

WHAT DARWIN MISSED

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December 14, 2020, Seattle

Darwin's theory of natural selection involves competition between species but avoids any consideration of human altruism. How do we account for self-sacrifice, sharing, and mutual cooperation?

In Elizabeth Gilbert's novel, [The Signature Of All Things](#), Alma Whittaker, a fictional nineteenth-century botanist, delves deep into the mysteries of evolution through a study of mosses. She discovers a multitude of different species inhabiting different environments. Some are very ancient while others are still evolving. This leads her to a controversial theory of evolution before Darwin's publication of [On the Origin of Species](#).

She presents this in a thesis but hesitates to publish because something seems to be missing. To her, evolution seems to be a fierce battle where the winner defeats the competitor and goes on to survive and evolve. One thing she can't reconcile is altruism, the act of helping someone else, even if it comes at a steep personal cost – why would someone risk their life to save someone not even related or known to them? What evolutionary advantage is gained by helping others?

Soon thereafter, Darwin published his theory of evolution, similar to hers but more detailed and eloquently expressed. However, he managed to avoid the subject of altruism. He based his theory on nature, avoiding any consideration of human altruism. Others have, over the years, debated this question but have not come up with a good answer.

Suzanne Simard is a professor of forest ecology at the University of British Columbia. This May, Knopf will publish her new book, [Finding the Mother Tree](#), "a vivid and compelling memoir of her lifelong quest to prove that the forest was more than just a collection of trees." A recent feature article in the New York Times Magazine (by Ferris Jabr, with photographs by Brendan George Ko), [The Social Life of Forests](#), discusses the work of Simard. She also presented a TED talk in June 2016, [Suzanne Simard, How Trees Talk To Each Other](#).

When Simard began her studies she provoked a backlash from other forest ecologists by suggesting that there is an altruism in nature that goes against the basic tenant of Darwinism – that trees actually help one another at their own expense. Is cooperation as central to evolution as competition?

In [The Overstory](#), Richard Powers writes "There are no individuals. There aren't even separate species. Everything in the forest is the forest." Trees in a forest do not exist in isolation – they are connected with each other through underground fungal networks to communicate and share resources. This argues against the idea that nature only competes for survival.

The mushrooms we see on the forest floor are just the fruit of a vast mycorrhizal fungus network, which connects trees and other plants through tiny threads called mycelium. They cannot photosynthesize but get their carbon, in the form of sugars, from plants through their mycelium. They also extract minerals and other nutrients from the soil. In turn, they share their wealth with plants. It is a

symbiotic relationship that allows the whole forest to survive and propagate. Simard demonstrated this by isolating a plant in a plastic bag and presenting it with a radioisotope of carbon in the form of CO₂. Other plants incorporated this radioisotope into their own tissue.

Small tree seedlings in a dense forest cannot get enough sunlight for photosynthesis. Instead, they get carbon and other nutrients from the fungal mycelium and other trees (so-called "mother trees") until they are tall enough to receive more sunlight. A tree that is weakened will send signals to other trees and receive carbon and other nutrients to survive – an act of altruism. Fungi are acting in their own best interests as they facilitate the health and survival of even the biggest trees. There is much communication going on in a healthy forest, both underground and by air-borne pheromones. Simard sees this as "a world of infinite biological pathways," species that are "interdependent like yin and yang" and veteran trees that "send messages of wisdom on to the next generation of seedlings."

Clearcutting is the bane of forests. Replanting with the same trees creates a monoclonal forest incapable of all the interactions and biodiversity necessary for its survival. Trees in these forests are weak and susceptible to disease. They are prone to forest fires as they grow close together, are all the same size, become infested with bugs, and have little understudy. New forest management strives to keep the large mother trees, cuts only the weaker and closer-spaced trees to thin the forest, and maintains the native understudy.

Humans and other animals have also evolved in synergism with their microbiota. Our gut microbiome aids in digestion and provides important nutrients for our health and survival, and we, in turn, ensure their survival. An imbalance brought about by invading bad species or the death of good species can greatly affect our health and wellbeing. This is much like a well-managed forest. Most of the cells in our body are not our own, but exist in synergism with us, and were necessary for our evolution. Mitochondria are organelles in our cells necessary for the generation of energy from our metabolism. Originally they were separate cells, which we acquired through evolution. We both benefit by a sharing of function – mitochondria can't survive on their own and neither can we.

It seems clear from the above discussion that altruism is a necessary factor in evolution along with Darwin's competition. Is it also important in human society and civilization? Considering this chaotic year of politics and pandemic, is there a role for altruism (self-sacrifice, sharing, and mutual cooperation) in the survival of our civilization? Is clearcutting and monoculture planting in a forest equivalent to nationalism with a uniform population and restricted immigration? Is a loss of sharing and self-sacrifice in an authoritative government similar to a loss of communication in a well-managed forest? Is self-sacrifice as important in fighting a pandemic as it is in maintaining a healthy forest?

Trumpism, which preceded Trump, is "all about me" and "what can I get out of it?". Polarization, fixed ideas, and distrust of reason and science; ignoring climate change; restricted immigration – all these are counter to the idea of evolution in the sense of altruism and competition. Will they lead to devolution and the collapse of civilization as we know it? There is much here to think about!