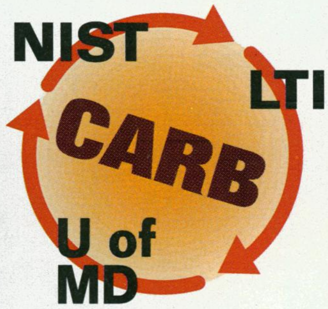
Novel Program I: Advanced Research in Biotechnology

DARROW MONTGOMERY



On a roll. Government, corporate, and university funding keeps the wheels of science turning at CARB.

Why did first-year doctoral student Ram Samudrala turn down offers from Cornell University and the University of Pennsylvania to study at what looks like a giant ski lodge on recently converted farmland in suburban Maryland? "I was completely blown away," he says, by the Center for Advanced Research in Biotechnology (CARB) in Rockville.

Samudrala isn't alone: *Forbes* magazine has called CARB "one of the 12 hottest addresses for science in the United States." Samudrala and his five fellow grad students like its dual focus on pure and applied research. That approach allows them to tackle basic research problems with one eye on industry—and gives them twice the career opportunities after graduation.

This idea is one of the hottest in science academe. It's a response to the unsustainable cycle of a growing number of postdocs competing for a shrinking number of tenure-track positions—from whence, if successful, they begat more postdocs. Seeking new models, leading scientists in government and academia are trying various experiments to bring the real world on campus. At CARB, this philosophy is reflected in the exchange lecture series between CARB researchers and researchers from Life Technologies Inc. (LTI), a biotech company in nearby Gaithersburg that develops new reagents for gene sequencing. It's also part of the reason crystallographer Andrew Howard of Molecular Simulations Inc. in Burlington, Massachusetts, is working at CARB to develop computer software for analyzing complex x-ray diffraction data. The data hold the blueprint of a protein's three-dimensional structure, which industry needs for rational drug design.

CARB was founded in 1985 as a joint venture between the Department of Commerce's National Institute of Standards and Technology (NIST), the University of Maryland, and Maryland's Montgomery County. Each year, it receives about $3.5 million from NIST and the university, and about $1 million in miscellaneous research grants and industrial contracts. Its role as a breeding ground for industry-savvy Ph.D.s is a byproduct of its main mission—to boost the U.S. economy by doing the sort of basic research the biotech industry needs but cannot afford to do on its own. "The basic training is to teach [the graduate students] to be good scientists," says Philip Bryan, one of CARB's 13 faculty scientists. "But they're also getting exposed to a different culture."

That culture is ever-present on the 8-acre campus. For example, faculty scientist Osnat Herzberg receives funds from American Cyanamid Co. to investigate the structure and activity of beta-lactamase, an enzyme that makes bacteria antibiotic resistant. Faculty scientist Fred Schwartz receives funds from Life Technologies to help elucidate the means by which restriction enzymes recognize specific bits of DNA. And Bryan received funds from Procter & Gamble Co. to make minute changes in the 3D structure of the protein subtilisin—an enzyme used in soap powders and other detergents to remove stains such as blood and egg—to better withstand its harsh environment.

But CARB's contacts and contracts with industry do not mean researchers are driven by the profit motive, says its director, molecular biophysicist Roberto Poljak, who came to CARB in 1992 from the Pasteur Institute in Paris. Take the soap-powder enzyme. "The distinction between our research and industrial research is that we didn't start out to make a better detergent enzyme," says Bryan. "We were looking at the energetics of protein folding, how it causes proteins to achieve their specific three-dimensional shape and how it affects their activity."

Much of the work at CARB is concerned with what Bryan calls "trying to understand the second half of the genetic code." By that he means the process by which long chains of just 20 different amino acids create more than a thousand proteins in a myriad of shapes. Samudrala will be working on one aspect called "threading," a novel technique for predicting the structure of one protein from the way its string of amino acids line up with—or thread through—pieces of other proteins of known 3D structure. "Most academics don't care about the research once they've solved a problem," says Samudrala. "But for us there's the impetus to push it on through to its practical applications."

Lan Wang, a fourth-year grad student who's working on the subtilisin-folding problem, agrees. "You feel very excited," she says. "You can see where your results can go in the very near future."

Despite their obvious enthusiasm for applied research, Wang and Samudrala want to pursue academic research once they get their Ph.D.s. Poljak says that preference may change as time passes. "Between you and me, [in the current job market] they may not be able to realize that ambition," he says. "They may have to go into industry." Whatever happens, however, Poljak is confident his students will be better prepared than most to succeed.

–Rachel Nowak

Novel Program II: Environmental Management

As part of her graduate program at Duke University, Rebecca Fawver has studied biometry, environmental physiology, ecology, regression, and global ecosystems. And after classes ended last spring, she worked as an assistant in an intensive biodiversity field course. But Fawver, 26, has no intention of becoming a research scientist. "I didn't want to get an M.S. or Ph.D. I plan to work with people, in a management position."

To do that, she is spending about $20,000 a year on a 2-year professional program at Duke's School of the