UCSD researcher learning the buzzwords of beespeak

By Jeff Ristine
STAFF WRITER

In the humid, pungent forest of an island in the Panama Canal Zone, a stingless bee zips into its nest, spins around in a tight circle and emits an intense, high-pitched buzzzzzz.

UC San Diego's James C. Nieh videotapes the sound and movements, which prove to be anything but random.

The bee, employing symbolic communication in a way only humans can match, has informed its nest mates exactly where they can find food.

And off they go.

Nieh is cracking some of the codes of stingless bees' communication, reviving an area of scientific inquiry that had been dormant for some time: how the insects use a complex language of dance and sound.

"I'm very interested in understanding animal cognition, you might call it the animal mind," said Nieh, a biologist. "I think that language is one of the best tools that we have

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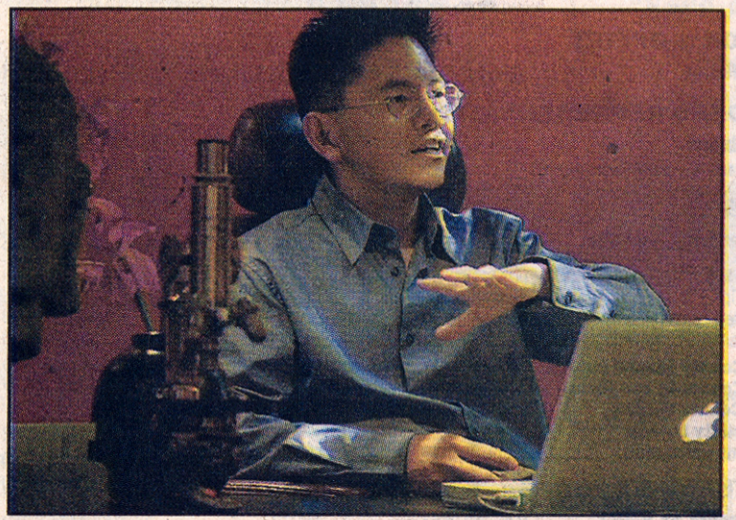

James C.Nieh of the University of California San Diego is cracking some of the codes of stingless bees' communication, including motion and sound. *Peggy Peattie / Union-Tribune*

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Insect's feeding 'signal' detailed in honors thesis

to explore that."

"My focus is to look at the exact mechanisms of how they do what they do."

He has found, for example, that differences in the duration of the bees' buzz pulsations and the number of turns they make convey essential information about the location and quality of a food source.

It has long been known that the familiar honeybee, a different species from stingless bees, uses what is called a "waggle dance" to communicate, and that the dance includes references to distance and direction to the food source.

But in focusing on a different bee — one found primarily in the tropics — Nieh is breaking new ground in scientists' understanding of insect communication.

In field studies, Nieh has found the stingless bees use somewhat different mechanisms than honeybees to pass along information.

Sound is louder and seems to be more important in stingless bee communication, and at least one variety can do something the honeybee can't: report the height of a distant food source.

There are more species of stingless bees than the honeybee type, and Nieh said the variation is a boon to research.

Nieh's mentor, biologist Tom Seeley of Cornell University, said Nieh is the first to do extensive research in the tropics on stingless bee communication.

"People had thought that maybe honeybees were some sort of weirdo thing that was very much an exception among insects," said Seeley. "But what James' work is showing is that . . . it's probably not as unusual as people had thought. There may be a lot of these small-brained creatures out there that are quite sophisticated."

Nieh, who came to the University of California San Diego last year, became interested in bees as a Harvard undergraduate while taking a course in animal behavior "for fun." He wound up writing an honors thesis on a "signal" that bees use during feeding. He met Seeley, who helped steer him into the world of stingless bees.

Bee communication is considered symbolic communication, a scientific term, because it conveys specific information about their environment in an abstract, simplified way.

Many animals and insects, such as ants, can physically lead others to food without using symbolic communication. Others, like the macaque monkey, can issue simple symbolic calls — one to warn of a cheetah, one to warn of an eagle, for example.

"What the bees are doing is very unique in terms of efficiency," said Nieh. "You can save a lot of energy by telling someone where to go, rather than going with them."

Nieh and his research team conducted field tests in Brazil and on Barro Colorado, a Panamanian island maintained as a preserve.

In one test, Nieh set up a "training" food station for bees to visit and report back to their nest mates, then placed an identical "control" feeder at the same distance in the opposite direction. Nearly all the bees went to the training feeder.

"If they could not communicate direction, then you would expect them to search randomly and . . . arrive in equal probability at the control and training feeders."

Nieh found that the duration of the buzz pulses correlates with the distance of the food source.

The "dances" vary, too. There are half-turns, full turns and multiple turns, and differences in the speed of the motion. Nieh believes the speed may relate to the quality of the food source being reported: the faster the turn, the better the food.

Nieh has published five journal articles about his findings and is seeking funds for continued work.

"I have a grant submitted to the Defense (Department), a project to study stingless bee navigation because they have this remarkable ability to accurately target," he said.

James C. Nieh keeps small advertisements about his work in the hallway outside his office at UCSD to entice students into joining his research team. *Peggy Peattie / Union-Tribune*

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