

1. Mark your confusion.
2. Show evidence of a close reading on the page.
3. Write a one-page reflection in your WN

The 'Jane Goodall of Ants'

Smithsonian scientist Mark Moffett talks about the insects' social structure, their methods of making war, and why much of California is just one big ant colony.

Serfdom, war and dying for the tribe: It reads like a page out of a Russian novel. In fact, we're talking about ant life.

Mark Moffett, an ecologist and a research associate at the Smithsonian Institution, has observed all of these behaviors in ants — and much more. Known for his detailed photographs of insects and other small creatures, the author of books about the rain forest canopy and frogs has now written "Adventures Among Ants: A Global Safari with a Cast of Trillions."

The sci-fi-looking cover signals the journey to be found inside. Moffett, who did his doctoral studies in evolutionary biology with famed ant expert and animal behavior researcher Edward O. Wilson, traveled to remote parts of the world to study hard-to-find ant species and investigate the more intricate parts of the insects' social behavior. The book includes new hypotheses on ant behavior and evolution, including theories on foraging strategy, mass hunting and the origins of ant slaves.

You've been described as the "Jane Goodall of ants" — how do you feel about that?

I grew up reading adventure stories and science fiction, so I am thrilled to fall into a category of explorer naturalists. Careers in nature are thriving because there is a lot to be discovered. Not everything is mapped out. You can be out there, finding new behaviors and species all the time.

Your exploration of different types of ants has taken you to the Amazon, Nigeria, Botswana, Madagascar, Borneo, India, Australia. Is there a place where ants are particularly important, in terms of what they add to the region's biology?

Clearly, ants rule the Amazon basin. That's hard to match. You can get more different types of ants in one tree than you can in all of Great Britain. It's the drama of the Amazon. The early explorers called the Amazon "one big ant hill."

What behaviors in ants seem particularly human?

They outdo us in the amount of effort they put into environmental health and social welfare. Colonies of leafcutter ants put their trash in their innermost chambers that can be huge and take years to construct. It's equivalent to how we store nuclear waste [in the deepest places in the ground]. This level of effort tells us something about a topic we're just beginning to recognize as important, in terms of how we invest in dealing with waste.

On the other hand, ants care about the health of their own society more than themselves. Sick ants wander off and die on their own rather than infect anyone else. For ants, as individuals, it's a rough life. As a society, it isn't so bad.

In your book, you write about ants' different kinds of hunting behavior. Can you discuss?

Most ants either hunt on their own or send out scouts to search individually, much as human armies use spies.

With scouting strategy, you spread out and you look around alone, because in spreading apart, you're going to have the greatest chance of finding something. Scouting strategy allows the ant foragers to search far and wide and therefore to find much more, but after one of the scouts does find something — say a prey she wants to kill — she often has to go get help, which gives the prey lots of time to escape.

Mass hunting is searching in a group. It's something like a fox hunt, but with thousands or millions involved. Only army ants and a few others mass hunt. Army ants put soldiers together in a tight group. The swarm moves forward together. When they do find something, they have the shock-and-awe affect. You find less, but you kill more.

Leafcutter ants — these ants use foliage as mulch, on which they grow domesticated fungus. You describe their agriculture as parallel to the history of farming in humans. Can you talk about this?

Leafcutter ants have agriculture, which we don't think of in the animal world.

The fungus is their food. It has their complete diet. These ants started growing their fungus 50 million years ago. Twelve million years ago, they domesticated that fungus so that it could no longer grow in the wild, much as we domesticated wheat and rice. And 8 million years ago, they figured out how to use leaves as a way to grow the fungus in huge monocultures. They even invented pesticides. These are produced either by glands on the ants or by a relative of the penicillin fungus that they grow in their nests.

Why does slavery exist in ant life?

It's a way to get free labor. Slavery turns out to be very rare in nature. Particularly in North America and Europe though, ants plunder other colonies and steal the young. All you have to do is trick a young ant into thinking it is part of your colony, and it will work to death for you.

Let's talk about war. Can you describe what ant warfare looks like?

War can vary, depending on the size of the population. In smaller groups, fights can be ritualistic, as they often are in tribal human groups. Honey-pot ants — they will face each other off. They stand on their toes trying to make their enemy believe that they are much bigger. In this method, no one has to be hurt. Ants are scared away, and the ones with the most left standing there wins.

In larger groups [tens of thousands or millions], ants battle without hesitation. Marauder ants in Asia clash in broad fronts of tens of thousands, and mow each other down. A leg pops off here, antennae pop off there.

It's safer to fight at a distance, as humans have done ever since the spear was invented. Some ants have chemicals they shoot out of a gland associated with their stingers. One species even drops rocks on the heads of its competitors.

What are super-colonies? Why do ants form them?

Only a few ants and humans can build societies of any imaginable size. Some of the most dangerous species have that capacity, expanding their territories indefinitely to form super-colonies. The ants in each super-colony share a common identity, their own nationality — they are one big, unified society.

That has happened here in California with Argentine ants. They came here about a century ago. Their colonies have the ability to just keep growing in population. There is a colony here in California that stretches between San Francisco and the Mexican border and weighs more than the entire city of Carmel. It is very uninventively called the "Very Large Colony."

You can take an ant here in L.A. and drive it down to San Diego and drop it off, and it would blend in seamlessly with its nest mates there.

What species are in Los Angeles specifically?

The Very Large Colony has taken over the Los Angeles basin. Many of the species that were here originally 100 years ago are being driven to extinction by this ant. There are repercussions to that in terms of biodiversity loss, for plants and animals both.

Was it difficult to locate ants in some of the more complex terrain [thick forest, vast deserts] that you visited?

The really cool ants are hidden away, with small colonies that are hard to find. When you have a research grant it's a combination strategy: You pick out the thing you think you can find, and stealthily look for the rare gems.

You describe ants as highly social creatures that express their sociality through a division of labor. Can you describe that?

Ants have been social much longer than humans, and their division of labor varies quite a bit between species. Some ants within a colony are lazy. (Ants actually sleep; most people don't know that.) What we call "elite ants" end up doing most of the work. They can influence others to pitch in, however.

Adam Smith predicted in his book "The Wealth of Nations," written during the Industrial Revolution, that the individuals of a society could start to become dumber and dumber because each is just doing one little task over and over again. Similarly, ants that live in large, structured societies have something like assembly lines, and individuals are born capable of doing one job only, or they get good at their one task over time. The result is that a single ant cannot function away from the group. Without the help of others, it's quickly dead.

Argentine ants are "global invaders." Why is this?

They come from this single area in northern Argentina that is the breeding grounds for some of the nastiest invaders on the planet.

In human warfare, there is something called the "dear enemy phenomenon." What that means is if you have warring, there is a lot of death at first, but usually, after time, a territorial border is formed and a no-man's land is created, with less mortality.

This happens in ants, too. But in this floodplain region of Argentina, the water rises and falls. Each time the water falls, the ants must reestablish their territory from scratch, and the dear enemy phenomenon is lost. The ants start killing each other with no end.

When a ship shows up, they're on it. When the ship gets to its destination, the ants disembark and continue the relentless killing of whatever local species they contact.