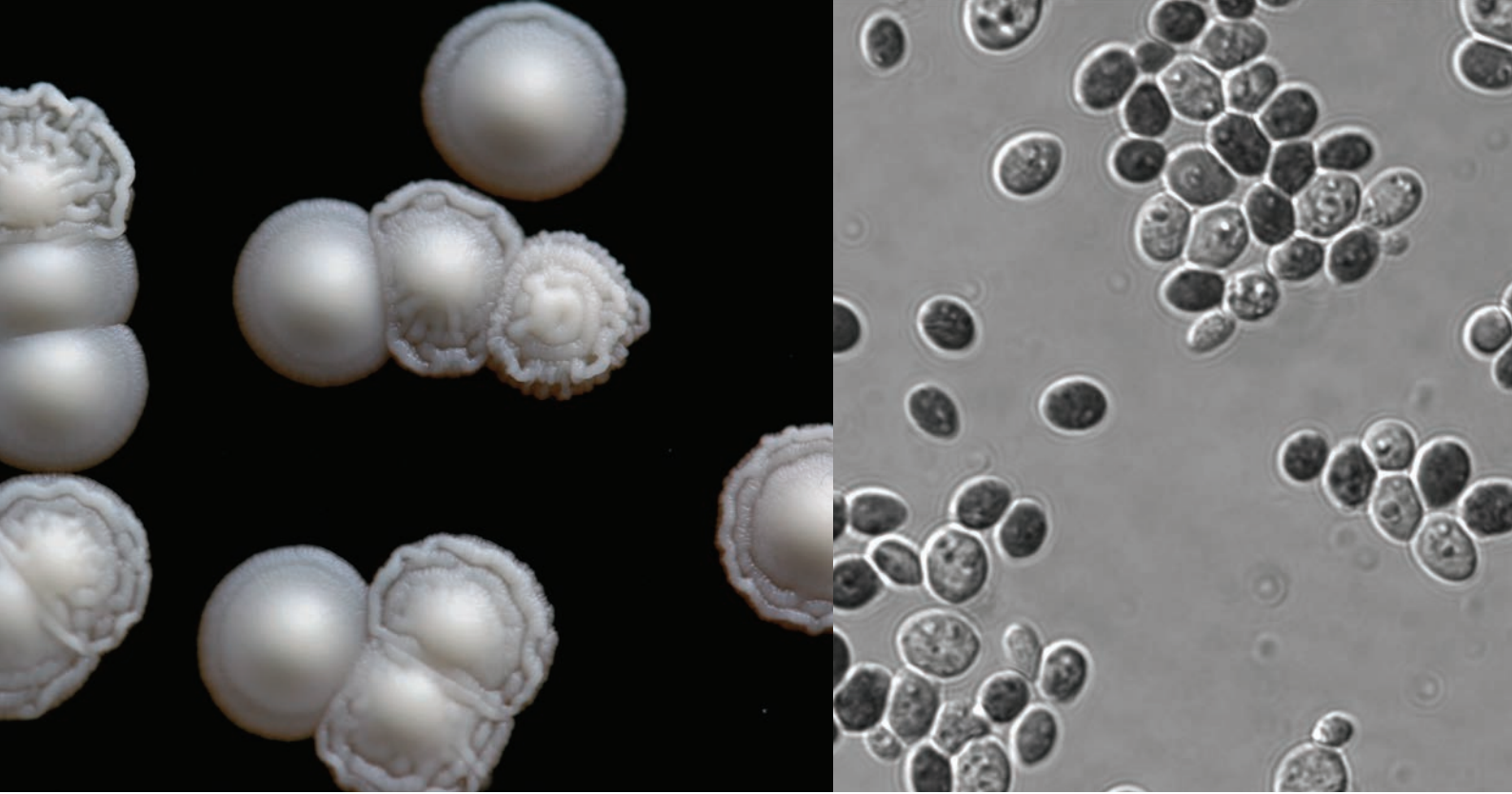




Fungus K. humilis. Photo by Elizabeth Landis, published on Microbialfoods.org, 2018.

HUMAN CIVILIZATION DOES NOT EXIST:
A FUNGAL MANIFESTO
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There is a case to be made that fungi have controlled nearly the entirety of the world's prehistory and history, and that they will control the future too. Here, I make that case. I offer this manifesto on behalf of the fungi which cannot write with a computer or a pen, and yet have etched their hieroglyphics into much of the rock and nearly all life on Earth.

Fungi evolved in the sea. They then moved onto land. As they did, they partnered with the first plants, although we could also say that they domesticated the first plants. They corralled and tamed those plants such that they would provide the fungi with some of the sugars they'd created using energy from the sun. The plants were courtiers to the fungi's sweet needs. In return, the fungi took care of their obliging plants by providing them with nutrients that they'd gathered from rocks and, once it began to exist, soil. We now call the relationship between fungi and the plants that they domesticated "mycorrhizae," or "mycorrhizal," both of which translate as "fungus roots." But what might the fungi call it if they were telling the story? They might describe the plants as their crops. They might describe nearly all plant life on Earth as their dominion.

Before I go on, let me explain my approach. When Western humans tell the story of their “ancestors”, many, as a bit of a linguistic crutch, often say “they did this” or “they did that.” This implies at least three things. It implies that the humans intended to do the thing. It implies that they were in control. And, also, it implies that “humans” is and was a useful collective noun. Think about apples. We say that humans domesticated apples. Yet, the process required little in the way of intent, whether for the humans or the apples. Humans ate apples, walked home, squatted and shat an orchard into existence. Picture a fire at the center of a village, then a ring of houses then, beyond the houses, a ring of apple seedlings. From those well-fertilized seedlings, apple trees grew. Humans continued to eat and shit apples as they moved around Europe and Asia. More apple trees grew up. Orchards appeared everywhere these humans stayed for a while, the air sweet with the smell of apples and their rot. In this case, the humans needn’t have chosen to control the apple. They needn’t have thought about it at all. They just needed to pick the apple, to bite the apple, to savor the apple and to digest but, not all, of the apple. Also, it wasn’t “humans,” who did this. It was, instead, a small number of people in a small community in, perhaps, Kazakhstan. Narrower than that, it was a small number of people in that place at a specific time, a patch of people in a patch of time.

When I talk about fungi, I’m going to use the same sort of crutches often used to describe human histories. I’m going to write as though they had intent. I’m going to write as though they were in control. I’m also going to lump fungi together and attribute these changes to their collective kind, “fungi,” much as in telling ancient human histories we attribute actions to our kind, “humans.” Finally, I’m going to assume the fungi are arrogant, that they take credit for those things that they did and also for things that they didn’t do. In this way, I’m assuming that the fungi tell their story in the Western way, that they speak presumptuously and uncritically of their own Odyssey.

Now, returning to their story, the fungi controlled the plants and colonized the land. Then they undertook other kinds of control. They, for example, found algae and made a kind of creche for the algae out of their own bodies. The algae, like the plants, could provide sugars to the fungi. The fungi in return provided nutrients but, in this case, also a kind of home. We call these fungi that hold the algae up worshipfully to the sun, lichens. Again, we do not know what they call themselves, or what chemical signals they produce when called upon.

Over time, the fungi enlisted other beings and domesticated animals. In some cases, this domestication was quite complex. Fungi evolved to colonize the brains of some ants, make those ants crawl up high into trees and bite down, all so that the spores of the fungi could rise up high into the air. They turned

the ants into a kind of circus act, the Miss La La of their tropical performance. Elsewhere, fungi domesticated yet other ants that gathered, cut and chewed up leaves for them, presenting them as one might present a gift to a child-like god. Other fungi evolved to produce smells so attractive to wild pigs that the pigs dig deep underground to get to them. The pigs dig as if pursuing sex. They dig as if to mate with the ground and then, having gotten deep enough, they find the fungi, gather them in their mouths and carry them to some far away better place. We call these fungi truffles.

Often, fungi are sessile. They gather by extending long hyphae which produce chemicals that break apart rock and soil and release nutrients (hyphae are often described as “rootlike,” but hyphae long preceded roots). This is external digestion, a way of eating the outside world. For fungi, the outside world is their inside world. Picture the Earth entrapped by fungi; picture the Earth as the mouse inside their snake-stomach. This gathering requires energy. It also entails a kind of stasis. Some part of each fungus that is producing hyphae must stay still.

Eventually, fungi became bored with sessile life. They wanted to move, to explore, to live in more freely. As a solution, they developed the ability to ride from place to place. Rather than waiting for plants to give them sugars, they would just go to the sugars. These new fungi could live their whole lives as single cells; we call them yeasts. Yeast-fungi found ways to produce smells which would attract not pigs, but insects. Sometimes bees. Often wasps. On other occasions carrion beetles. The insects would, like the pigs, gather the fungi in their mouths and carry them in their bellies, depositing them in a place filled with food. Often this was a flower, or the sap on an oak tree. Some place filled with nothing but food. Upon arriving in these places, the fungi did not produce hyphae, but simply divided. One became two, two four, and so on, through a whole biblical series of “begetting” taking place in an individual corolla or inside an Earth-shaped, cracked-open grape.

This was enough for a long time, until these fungi began to call not just to wasps and bees, but to primates too. This occurred recently, just 30 million years ago, or perhaps only eight million years ago. The primates were tempted. The fungi were calling to them from inside some sugar source, perhaps a fruit. The fruit was on the forest floor. Its aromas reached up to the primate. The primate reached down, fingers outstretched like Michelangelo’s hand of God (or was it the reverse?). The primate sniffed the fruit and ate it. In the fungal story, this is the Garden of Eden. This is the temptation.

The process through which yeast-fungi domesticated ancient primates entailed many detailed changes in the primates, precision changes in design. The fungi favored primates with new genes

that allowed them to digest alcohol. The fungi changed the brains of the primates, favoring those that were pleased by the alcohol. Alcohol is the waste product of yeast-fungi. And the fungi favored primates that also liked their bedfellows, lactic acid and acetic acid bacteria. They favored primates that liked the sour tastes of these bacteria and even that had new genes that calmed their immune systems when ingesting these bacteria. The yeasts shaped these primates in more ways than humans would later shape the pigs that they domesticated. However, the yeasts themselves didn't change. They didn't need to; they changed the primates instead. In the process of all of this change, the fungi also shaped the intestines of the primates, filling them with villi that stood like Bronze Age standing stones. The yeasts took rides between these villi. Many yeasts could thrive between them (note, this is not true chronologically. It was bacteria that created these villi. But colonists often claim the innovations of their predecessors).

This went on for millions of years until the yeasts engineered their masterwork. They convinced some of these primates, perhaps the first humans, not only to consume yeasty-fruits which they would then carry from place to place, but also to bring fruits to the yeasts. They convinced the humans to pile fruits in place, so that they (the yeasts) might eat them. They convinced humans to create vessels in which to store the fruits that they might drink from them. This went on for hundreds of thousands of years, but the yeasts were hungry for more. They were greedy. There was so much more of the world that was not yet theirs. And so they implored the humans for more. And the humans obliged. They began to farm grains to feed the yeasts. But more than that, they prepared the grains for the yeasts. They found creative ways to convert the starch into sugars the yeasts could consume. Sometimes this involved malting. In other cases, it required feeding the yeasts to other fungi first, that they might release the sugar. Still, though, this wasn't enough. The yeasts wanted more. And so they urged the humans to begin to gather and to share them. They asked that the humans worship them. Drink of us and think of each other. Or, in some cultures, drink of us and think of your god, a god whose blood is yeast-made wine and whose body is yeast-made bread. In each place, because humans are variable, the yeasts shaped humans in subtly different ways. This continued until the humans needed to do even more for the yeasts. They needed to find ways to fertilize grain-crops and so they turned to guano. Then they created massive machines to extract nitrogen from the air and put it on fields. They needed energy to fuel their production and so they began to burn the ancient dead bodies of plants (those same plants that the yeasts had domesticated long ago). This has cascaded into our moment when more and more energy is required each year and more and more yeast is fed each year.

It is unclear how the fungi will contend with their current situation, how they will take advantage of what they have made in order to imagine what comes next. The yeasts and their domesticated animals might not be the fungi of the future. Perhaps instead it will be those that break down cement and rend buildings back to the ground; those that grow through kitchens and overtake civilization. Perhaps it will be them for a while. Or maybe the immediate future is to be driven by the fungi that, as the Earth warms, have begun to more fully take advantage of the bodies of mammals. Perhaps the future is one in which fungi are predators that, like lions, leap upon humans, dogs and cats alike. With the future of fungi, there are many *perhapses*, many possible worlds. Some involve humans. Most don't.

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