.
Quick aside: I work thirty minutes a day less than a peasant farmer in medieval Europe? That's not progress! Stan, I want more time off!

Stan just pointed out that I have a chair, something that peasant farmers in medieval Europe did not enjoy, and I want to say that I'm very grateful for my chair. Thank you for my chair, Stan.
Anyway, a forager would go out, hunt or gather, come home, eat, spend time with the family, dance, sing, tell stories, and foragers were also always on the move, which made it less likely that they'd contaminate their water, or sit around waiting for a plague to develop. And with their constant walking and their varied diet, foragers were in many ways healthier than the peasants of ancient civilizations. There were also, in some ways, healthier than us, but we have antibiotics for now, so we live longer, for now.

The classic view of foraging life is best described by Thomas Hobbes, who wrote: "No arts, no letters, no society, and which is worst of all continual fear and danger of violent death and the life of man, solitary, poor, nasty, brutish, and short." Except, not really. I mean, life for the average person in twelfth century France was also a smidge nasty, brutish, and short, and a lack of wealth disparity in foraging cultures may imply greater equality between social rankings and even between the genders since female gatherers appear to be responsible for the majority of food collected, rather than the hunting males. And from the perspective, life was kind of ruined by the advent of agriculture and then, later, with states, as Jean-Jacques Rousseau said, "The first person, who having enclosed a plot of land, took it into his head to say, "this is mine" and found people simple enough to believe him, was the true founder of civil society. What crimes, wars, murders, what miseries and horrors would the human race have spared, had someone pulled up the stakes or filled in the ditch and cried out to his fellow men: 'do not listen to this imposter, you are lost if you forget the fruits of the Earth belong to all, and the Earth to no one'" and thus summarizes one of the great debates in the world of political science.

Man, Big History discusses everything! Now, it's possible that

neither Rousseau nor Hobbes is completely correct, and that private property and agriculture didn't create the glory days or end them. As previous mentioned, all primates have a dominant hierarchy of some kind. Also, you don't need a wealth disparity to drive human beings to hurt each other - like, surveys of excavated remains 'from the paleolithic indicate a murder rate that was possibly as high as ten percent. Now, those statistics are still disputed, but despite the relatively short work day, life in the paleolithic sounds a lot less appealing when you consider the high murder rate, and also, the occasional infanticide. That's not even to mention the older, disabled people who, when they couldn't keep up anymore, were abandoned to die in the wild. I can't help but feel that I might not have thrived in the paleolithic what with my visual impairment and my general lack of interest in hunting.

Anyway, we call this the Hobbes vs. Rousseau debate, and it's still unresolved. I mean, humans may have been corrupted in many ways by society, on the other hand, it's possible a lot of the crimes and follies of human history may just be symptoms of our coping with the bad wiring left to us by evolution.

You know, humans are a bit of an obsolete machine, we aren't particularly well-suited to the many lifestyle changes that have happened in the past thousand years - faster than our genes can keep pace with. But how you interpret the lives of early human foragers largely determines your view of history and also the fundamental nature of the human character. Ask yourself which side you sit on: Is humanity fundamentally good and corrupted by technology and modern social orders, or are we fundamentally flawed and in need of some sort of structure and authority? Or is there some kind of both and/or way of addressing the question? Here at Crash Course, we don't have answers, but we are grateful that you're pondering these questions with us.

In any case, collective learning was really good for our survival, but then, 74,000 years ago, disaster struck. A super-eruption at Mt. Toba on the island of Sumatra in present-day Indonesia clouded the skies with ash and cooled the climate. Plants and animals, A.K.A. food died off and genetics studies showed that this reduced the human population to a few thousand people. So as a result of this, we aren't exactly inbred, but there's more genetic diversity between two of the major groups of chimpanzees in Africa than there is in all of humanity.

So this small group heroically recovered and spread out of Africa 64,000 years ago, colonizing diverse environments and continuing to innovate. For 13.8 billion years since the beginning of the universe, complexity had been rising in a powerful crescendo, but in the space of a few millennia, collective learning was about to make things really bonkers. More on that next time.