Environment, where the curriculum is loaded with policy and economics as well as science. Next May she expects to graduate with a master of environmental management degree. When she does, she'll join the growing ranks of grads who plan to use their scientific education not in research or teaching but as background for diverse careers in business or government.

Duke and a handful of other top schools offer graduate degrees that blend natural science, social science, and business in a curriculum rooted in real-world problems and solutions. At Duke, the School of the Environment began as a school of forestry in 1938, but its mission has grown to encompass fields from marine science to ecotoxicology. In 1991, the school dropped the word "forestry" from its name.

What's unique about such schools is that they explicitly package natural and social science, explains Jarod Cohon, dean of Yale University's School of Forestry and Environmental Studies. In the past, environmental professionals have been forced to patch together their own educational programs, perhaps combining a research-oriented degree with an M.B.A. or on-the-job training. But today, schools such as Duke and Yale take their cue from schools of public health and business. The goal is to produce scientifically savvy professionals who can manage a preserve for the Nature Conservancy, write regulations for the Environmental Protection Agency (EPA), or plan logging operations for Weyerhauser Inc.

PHOTOS BY JIM WALLACE/ DUKE UNIV. PHOTO DEPT.

Policy wonk? Rebecca Fawver hopes Duke's novel 2-year environment program, housed in the Levine Science Research Center, will spawn a career in, say, government.

The idea is timely. Indeed, while many areas of higher education are retrenching, leading environmental schools are hiring more faculty and enrolling more students. Most schools offer research-oriented Ph.D. programs too, but it's the professional programs that are growing most rapidly, fed in part by a seemingly insatiable demand from students. At Duke, applications have been increasing at an annual rate of 20% in the past few years, says Norman Christensen, dean of the School of the Environment. And so far, at least, grads are getting jobs: A 1992 survey found that 95% of management students found work within a few months of graduation.

Part of the attraction is the promise of business skills as well as scientific understanding. For example, Fawver has taken classes in economics, sustainable development, and conflict resolution, and she's eager for more training in speaking, negotiating, and writing. "It's skills, not knowledge per se, that I'm interested in."

Even science courses emphasize real-world problems and require students to work in groups. Says John Fitzpatrick, who earned a B.S. in biology at Brooklyn College before coming to Duke, "In a traditional undergrad [science] class, you learn the progression of thought in a field and review the experiments already done. Here, it's like, 'Here's the information, now how do we apply it?' "

Duke's management degree requires an independent project, but students typically tackle an existing environmental problem, such as managing a heavily used estuary, rather than conducting original research. "Students who want to go on as scientists are better served by traditional science degrees," admits Christensen, who was trained as a botanist.

Indeed, the backgrounds of students in the Duke program vary widely. For example, management student Elizabeth Cummings majored in political science and never considered becoming a scientist. But while working as a consultant, she realized that her successful colleagues knew much more science than she did. "They could go look at a site and understand the hydrology," she says. "I needed a better working knowledge of how a watershed works, and I didn't feel that learning on the job would be sufficient."

On the other hand, biology major Fitzpatrick considered getting a Ph.D. in ecology, but instead chose the professional program with an emphasis on conservation biology. He reasoned that the program could give him both the scientific insight as well as the real-world skills needed to make a practical contribution to the field. "It's the best of both worlds," he says.

–Elizabeth Culotta

Novel Program III: Undergraduate Nanotechnology

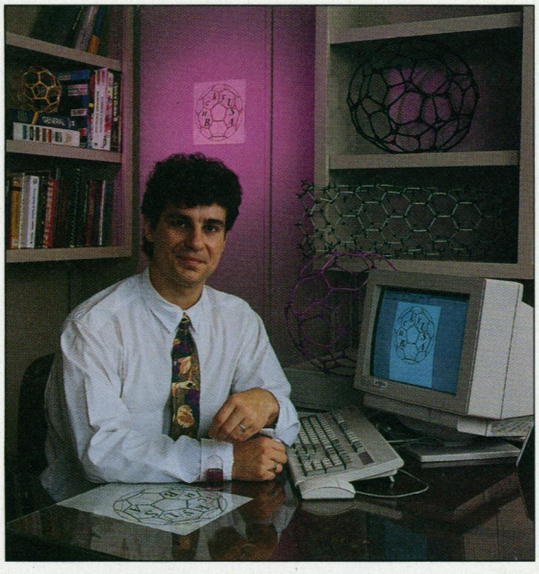
When Felipe Chibante arrived at the Houston laboratory of Rice University chemist Richard Smalley, he'd never even heard the term nanotechnology. Rather, he was merely an undergraduate chemistry major who figured to become a physical chemist one day. Six years later, and 6 months after completing his postdoc, Chibante is a full-fledged member of a new field that's forcing universities to change their approach to teaching and research. What converted Chibante was a pathbreaking initiative in nanotechnology devised by Rice University officials committed to riding the curve of scientific progress on their campus and abandoning traditional disciplinary groupings in undergraduate and graduate education.

At Rice, as at a growing trickle of universities across the nation, administrators are keeping a close eye on the changing needs of the marketplace as they prepare students for careers in science. Over the last 15 years, for example, Rice has created a Quantum Institute, which combines faculty from the physics; chemistry; space physics; astronomy; materials science, and chemical, mechanical, electrical, and computer engineering departments; an Institute for Biosciences and Bioengineering; and a Computational and Information Technology Institute. The common denominator is uniting several disciplines and producing graduates and postgraduates who can more easily find real-world uses for fundamental research.

The nanotechnology initiative, conceived by Smalley 2 years ago, is expected to influence Rice's undergraduate education in the same way over time. A new building will house both the initiative and the university's department of chemistry, and six faculty positions have been created—three in physics, two in chemistry, and one in electrical engineering—to get it rolling. Another special feature: Undergraduate teaching labs will be constructed alongside research labs. Nanotechnology will also be a part of undergraduate courses, although there won't actually be a course on the topic. "We're still forming it out of the mists," says Smalley about the initiative.

Fortunately for Chibante, the mist didn't have to

THOMAS LAVERGNE/ RICE UNIV.



Lone-Star guinea pig. Felipe Chibante went to Rice as a chem major and emerged as founder of a company, Bucky USA.

RICE

evaporate before he could benefit from the initiative. Indeed, his career move embodies the goals Rice officials set when they began the program. Instead of going into academia, where jobs are scarce, Chibante started Bucky USA, a company offering specialty fullerenes to a small community of researchers around the world. This fall he opened Texas Nanotech Inc.

The decision to open his own businesses was difficult, Chibante says. But in his field, being a scientific entrepreneur seemed like his best bet. "I'm seeing a lot of research being done by small businesses," Chibante says. "I never knew that this existed before."

Smalley did. He and many other researchers are convinced that nanotechnology research will lead to industrial materials with unusual properties, medical devices that work on the scale of a single cell, and machines that mimic biological processes such as photosynthesis. Johns Hopkins University physical chemist Kit Bowen calls it "the last frontier of miniaturization." That's where Smalley's institution hopes to be, producing many more students who, like Chibante, acquire the traditional academic credentials but pursue untraditional career paths.

All this isn't without precedent, of course. To Smalley, the nanotechnological revolution will be similar to what has occurred in biotechnology, and he anticipates a time when a Ph.D. in fullerene chemistry or nanoscale electronics will be a marketable commodity. That time hasn't arrived, but already graduate students from six departments—chemistry, physics, biochemistry, mechanical engineering and materials science, chemical engineering, and electrical and computer engineering—are starting to work cooperatively. Smalley hopes their unusually broad training will give them the right ticket to a successful career in science.

–Matt Crenson

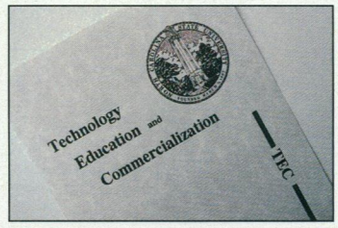
Matt Crenson is a science writer at The Dallas Morning News.

Novel Program IV: Commercializing Research

Before Scott Wolter started his master's degree in materials science 2 years ago at North Carolina State University in Raleigh, he carefully considered his career options. There was life as a bench researcher—but real-world applications were more appealing than basic research. There was also industry—but a recession made the job market pretty tight. What he really wanted to do was form his own high-tech company. But his lack of business experience made him unattractive to investors, even if the right idea came along.

Now, with newly minted master's in hand, Wolter is following his entrepreneurial dreams thanks to an academic program that teams business grad students with researchers (no Ph.D. necessary) in forming start-up companies to commercialize university-based research. "What's really exciting," says Wolter, "is that this program has lowered the normal hurdles to testing the waters and seeing if you can start a small business."

The Technology, Education and Commercialization (TEC) program at N.C. State is among the most recent efforts by educators to provide science grads and postdocs with alternatives to the traditional research career path. Few quibble with the value of science graduate schools in turning out topflight researchers. But in recent years, an increasing number of science grad students have been unable to find jobs. "That's one reason we think this program is important," says N.C. State materials scientist Angus Kingon, co-director of the program. "We think of it as an alternative to a traditional postdoc or post-masters," he says.



Kingon also hopes that the program will address industry's concern that research scientists lack training on half of the R&D equation, namely, moving scientific innovation from lab to market. In recent years, business schools such as Stanford University and the Massachusetts Institute of Technology (MIT) have tried to pick up some of the slack by requiring business grad students to take courses in particular scientific disciplines. But the response from most science programs has been lackluster at best.

TEC's solution is to give scientists firsthand training by placing them on small teams with the goal of commercializing research. Each team, says Kingon and co-director Stephen Markham, an assistant professor of business management, will be made up of business grad students and scientists with training in a common area. Wolter and three business grad students comprise the first four-member TEC team, formed in February, which will examine possible ventures in materials science. Future TEC teams, says Kingon, will likely be made up of two scientists and two business students and will focus on other research strengths at N.C.

PHOTOS BY LISA CHRISTENSEN/N.C. STATE

TEC team. Faculty members Jim Jeck and Stephen Markham help graduate students Scott Wolter, Tony O'Driscoll, and Michael Zapata make a business of materials science.