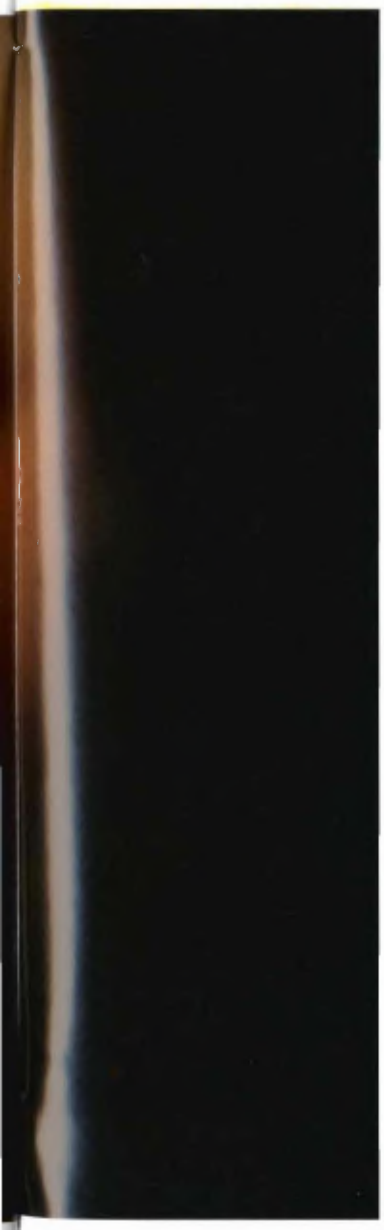
The Amazing World of

Christien Ziegler

OU zoologist Michael Kaspari organized AntLab to study the tiny creatures he considers scientifically important and "just plain cool."

An OU professor searches the globe creatures may hold for mankind's

Mike Kaspari's Ants



Tucked away on the third floor of the University of Oklahoma's rambling Sutton Hall lie tens of thousands of tiny, silent residents who may hold a big clue to the future of our world.

Welcome to AntLab, where scientists are answering questions about some of Earth's most intriguing creatures and their role in climate change.

"Our goal is really to understand how ecosystems work," says Michael Kaspari, an associate professor of zoology who heads AntLab and serves as director of OU's Graduate Program in Ecology and Evolutionary Biology.

"Ants are kind of an interesting probe because they're common everywhere, and they're important in virtually every ecosystem on land. They have their antennas in all sorts of ecosystem pies, from tending seeds and planting seeds to keeping down pests to becoming pests themselves."

Besides, Kaspari freely admits, ants are just plain cool.

"The reason Uncle Milty sells so many ant colonies is because they're fascinating to watch," says Kaspari, who mixes enthusiasm for his work with liberal doses of humor. "Individually, they're pretty stupid, but collectively, they're pretty smart."

Kaspari shows off his team's collective efforts—80,000 samples representing 700 species of ants gathered from 49 ecosystems throughout North and Central America during a four-year period. This "biodiversity library" is so vast that ant biologists across the nation regularly borrow from it.

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Kaspari focuses on the ants he and his research team have collected in the field.

Each ant collected gets the same initial treatment by being placed in ethanol. Samples of species are cleaned, identified and mounted on tiny, triangular points. Some of the ants are so minute they give researchers eye strain and can barely be seen in rows of sealed, bar-coded boxes. Other samples are left in ethanol or, in the best form of preservation, stored in ethanol and refrigerated until they are sent away to have their DNA extracted by taxonomists, who

for the answers that the tiniest of knottiest problems.

By Anne Barajas Harp

Debby Kaspari's pen captures the fierce Paraponera clavata, one of the largest ants in the world, with one of the most powerful stings.

have the job of "working out the evolutionary history" and deciding exactly which ant they are looking at, Kaspari says.

Think of it as "CSI for Ants."

"Asians say the first step toward knowledge is putting the right name on things. We are not that far yet," he says, explaining that in his team's journeys across tundra and tropical rain forests and everywhere in between, a full one-third of the ant species they sampled had never before been identified.

A wall map studded with colored pins illustrates the team's hopscotching nature.

"Our work focuses on not a given region, but across a good fraction of the globe. The reason is that to understand the global patterns of climate change, you have to have a snapshot and a working model of how the earth works."

A cluster of pins also covers home territory. "Oklahoma is one of the best places to do this kind of work because you can go from a swamp in one corner to the highest mesa in another. Oklahoma has as many different biome types as virtually any state in the nation," Kaspari says.

Stephen Yanoviak

In Amazonian Peru, a suspension bridge hung between two trees gives Kaspari access to the rain forest canopy, which contains about half of the of the area's astounding diversity.

Some of Oklahoma's tiniest denizens have been spared the ethanol treatment and live in a glass tank, where they are fed sugar water and bits of dead cricket while Kaspari and his team use highly sensitive equipment to measure how much carbon dioxide the colony puts out. In other words, as a collective organism, how do ants breathe? If there are more ants in a colony, do they put out more carbon dioxide, or do they conserve energy?

"To understand how they'll respond to changes in temperature during global change, you need to understand this basic measurement. It's something that very few people do, but it's an important part of the puzzle."

An even more important part of the puzzle may be as simple as the salt on your dinner table. The National Geographic Society has funded Kaspari's study to understand the relationship between what is called "the Brown Food Web," ants, salt and how quickly the earth might warm up if the climate continues to change.

The Brown Food Web is shorthand for the mysteries of decomposition on the tropical floor. As Kaspari wrote vividly on his Web site, "Forty meters below the lush green of tropical canopy is the brown world where bacteria and fungi rot the dead." These tiny creatures represent 60 percent of tropical di-

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With former student Mary Johnson looking on, Kaspari scoops up litter from the tropical forest floor in search of ants he has trapped within aluminum flashing fencing.

"To discover something no one's ever seen before, there's nothing better."

versity and have mostly been overlooked by scientists, he adds.

Ants are an important part of this cycle, in that they "eat the things that eat the things that eat the microbes," Kaspari says. In most Brown Food Web systems, decomposition happens quickly. Soldiers who have served in tropical areas can attest that anything touching the tropical floor decomposes—even jet fuel rots in that atmosphere. But Kaspari has discovered deep tropical areas like those of Peru, where three to four feet of dead leaves are piled up, untouched. Why?

The answer may be salt. Kaspari believes these tropical forests are so far inland that rain does not carry much saltwater from the sea. "Basically, there are no nutrients. These are old, old ecosystems that are not getting any new nutrients replenished from the ocean. We think it may be really important," he says. "There's the whole great carbon question—where is the carbon in the ecosystem going and to what extent is that governed by all the critters in the Brown Food Web?"

As the planet warms up, Kaspari says the world will get wetter. More salt may be carried from the ocean. And one thing researchers know for sure is that ants love salt, especially landlocked ants. (Kaspari has baited areas across the world with salt and watched the ants "vote with their feet.") If ants get the salt they are craving from increased rains, Kaspari wonders if they could help set off a cycle of decomposition that will release an enormous amount of new carbon dioxide into the atmosphere.

"One of the scariest things about climate change is when you enter a situation where there is 'positive feedback,' " Kaspari says, comparing it to someone who accidentally puts their foot on the gas pedal instead of the brake. "If you think the tropics are a happening place now, give it some salt, and you haven't seen anything yet."

The salt project is one of several AntLab studies funded by National Geographic, including a survey of army ants that revealed they are much less damaging to the rain forest than previously thought. Kaspari's research also has overturned conventional wisdom that says winters are bad for ants. In fact, he has found they thrive in a climate with extreme temperatures.

"It was one of those 'aha' moments when you realize that your preconceptions were wrong. That's what science is all about—when you find out something is wrong, that's progress.

"To discover something no one's ever seen before, there's nothing better," says the OU President's Associates Presidential Professor, who has been named a research associate for the Smithsonian Institution, a NATO Post-Doctoral Fellow and a U.S. Department of Energy Global Change Fellow.

Kaspari has shared his passion for discovery with thousands of OU students in his 600-person Introduction to Zoology course, which has earned him the Most Inspirational Faculty award, and with more than 1.7 million elementary and middle-school

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By studying ants and their interaction with organisms and ecosystems, Kaspari seeks to understand changes in ecological communities.

students through National Geographic's international "Jason Project." The program was founded by Titanic explorer Robert Ballard and connects children with scientists.

Kaspari helped kids explore a tropical rain forest in Panama live by satellite, completing five one-hour shows daily for two weeks. Students were encouraged to ask questions and brainstorm experiments. Kaspari did whatever it took to get the lessons across. To teach students about the Brown Food Web, Kaspari and his crew put on a skit, complete with British accents and sock puppets, while an assistant pretended to be a tree rotting on the forest floor.

"There was a lot of improvisation," he says of the Jason Project. "I've never worked so hard in my life."

Enthusiasm and a sense of wonder permeate Kaspari's work, whether he is describing his favorite ant—a huge specimen whose bite is said to hurt for 24 hours ("It was like having your hand slammed in a car door for about six hours," he recalls of his own experience. "It's a beautiful ant, just scary as heck.") or talking about what he sees when he looks at tiny creatures that get shaken out of leaf samples and examined under his microscope.

"It's like Christmas," he says warmly. "It's magical."

Kaspari loves collecting ants the way some people love collecting antiques and thinks the "buzz" he gets from his discoveries is the same drive that pushes children to hoard trading cards. In fact, he thinks the urge to collect nature may be hard-wired into our brains.

"Kids know less and less about the natural world, but they still have this urge to hunt down biodiversity. Pokemon ™ is just biodiversity displaced toward Japanese anime, in the same way that some people can recognize every form and model of the Ford Mustang . . . which is a very hopeful thing, because to my mind it means that the current loss of interest in the natural world is still there percolating. We just need to let people see it again and get them outdoors and looking around."

Looking around may be the most childlike way to explain Kaspari's job of studying how the living and non-living worlds interact. But he and his researchers will soon be back in the tropics of Peru, seeking answers to one our world's biggest problems by examining some of our tiniest beings. Kaspari is well aware that they have plenty of work to do.

"Our job is to do what we can to understand the role of ants in the natural world, and by doing that, hopefully help us predict what the world is going to look like 10 years from now, 100 years from now," he says. "It's an amazingly cool job."

(Kaspari's Web site for the OU AntLab can be seen online at http://faculty-staff.ou.edu/K/Michael.E.Kaspari-1/.)

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