Mitera Techne

How Hominid Coevolution with Technology Gave Birth to Homo Sapiens

By
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During a walk Friday, trash day in my neighborhood, I heard the high-pitched squeal of a garbage truck's repeated breaking while moving from house to house, juxtaposed with the chatter of various bird species, and I was struck by the beauty of their blended noises. As I frequently walk alongside Interstate-90 while making my way through Finch Arboretum and hear the crescendo of different engines whizzing by, I'm reminded of the soothing ocean waves that dominated the soundscape of my childhood. Most people, I'm guessing, don't find beauty in the squeal of truck breaks, nor comfort from the noise of traffic, but I do. I do because I believe human beings, our behaviors and our inventions are part of nature, and I'm filled with the wonder of it, just as I am by the wonder of other creatures. As I write in my book, *Evolution's Way*:

> Many consider technology the opposite of humanity, and those who use it, a bit inhuman. When it comes to using technology to blow up our neighbors and their neighborhoods, I'd say there's some serious truth to this. What could be more inhuman than killing other humans? Yet anthropologists have also long distinguished toolmaking as our species' specialty, and *technology* is just another word for "toolmaking." Technology is, perhaps, the most human kind of undertaking. Fish swim, birds fly, and humans make tools.[1]

There is no denying that our toolmaking activity is altering our environment so quickly and detrimentally that many species are unable to adapt. Human behavior can be extremely destructive. But this is so for all creatures. Plants and animals, through activity and encroachment, alter the environment just as the environment alters them. This is how evolution works, through adaptation to adversity. Not all creatures survive. In fact, most do not. The vast majority of all creatures ever to have lived have gone extinct, most by evolving into something else.

In Unitarian Universalism we promote *respect for the interdependent web of all existence, of which we are a part*. Coevolution is the basis of this interdependence. We change and are shaped by our relationships to everything else. Without gravity and terrain, we'd be without feet. Without oxygen, we'd have no need for lungs. Just as fish would be without fins or gills were it not for their watery surroundings. Charles Darwin said, "there could have been no flower before there was an eye to see it."[2] Plants began flowering and ripening to better reproduce only after animals developed the ability to see them. Animals, in turn, have developed color vision, olfactory senses, and the ability to digest their nutrients in exchange. That's coevolution: plants shape us, and we shape them. Earth shapes us and we shape the Earth.

We like to think of ourselves as the dominant species on the planet, but just take a look at all the green grass dominating our manufactured landscapes and consider all the water

resources, fertilizer, and weed killer this unassuming species has engineered us to lavish upon it. When describing history, Michael Pollen says, "it makes just as much sense to think of agriculture as something the grasses did to people as a way to conquer trees."[3] Has a war of weeds made us what we are? Have plants crafted our notion of beauty to make us their midwives and caregivers?

The entire Universe and everything within it evolves—stars, planets, life, and the tools life fashions—and they do so together, which is what *coevolution* means, "evolving together." Evolution occurs in relationship. Still, it's hard to get our modern minds around the thought that our tools, no matter how sophisticated, are part of this dynamic universal process. They are only cold blunt objects we've fashioned with our own hands, with think. We improve them over time as our understanding improves but that's a far cry from saying they evolve, which some would restrict only to organic processes. Yet there are many creatures that depend upon other species and forces to help them grow and reproduce, plants being the most obvious. They need birds, and bees, bears, wind, and humans who desire them in our gardens, to help them reproduce and spread their genetic information across the planet.

But today I want to focus on our coevolution with technology. If what I say is true, that everything evolves together, then our tools must also have an impact on what we have and will become. That's the point of my title, *Mitera Techne*, "Mother Technology:" that technology gave birth to us. Without it, I'll venture to argue *Homo sapiens* would never have existed. Were it not for the very first tools other hominids used—stones and fire—we'd still be swinging in the trees picking lice off each other's backs.

To begin, it may be helpful to understand that so far we've discovered over twenty early hominid species, many of which are thought to have once coexisted. Nine of them were on the evolutionary path leading to us, *H. sapiens*. The rest died out. Among the earliest of our hominid ancestors was *Ardipithecus ramidus*, which lived in Ethiopia 4.4 million years ago. Its name means "ground root," which is apt because it was a bridge between our tree dwelling and our bipedal ancestors, the root of our beginnings. *Ramidus* still lived in trees and had opposable toes, but its pelvis indicates it walked upright on two legs. Although it was no longer as good at climbing trees as other primates, and *Ramidus* couldn't walk or run very fast, a geological cataclysm in Africa at the time, resulting in an eruption of high mountain ranges, gave an advantage to this unique biped. The mountains blocked clouds from passing, causing the eastside of the African continent to become hot and barren. But being able to walk upright and carry food long distances, Ramidus was no longer dependent upon the vanishing forests to survive and so was able to endure these dramatic changes in climate and habitat.

Two hominid incarnations later, *Australopithecus afarensis* emerged, 3.7 million years ago, and had become even more suited for walking, indicated by its flat feet, which further meant it had left the trees for good. It is believed to have traveled in groups and lived on plants and insects. Still, it wasn't fast and had no natural defenses, which made its new grassland habitat dangerous. Yet it survived predation by walking in large groups and likely using sticks and stones to defend itself. This need for group protection may also be the beginnings of human compassion and cooperation, which transformed us into social creatures.

Afarensis split off into two other species, one of which eventually led to a physically stronger hominid that died out, and to the less robust *Homo habilis*, which eventually evolved into us. *Habilis* lived 2.4 million years ago and was initially a scavenger, which included eating scraps of meat off the bones left by predators. Fossil records prove the scavenged bones they ate from were shaved with sharpened stone tools, which was a serious bifurcation point in hominid history, giving *Habilis* the choice to remain scavengers or to use the sharp edged stones they fashioned to become hunters. Being able to walk long distances and survive in a variety of habitats, the latter seemed the natural choice. It's even possible that *Habilis* went from being scavengers to hunters during their own existence. In other words, technology, simple as it was, allowed them to adapt their behaviors without millions of years of biological evolution, just as evolving technologies allow us to do today.

The problem with being a hunter, however, was all their body hair. Most animals could still outrun them, so *Habilis* would have easily been overcome by heat exhaustion before ever catching anything. To solve the problem, welcome our hominid lineage's next incarnation: *Homo erectus*, with long strong legs and a mostly hairless body built for going the distance. *Erectus* emerged with a unique cooling system: being hairless allowed it sweat and cool off while still moving. To this day there are no other mammals that can run marathons without collapsing of exhaustion or heat stroke after a short distance. Even the fastest animals, like cheetahs, run in short bursts and must catch their prey within minutes or give up because their fur causes them to quickly overheat. They cool themselves rather inefficiently by panting. But erectus could chase and track its game for as long as necessary, patiently waiting for their exhausted quarry to finally collapse.

So how did this change happen? How did *Erectus* become the first naked ape? It certainly wasn't by shaving with their stone tools, but it may have been because of another game changing technology: fire. *H. Erectus* is the earliest hominid evidenced to have controlled fire, about a million years ago. But anthropologist Francis Burton believes "this presupposes an intimate and long-standing connection to, and association with, fire"[4] by earlier hominids, like *Habilis*. If so, it could explain the evolutionary role warming by fire played on hominid hair loss. In his book, *Fire: The Spark that Ignited Human Evolution*, Burton says, "As fire became increasingly indispensable, selection for fur would have been relaxed and hairlessness would have been a more frequent variant."[5]

Of course, hominids didn't invent fire anymore than they invented stones. The evolutionary leap was their use of both as tools. And just as stone tools pulled us out of the trees by flattening our feet, sitting around the red glow of fire light also dramatically altered our physiology. We went from being daytime animals enclosed by darkness at night to being exposed to some light all the time. This alone could explain hominid's hair loss given melatonin, which plays an important role in hair growth, is a hormone produced in darkness. Given the hot days and cool nights, hair would have become misery for animals warmed at night by fire. Nor should we discount the changes exposure to red light in particular would have had on hominids. If you hold a flashlight against your hand, the white light can't be seen, but the red-light shines through because red light passes through our bodies, which is why it's so effective at warming us. But it has other impacts too.

In addition to altering our hormone balance and circadian rhythms, sitting around the safety and warmth of campfire light with nothing else to do and nowhere else to go, may have led to the development of language. It may also help explain the rapid growth of the hominid brain to three-times its size in just a million years, which took place during *Erectus's* epoch. Staring directly at red light, something other creatures can only do for a short while during sunrise and sunset, would have stimulated Hominid's optic nerve and frontal lobes. And because melatonin naturally interferes with the formation of memories, Professor Burton wonders "if firelight, by inhibiting melatonin, enhanced memory formation and associative patterns in the Ancestor."[6]

According to a Smithsonian article entitled, "Why Fire Makes Us Human," eating cooked food also gave our Hominid ancestors more fuel to grow bigger brains. "Cooking freed up time," the article says. "[Other] great apes spend four to seven hours a day just chewing, not an activity that prioritizes the intellect."[7] Eating meat also led to shorter digestive systems that also saved energy. "My view of human evolution," Burton says, "is that the acquisition of fire was the engine that propelled the incredibly fast evolution of humans. Directly or indirectly, it affected cognitive processes, social processes, genetic systems, reproduction, the immune system, and digestion, among others."[8]

I'll begin to wrap up by mentioning one more piece of early hominid technology, the atlatl, a tool that extends arm strength for throwing spears greater distances. At the time it was invented, two to three hundred thousand year ago, there were three hominid species on Earth. *H. erectus* eventually spread to parts of Asia, those we now call *Peking Man* and *Java Man*. Others evolved into *Neanderthals* and went to Northern Europe. Those that stayed in Africa became us, *H. sapiens*. Although the others were more hardy and powerful, *H. sapiens* were smarter in many ways. The *Neanderthal* brain was larger but most its weight was in the back of the head, in the occipital area. Our brain growth was in the frontal cortex, allowing us to be analytic and creative. *Neanderthals* could naturally throw spears a lot farther than us, but we were the superior hunters because we invented technology that allowed us to chuck them twice as far as our competitors. You know the rest of the story, we survived, they did not.

But were it not for Hominid's first technologies, stone knives and campfires, the story would have ended differently. Early in our existence, about 190,000 years ago, Earth entered an Ice Age. It didn't impact Asia, so *Erectus* was safe, and *Neanderthal* had already adapted to living in colder climes. But *H. sapiens* would have surely perished as the arid African continent became overtaken by glaciers. Most of them probably did. But a group was able to survive the cataclysm by walking south to the continent's southern cape, which wasn't impacted by the glacial disaster. That's when the bottleneck happened, when our species became so few that today we all remain more genetically akin to each other than most other animals on Earth. This small remnant survived, propagated, and outlasted both *Erectus* and *Neanderthal*, largely because of our ability to quickly adapt to changing environments, or to any environment we choose to enter, including outer space today, by inventing technologies.

Although there are a few other hominids still around today—gorillas, orangutans, and chimpanzees—none of them exhibit anywhere near our toolmaking abilities. But the point

here is were it not for our most primitive technologies, stone tools and controlled fire, we wouldn't exist at all. It was stone knives that turned us into hunters by flattening our feet and elongating our legs: and fire that changed our cooling systems so we could traverse great distances without collapsing, perhaps making us smarter in the process. The technology came first, shaped us, and made it possible for us to survive outside the trees, walk the long journey south, and to eat and stay warm along the way. Without these technologies, invented by our hominid predecessors, it's not possible for *H. sapiens* to have ever existed at all, let alone to have survived the cataclysm 190,000 years ago. Technology is our mother. We coevolve with it as part of the interdependent web, both advancing together.

Today our tools are far more complex than stone knives and campfires precisely because they are part of natural evolutionary processes. And just as they have helped make us what we are, they will help shape what we are to become, even as we are shaping them. Tools are but an extension of our humanity, just as the atlatl extends the strength of our own arms. We are the toolmaking species. That's our behavior. It defines us.

As a humanist, I like to keep all of this in mind, because it helps me frame humanity in the positive light it deserves and needs. For centuries we've been taught that human nature is naturally flawed or that we are separate from nature to begin with. So we consider the squeal of breaks and the noise of traffic and all our other technologies as proofs of our unnatural and unholy existence. But it's all nature, sometimes terrifying, sometimes beautiful, and always astonishing. From the stones that otters use to break open abalone shells, to the hammer a carpenter uses to drive a nail; from the branches elephants use to swat flies, to the airplanes pilots use to fly across the world; from the marine sponges dolphins sweep the ocean floor with to uncover prey, to the telescopes astronomers use to discover distant worlds, it's all natural. As I said, the entire Universe and everything in it is evolving and we are evolving with it, coevolving in relation with all that is. I find this thought even more beautiful and comforting than the sounds of ocean waves and roaring engines.

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[1] Eklof, Todd F., *Evolution's Way: Toward Exponentially Higher States of Complexity, Consciousness, and Unity*, Oakleaf Press, Spokane, WA, 2020, p. 242.
[2] Sheldrake, Rupert & Fox, Matthew, Natural Grace, Doubleday, New York, NY, 1996, p. 59.
[3] Pollan, Michael, *The Botany of Desire*, Random House, New York, NY, 2001, p. xxii.
[4] Frances D. Burton. Fire: The Spark That Ignited Human Evolution (Kindle Location 82), 2009, Kindle Edition.
[5] Ibid., Kindle Location 2186f.
[6] Ibid., Kindle location 166.
[7] https://www.smithsonianmag.com/science-nature/why-fire-makes-us-human-72989884/