Summer Systematics Institute

Academy research program for undergraduates wraps up its 12th year

Courtney Mattison displays a preserved gorgonian coral. This summer she researched the symbiosis between corals and barnacles.

With a pencil and a steady hand, Chris Laumer carefully marks 17 points on a clam shell the size of a dime. To the outsider, these points are completely arbitrary; to Chris, they contain a wealth of evolutionary data, accessible only through complex mathematics. "At the start of the summer, we were told that we'd be the best in the world at something," he says. "I am the best in the world at finding these 17 points on the shell."

Chris is one of nine undergraduates participating in the 2006 Summer Systematics Institute (SSI) at the Academy. Now in its 12th year, SSI provides students with the opportunity to conduct independent research based on the museum's collections, with the guidance of an Academy scientist. For many, this intense eight-week internship offers both personal and academic adventures.

Chris, for example, is visiting the West Coast for the first time. He took a 90-hour train ride from Philadelphia so that he could see the Rocky Mountains on his way to San Francisco. This summer represents his first significant research experience. And his project, which involves an esoteric branch of biology called morphometrics, is completely new to him.

But halfway through the program, he's already hit his stride. He speaks with his mentor, Dr. Peter Roopnarine, for an hour every day about "non-Euclidean n-dimensional space"; he leafs through a tome entitled *Programming in C* when not examining clams; he's even made a contact through Roopnarine for a potential graduate adviser.

Above: Nicole Cox measures the pedicellariae (ice tong-like defensive pincers) on an Atlantic sea urchin.

"The distinction between free time and work is starting to dissolve," he says, "because I enjoy what I'm doing so much."

The first Summer Systematics Institute was held in 1995, organized by then Director of Research Dr. Patrick Kociolek as an Academy-funded pilot project. Today, the program is supported by the National Science Foundation and Robert T. Wallace Foundation, with an additional internship in biological illustration funded by the Academy Fellows. Funding goes toward a generous stipend as well as living expenses for the students.

Dr. Rich Mooi, one of the Academy's curators of invertebrate zoology and geology, has overseen the SSI for the past eleven years. To keep the program running smoothly, he coordinates everything from grant applications and scheduling to identifying prospective mentors and reviewing student applications.

"We look for those who might not normally get research experience in their home institutions, as well as groups underrepresented in the sciences," says Mooi. "However, that doesn't mean that others won't be accepted. The most important criterion is a fit between adviser and applicant, usually a combination of academic excellence and an interest in whole organism biology."

Competition for the coveted few spots has intensified since the program's inception—though it used to average 50 applicants per year, the number of applicants this year surged to 106, a record high. The applicant pool is diverse in terms of race, gender, prior research experience, size of undergraduate institution, and geography. Students from North Carolina to San Francisco, from small liberal arts colleges to massive state universities, all vie for spots.

Once the selected interns arrive at the Academy, more than just research awaits them. They also attend daily workshops, seminars, and lectures presented by Academy scientists, covering such topics as molecular systematics, collections management, and how to give effective presentations. And while the summer culminates in a day-long series of research presentations, that is by no means the end of their experience. Interns often return to finish projects, attend national meetings with their mentors, publish papers, and—in some cases—go on Academy expeditions related to their work.

One of the most important aspects of SSI is its role as a stepping stone to graduate school. Mooi knows of at least 30 former interns who have gone on to Master's or Ph.D. programs in the sciences. Inspiring students to pursue graduate programs, especially those focused on systematics, is a responsibility that the Academy takes seriously. Although the National Science Foundation funds 140 biological internship programs annually, only five involve systematics-based research institutions like the Academy.

"In this day and age, it's never been more important to understand biodiversity, because much of it is disappearing," says Mooi. "Sending out the next generation of scientists is a critical task. If we don't do it, who will?"

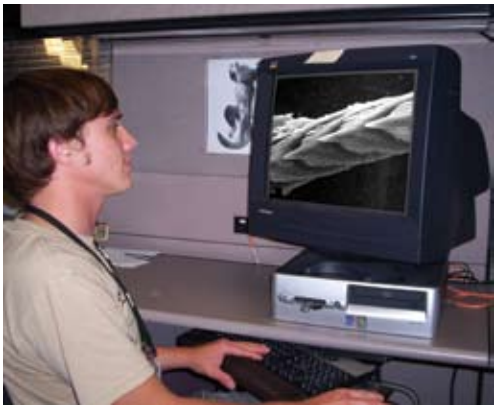
Katie Marshall holds a frog from Sao Tome and Principe. She is investigating whether or not the frog populations on the islands have evolved into different species.

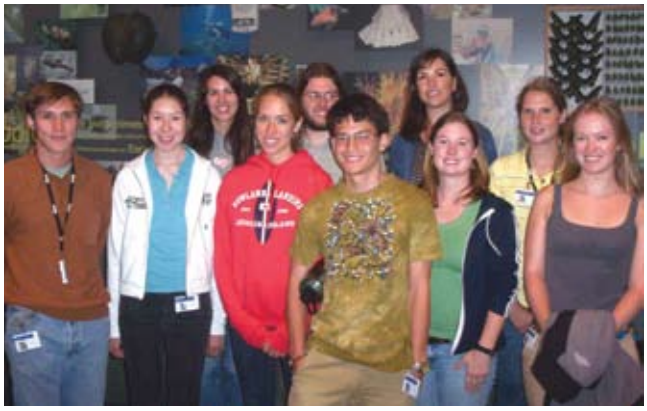
Down the hall from Chris and his clams, intern Carmen deLeon is squeezing the last drop of *Plasmodium* DNA into an agarose gel. *Plasmodium* is the parasite that causes avian malaria; Carmen is investigating whether it is infecting California's spotted owl population.

Although Carmen has studied birds before, she never thought about devoting her career to ornithology until this summer. "SSI makes me feel more secure in my decision to pursue scientific research," she says. "I now know the lab techniques to make a difference—I don't think I've ever learned this much in this amount of time."

Besides gel electrophoresis, her new skills include extracting DNA, aligning sequences, and creating phylogenetic trees. With this powerful molecular arsenal, she says she's ready to face the rigors and joys of a scientific career.

"You have the passion in you," she says, while waiting for the results of her experiment. "You just need the right opportunities."





Left: Jason Koontz examines the radula of a tropical sea slug, magnified several thousand times by a scanning electron microscope. Center: The 2006 SSI interns hail from seven different states. Right: Erin Hunter, the biological illustration intern, pays close attention to detail. "Sometimes my adviser will tell me to draw the hairs on a flower stem three millimeters longer," she says.