

RAINFOREST CLASSROOM

How do you make a class on tropical ecology more effective?
Hold the class in a South American rainforest.

BY DAVID PESCI



Students use non-contact laser devices to take the body temperature of lizards in relation to their environment, comparing this data to lizard behavior.

Nora Connor ’07 knew that “Tropical Ecology” would be wildly different from any other class she’d taken at Wesleyan. Still, she hadn’t expected to wake up and find a tarantula the size of her hand above her bed.

“An even bigger one was nesting in a tree by the out-house,” Connor says. “So people had to be very careful not to brush against the tree and disturb it, especially at night.”

This surprising welcome to field science took place in Guyana, where 14 undergraduates had the opportunity to study four tropical environments during 10 days of spring break in March.

“Guyana *was* the classroom,” says Barry Chernoff, Robert K. Schumann Professor of Environmental Sciences and professor in both biology and Earth & Environmental Sciences. “Every day instruction and research occurred pretty much from when the students got up in the morning until they went to sleep at night.”

Chernoff created the class using a grant from Wesleyan’s Fund for Innovation in order to offer interdisciplinary instruction in an ecologically diverse, rapidly changing part of the world. He intended the class to benefit science and non-science majors alike by providing an unforgettable taste of field research as well as an appreciation for the importance of threatened ecosystems.

“These areas are so beautiful and so vital, but so many of them are also endangered or being encroached upon at an alarming rate,” Chernoff says. “This was a chance for our students to study all this in context.”

Their work began at the CEIBA Biological Station, a nonprofit research and conservation facility occupying roughly 50 acres of lowland forest on the Madewini River in Guyana’s secluded northeast corner.

“We were driving down this road in the middle of nowhere and then all of a sudden we just turned into the forest,” says Connor, a biology major. “It wasn’t a dirt road, not really a road at all, just a swath through the trees that went on and on for miles.”

They finally arrived at a large open-air hut, where they set up their pods, a sort of combination hammock and sleeping bag that enclosed each occupant in an insect-proof mesh.

Ian MacLeod ’07 observes a tarantula on a leaf during one of the ecological surveys in the rain forest.

Though the pods themselves were quite comfortable, the world inside and outside the hut constantly reminded everyone of the unfamiliar and dangerous environment. In addition to the tarantula that took up residence over Connor’s pod, students faced large beetles, mosquitoes, centipedes, and snakes—both constrictors and some deadly venomous types. Other creatures seemed to be everywhere.

“I was packing for one of the side trips and a scorpion crawled out of my bag,” says Ian MacLeod ’07, a biology major. “It definitely got my attention.”



Daytime temperatures were in the 90s (F) and humidity remained north of 70 percent day and night. Light sleepers were treated to the screeching brays of howler monkeys throughout the night. Just before dawn, the monkeys’ din was joined by the crowing of roosters that lived on the preserve. A little while after sunrise came Top 40 music.

Top 40 music?
“It was a real reminder of how endangered the envi-

ronment is down there,” says Kevi Mace ’07, a biology major. “A developer had bought the land directly next to CEIBA and turned it into a water park. They were practicing some water show all during our first day there and the music blasted all day long. It really wasn’t what I expected.”

Which was a lesson in itself. Chernoff says that among the biggest threats to tropical environments today is reckless development. That the students could see (and hear) this on their first day provided a tangible and dramatic example of Guyana’s ecological challenges.

“It was really jarring,” MacLeod says. “Here you think you’ve been brought to a remote place where you can study a pristine environment and you’re reminded how relative ‘remote’ and ‘pristine’ have become.”

Despite the music, students began work on their projects (see sidebar) only to discover an enduring truth about fieldwork: nothing goes quite as planned.

The group studying the links between lizard activity and temperature found that they could not use uniform sampling areas because of wide variances in lizard distribution. The frog group found there were fewer blood-sucking flies in general than they expected to encounter. And at the end of their study, the team that surveyed forest ecology found that the data points they had chosen—leaf morphology and forest diversity—did not prove to be good indicators of forest type.

“Adapting to what nature gives you is part of field work,” says Chernoff. “So is dealing with unknowns. That’s one of the basic tenets of science, but in the lab these factors are often minimized. In the field, you can’t fake anything. It’s all right there.”

Jenny Doyle ’07, a religion major also enrolled in the environmental studies certificate program, agrees:

“Though analyzing our data and making conclusions was certainly fruitful, it was the process itself that taught me the most—how to set up and carry out a field study and collaborate effectively under all sorts of changing conditions.”

The best way to study tropical ecology, in Chernoff’s view, is to observe as much of it as possible firsthand. He and the students made regular forays into the surroundings. They were often joined by Godfrey Bourne, an administrator of the CEIBA station and researcher, as well as an associate professor of biology at the

University of Missouri-St. Louis and a longtime friend and colleague of Chernoff.

“Going through these forests with Godfrey and Barry was just amazing,” Mace says. “They seemed to be able to answer any question we had about the plants or animals and turn those questions into discussion about local ecological systems and broader issues.”

The students were also able to see how these systems changed from day to night. During an after-dark kayak trip down one of the rivers, students pointed their headlamps into the jungle.

“It absolutely glowed with millions of sparkling dots,” says MacLeod, whose focus is environmental studies.

Condensation on the leaves? Possible, except the ‘dots’ moved, some very quickly.

“Spider eyes,” says Connor. “They were everywhere—like the stars.”

On another night, while hiking through the forest, students encountered several types of plants that flowered only after dark, prompting Chernoff to ask the students how they thought these plants were pollinated. Chernoff says that exchanges like these are part of what made the class so effective.

“Topics would come up during our hikes into the field or lunch or the downtime and they would provide tremendous teaching opportunities that you’d never have in a classroom,” he says.

A student question turned into a mini-seminar on grant-writing for the whole group, led by Bourne, who is a director of the National Science Foundation’s Behavioral Ecology Program. “He was very detailed about what makes a good grant proposal and what the committees look for,” says Chernoff. “The discussion was tremendously beneficial, especially for the science students.”

The students also helped Bourne, who, along with a researcher from Belgium, had been trying to identify a previously uncategorized species of frog. Its call had been heard and recorded, but scientists had not yet captured one. However, Lauren Nichols ’07 did exactly that.

“We could hear it, and Lauren turned and there it was,” Connor says. “It was very small. She was able to pick it up. The researcher got so excited he practically yanked it out of her hand.”

Another student also captured a previously unidentified species of fish, *Hyphessobrycon*, which belongs to the family of tetras.

“Very unusual and very impressive,” Chernoff says. “Many scientists will spend a lifetime in the field and never identify a new species.”

Days later the group continued their research in a new environment: the Dubulay Ranch, a privately-owned working ranch along the Berbice River. This sheep and cattle ranch is located on a 50 square-mile tract of land in a savannah region with several hundred acres of forest. Unlike most ranchers in Guyana who clear-cut forests,

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owner Alex Mendes opted against clear-cutting and has maintained forest on more than half his land.

“Alex is an interesting guy, and I wanted the students to meet him,” Chernoff says. “He could dramatically increase his profits by clearing the forest on his land and by using less environmentally friendly methods on his ranch. Instead, he has chosen to try to find a balance.”

Mendes has recently brought down university experts from the United States to develop experimental farming techniques that are environmentally friendly. His environmental ethic does sometimes run smack into practical problems, which he revealed to the students when he showed them the skins of a jaguar and a puma that he had killed. The big cats had been killing sheep on the farm, and after three attacks he knew that the animals had acquired a taste for the sheeps’ meat. At that point he had to decide whether to hunt them down or risk losing more livestock.

“I’m from Vermont and know quite a few farmers, so I understood his position,” says Connor. “He was not only trying to protect his investment, he employed several dozen people around the area. If his ranch starts to fail, they lose their jobs as well.”

For Doyle, listening to Mendes was at the very least thought-provoking.

“Hearing him talk so openly about the difficulties of his business and lifestyle made the deaths of the puma and jaguar fall into a gray area for me,” she says. “My knee-jerk philosophy was ‘No, it’s not right to kill those animals.’ But because the rancher was visibly conflicted about his decision, having the intricacies of a specific situation right there was great for stretching my perspective.”

MacLeod was less forgiving. “I thought he articulated his position well,” says MacLeod. “But as an environmen-



(Top, left) Students made the extraordinary find of the *Hyphessobrycon*, a previously unidentified species of fish. (Top, right) A rancher showed students the skin of a jaguar he had reluctantly killed after it had eaten several sheep and his dog. (Above, left) The group at Kaieteur Falls. (Above, right) Students found the endangered and rarely-seen Golden Frog in the cloud forest near Kaieteur Falls.

talist, I really couldn't condone his methods. I really believe profits should be sacrificed for ecological integrity."

Chernoff was pleased. He knew that talking to Mendes would produce a lot of discussion.

As did the flight to Kaieteur Falls National Park. The journey took about 45 minutes in small, single propeller-driven planes that provided a bone-shaking ride over the cloud forest to a small landing strip at the edge of the park. Looking down, the students could see huge swaths of land in the middle of the rain forest clear-cut and gouged out.

"Strip mining for gold and diamonds," Chernoff says. "The regulations are very poor. Miners basically just come in, rip everything out, dig huge holes, sift through the soil and then move on, leaving the exposed earth behind."

"It was disgusting," says MacLeod. "And then you see the falls at Kaieteur coming up, and they are so absolutely breathtaking and such a spectacular natural phenomenon. It was just such a stark contrast."

Of all the locations the students studied, Kaieteur Falls most closely fit the ideal of "pristine." The park comprises a few hundred square miles in western Guyana and is in the middle of a true cloud forest. It is also notable because the Potaro River, which flows through the park, is a black water aquifer. Large numbers of leaves and plants find their way into standing water during the rainy season, and acids leach from the leaves into the water, turning it black.

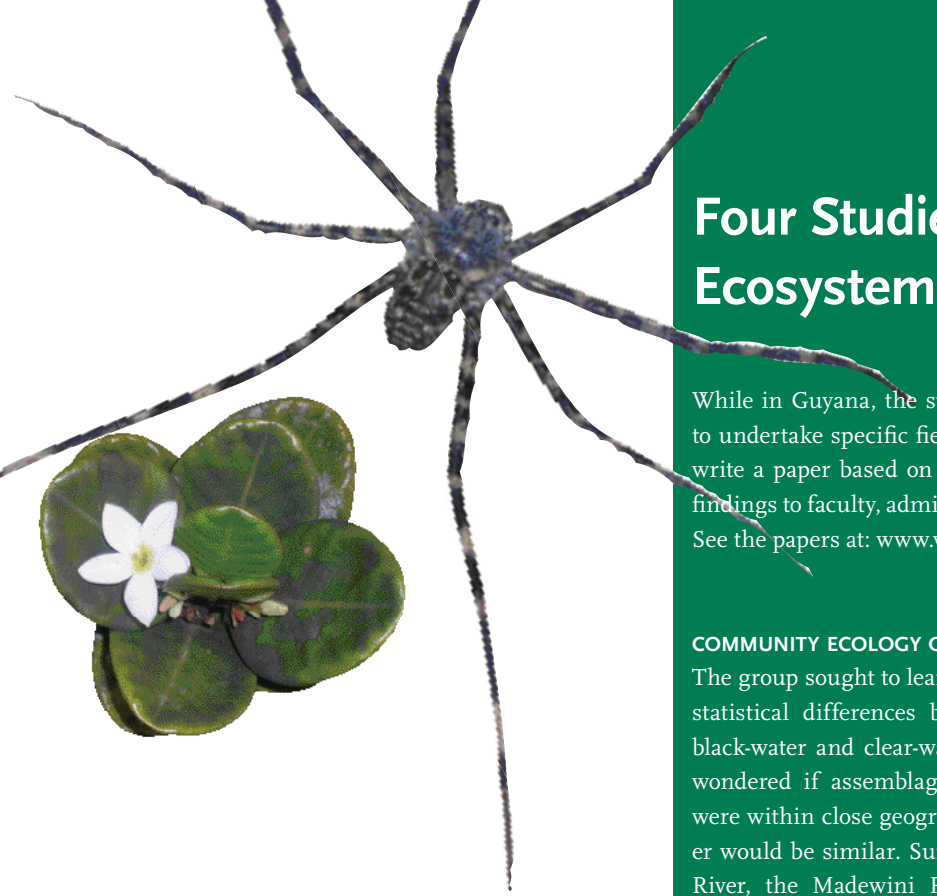
The cover of the cloud forest makes for a more humid environment. Nights are darker because light from the moon or stars does not penetrate the canopy. Plant and animal life are highly diverse. Students often felt they were completely alone, deep in a wild habitat—often, but not always.

"There was a small camp of gold miners who had taken up residence in the park," MacLeod says. "I don't know if the government knew about them. Their camp was about a 40-minute walk from our area. And they were definitely prospecting."

Chernoff says that small squatter camps like this may do less damage, but there are other hazards to the environment.

"They use mercury to separate the gold from other rocks and ore, and they aren't very careful with it," he says. "They also kill snakes and other animals that wander into their camp or that they perceive to be a threat."

When they returned to the United States, the students



spent the next month sifting through the data they generated and writing papers based on their research. Their findings were the subject of a formal presentation in May before Commencement.

"It was the best science class I've ever taken," says Connor. "I hadn't done field science before or much study outside the lab and this was just amazing. It really whetted my appetite for more field study."

For Doyle, a non-science major, the class served a different purpose.

"It wasn't just about science," she says. "Guyana was a rare chance to be more physically involved in the intellectual process, learning by being there."

Though funding meant it was a one-time offering, Chernoff hopes he can offer the class again soon.

"It was just a tremendous success on so many levels," he says. "Not only did they learn field techniques and gain a deep appreciation for the complexities of tropical ecology, but I was able to give them a lot more personal attention. There was so much active learning going on. As an educator and a researcher, that's what you want to see in your students."

Special thanks to Barry Chernoff and to all the students who took this trip for generous assistance in providing Wesleyan magazine with photographs.

Four Studies, Four Ecosystems

While in Guyana, the students split into four groups to undertake specific field studies. Each group had to write a paper based on their study and present their findings to faculty, administrators, and other students. See the papers at: www.wesleyan.edu/magazine.

COMMUNITY ECOLOGY OF STREAM FISHES IN GUYANA:

The group sought to learn whether they could discern statistical differences between fish assemblages in black-water and clear-water environments. They also wondered if assemblages in separate locations that were within close geographical proximity to each other would be similar. Surveys took place in the Potaro River, the Madewini River, and tributaries of the Berbice River.

FOREST DIVERSITY EFFECT ON LEAF MORPHOLOGY AND PLANT DIVERSITY:

The group examined the differing types and characteristics within four distinct types of forests using transects and examining leaf morphology. The four forest types examined were: a dry evergreen forest on white sands; an inundated forest on a flood plain; a savannah forest; and an upland cloud forest (more commonly known as a rain forest).

THERMAL ECOLOGY OF GUYANESE LIZARDS:

Students examined whether ambient temperature, air and ground, as reflected in the body temperature of lizards, had an effect on behavior, and if so, whether these effects varied between lizard species.

INSECT ATTRACTION TO FROG VOCALIZATION:

The group examined whether mosquitoes and blood-sucking flies that preyed upon frogs were attracted to the mating calls of these frogs. The study used insect traps placed in proximity to pre-recorded indigenous frog mating calls, as well as control traps without sounds.