Undergrads Use Summer to Make Waves in Research

More than 500 students go to Caltech to work with top scholars and explore scientific ideas.

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Albert J. Bollard, 20, traveled from England to Caltech this summer to pursue lofty scientific questions with world-class researchers — questions like: “Would you prefer to run over a puppy with your car, or shoot dead a gorilla?” and “Would you rather kill a deer or suffer second-degree burns to your hand?”

The gruesome inquiry actually aimed to serve a greater social purpose. Bollard and his Caltech collaborators were studying how the brain responds to morally charged questions. Subjects pondered those repugnant choices while strapped into a brain-scanning machine.

One day in the future, economists and lawmakers might be able to use such knowledge to help make hard decisions about life-and-death policy issues in areas such as healthcare rationing or setting safety standards.

But for Bollard, the project’s payoff was immediate; it gave him a taste of the real-world excitement of research, with plenty of access to the facilities and faculty of Caltech. It was an entirely new academic experience for the Cambridge University senior. “There is not the equivalent of this at Cambridge. It’s just lectures and exams there,” he said.

Bollard is one of 242 students from colleges across the country and abroad who, along with 275 Caltech undergraduates, spent the summer in a kind of scholars’ paradise. Through summer research programs, dedicated students took a break from reading about scientific discoveries and spent their days trying to come up with their own.

For students, some of whom come from community colleges or from schools where professors conduct little research, the Caltech summer presents a rare opportunity to work with leading researchers. Undergraduates from prominent research universities are able to do the kind of work typically reserved for graduate students or to study with professors working on areas not being pursued by professors at their home institutions.

In the program’s 25 years, three participants have gone on to become Caltech professors.

This summer, Jennifer Bob, 21, a Seattle University senior, studied the relationship between communication and capital investment, something she could not have done at her school. In Seattle, she is majoring in business economics, taking courses in finance, accounting and management.

Although Bob said she might well pursue a master’s in business administration and a corporate job, she also has developed an interest in studying for a doctorate in economics. That late-developing interest was something that would have been difficult to develop in her business economics department. “We don’t have experimental economics,” she said.

A Lummi Indian from Bellingham, Wash., Bob said her project is part of a broader personal interest in developing economies, including Indian nations. Bob and her colleagues used computer simulations to see if more open communications made people more willing to invest in capital markets.

Caltech students say their summer experience differs from the academic year because they can focus their full energy on research projects without the responsibilities of classes, homework and exams.
“During the school year, students joke that there’s basically school, friends and sleep, and you pick two out of the three,” said Caltech economics professor Colin F. Camerer, who was a mentor to Bollard and Bob.

The Summer Undergraduate Research Fellowships program began in 1979 with 18 students and a budget of $36,000. Now, with related programs added, an overall annual $3-million budget funds the more than 500 students selected on the basis of their research ideas and academic records. The money comes from a mix of individual donors, federal and corporate grants, research grants held by faculty, and an endowment for the program.

In addition to free tuition, each student receives a $5,000 stipend to cover living and travel expenses for the 10 weeks. Students sometimes continue their research during the school year; the Caltech students do so on campus and others from their home campuses by correspondence. In October, participants will gather on campus for a conference to present their research findings to their peers.

Caltech professors say working with undergraduates benefits both them and their students. As teachers, “we want to motivate brilliant young people to become graduate students. We are seeding the next generation of researchers,” said biology professor Christof Koch.

Camerer said he especially likes working with undergraduates because he believes they are often more willing to ask questions and challenge their mentors than graduate students are.

“Graduate students sometimes feel they are constantly being judged, constantly auditioning. They might rather not say anything than sound dumb…. Undergraduates are not afraid of that. They have a kind of intellectual adventurousness,” he said.

Galen Loram, 21, a senior economics student at Caltech working with Camerer, has participated in the summer research program for three years. Loram is using brain scanning to examine which parts of the brain form the basis for curiosity. The research could be useful to labor economists interested in why people work hard when they don’t have to, Loram said. He hopes his work might lead to a published scientific paper, and he may go on to graduate school in neuroeconomics.

But he said his first summer research project, which he did not enjoy, was as valuable as his current one. That year, he worked on an organic chemistry project from which he made a life-changing discovery: He did not want to be a chemist. Although he enjoyed chemistry classes, Loram said he found “I was too prissy for chemistry. I didn’t like the bad smells, the chemicals eating holes in my clothes, the black spots appearing on my hands and I didn’t like wearing goggles and lab coats.”

Discovering this the summer after his freshman year left Loram plenty of time to change directions. “Research that goes badly,” he said, “can be as useful as a project that goes well.”