THE NEXT CENTURY

Young Scientists Voice Hopes and Fears for the Future

For many budding scientists, the fast-approaching 21st century—in which they will spend most of their working lives—is filled with both promise and anxiety. It holds the promise of fulfilling their dreams of productive research careers, of being able to—as one young scientist put it—"find out how things work." But it also holds worrisome prospects of hard-to-find jobs, hard-to-get grants, and hard-to-sustain careers.

Science interviewed 26 young scientists referred to us by professors around the country as particularly promising students. We wanted to get a preview of the hopes and dreams of people today who may be at the heart and helm of the U.S. scientific community tomorrow.

Most of the young scientists we talked to feel they have a reasonable chance of ending up where they want to be: in a university doing research. Despite a great deal of discussion these days of overly narrow Ph.D. programs (see p. 128), only one person in this group, Karen Topp, who hopes to get her Ph.D. in solid-state physics from Cornell University next year, seemed disillusioned with academia. Says Topp: "I used to think I wanted to be a professor, but that changed after seeing faculty here who spend enormous amounts of time trying to raise money."

Many in this group have seen equally gifted peers, discouraged by the lengthy training and uncertain future, drop out to go into professions such as finance or patent law. Still, most seem determined to stay the course. Says physicist Ted Liu, who is doing a postdoc at Princeton University: "It depends on what's the most important thing in your life. To me, it's doing what you want to do and getting paid for it, even if it's not that much."

MAYDIANE ANDRADE, 25
Graduate student, ecology and evolutionary biology
Cornell University

Andrade, who has been observing how the principles of sociobiology operate in mating practices of the Australian redback spider, is running scared. "I'm living day to day. If I think too much about 5 or 10 years from now it makes it harder. It used to be if you finished your Ph.D. you found a job. Now ... there's nothing at the end of it that's definite. You might have to go into something completely unrelated to what you have spent 6, 7, 8 years of your life doing." Andrade, who is from Jamaica, wants to be "a tenured professor with an active research program." But "being a woman, I eventually want a family, [and] I'd rather start a life than spend 6 years looking for a position."


ADRIANA ROVERS/CORNELL

No job security. Maydiane Andrade.

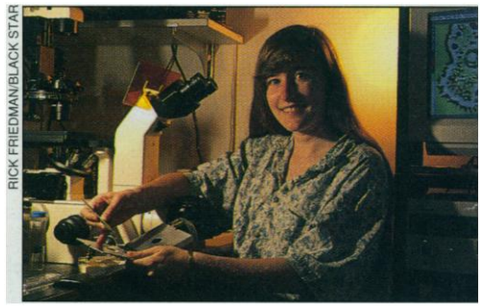
BILL BOTTKE, 29
Postdoc, planetary science
California Institute of Technology (Caltech)

Bottke, who just completed a postdoc at the lunar and planetary lab at the University of Arizona, is now heading for a 2-year Texaco Prize Fellowship at Caltech. "After that," he says, "the situation is unclear." Bottke is by no means an ivory-tower type—he likes managing large projects, he's interested in the politics of space exploration, and he's interested in high school science education. Nonetheless, "if I had to give up doing science ... it would be very difficult. I love doing planetary research."

Bottke does see harsh times ahead. "I think we're very quickly reaching a day of reckoning," he says. "We have too many people, not enough jobs, and it's going to force a lot of good people out of the field." Bottke thinks that institutions should be limiting the number of Ph.D.s they turn out. "What's really scary," he says, is "we're telling young people, especially minorities and females, they should get involved in science, but really there are no jobs right now. ... No one seems willing to deal with the problem."

JULIE THERIOT, 27
Postdoc, cell biology
Whitehead Institute,
Massachusetts Institute of Technology (MIT)

Theriot, with a Ph.D. from the University of California, San Francisco, is using pathogenic bacteria as models to study cellular movement. She hopes to be able to stay close to the bench. Theriot says the Whitehead Institute occasionally invites people in to talk about "what else you can do with your Ph.D." But "I think the problem in the culture is much deeper than that. A few afternoon lectures aren't going to change the communicated attitude that academic research is the best thing. ... All your role models are people doing research at a research university. When [they] talk about other things you can do ... I almost get the sense that they are paying lip service, or this is what you do if you're not good enough or not driven enough."


RICK FRIEDMAN/BLACK STAR

Hopes to stay close to the bench. Julie Theriot.

ROBERT McPHERSON, 31
Postdoc, experimental physics
Princeton University

McPherson says he's seen quite a few young physicists drop out of science for other careers. But "for me at least, there is nothing as interesting as searching out the basic constituents of matter. ... In the end, I suspect that success in basic research requires that it become an obsession."

Despite his single-mindedness, McPherson feels his training is making him broadly equipped: "Experimental physicists work on whichever part of a project is currently undermanned, [which means] I've developed technical skills in many parts of electrical and mechanical engineering"—as well as management skills.

McPherson is wary of calls to "broaden" the Ph.D.

MICHAEL MANCUSO

Nothing is as interesting as physics. Robert McPherson.

and thinks things work fine as they are. He says the physicists he knows who have left academia have found jobs that use their training: "If they had not become good scientists first, I doubt that they would be as successful as they are now." McPherson adds, "I have not met a single person who was a good physicist, who enjoyed research so much that it became a pastime more than a job, and who wanted a permanent position doing research, that isn't still in the field. The rest have been quite successful in finding jobs outside of physics. I don't see how we could ask for more than that."

CHRIS LIMA, 28
Postdoc, x-ray crystallography
Columbia University

Although he is in a highly specialized field, Lima says, "my adviser instilled in me you should know how to do everything to work in structural biology." So unlike some x-ray crystallographers, who have their material prepared by collaborators, Lima knows how to clone the gene that expresses the protein he wants to study, put it in a system that will manufacture a lot of it, harvest it, purify it, and assay it in preparation for crystallizing it and x-raying it to determine its structure.

Although biotech companies can use people like Lima, his first choice is still a research university. He figures he's in a better position than many to weather funding cuts because his work has obvious practical relevance: "My proteins are involved in a lot of cancers and signaling miscommunication."

Lima says he fears the budget-cutters "are losing sight of the value basic research has in the university system"—that being to "ensure that the top minds in science stay at universities where they come in direct contact" with the citizens of tomorrow.

JENNIFER MILLS, 21
Undergraduate, physics
MIT

Heading into her senior year at MIT, Mills has already helped write the computer code to translate Hubble telescope images of the comet Shoemaker-Levy impact on Jupiter. After graduation, she intends to get a Ph.D. in astrophysics.

RICK FRIEDMAN/BLACK STAR

Will industry cripple science? Jennifer Mills.

Despite her auspicious start, Mills is not sanguine about the future of research funding. "I wouldn't be surprised to see government funding slowly disappear," she says. The slack could be taken up by industry, but that has its own problems, such as crimping the free flow of scientific information to safeguard intellectual property rights. "Scientific research really loses its point if you can't share your information with the rest of the world," she says. "Medieval and Renaissance Europe produced some amazing scientists, but from lack of communication a lot of them spent a great deal of time reinventing the wheel."

JAMES McLURKIN, 23
B.S., engineering
MIT

McLurkin is heading for a Ph.D. in electrical engineering, but is taking a year off to work on microrobots at MIT's artificial intelligence lab. He's programming them with simple behaviors and wants to study how this will result in the creation of "a complex, structured community."

McLurkin's main career goal is "to build things that have never been built before" (a robot dragonfly is next). He has a second goal: to encourage more minorities (he is black) to get into science. While he can pursue goal number two anywhere, he says, academia is "the only place I know of where I can build things" that don't have to show commercial viability in 6 months. If academia won't have him, though, he'll survive—he'll start a robot company.

ANIRUDDH PATEL, 30
Graduate student, behavioral neurobiology
Harvard University

Patel, now beginning his eighth and final year in graduate school at Harvard, has carved out an unusual niche that combines neuroscience with ethnomusicology. Part of his thesis, for example, involves experiments with brain-damaged patients to find out where musical and linguistic perception overlap. Patel says that along the way he's learned "techniques and concepts from different fields—from neurobiology to behavioral and evolutionary biology, psycholinguistics, and music perception." He wants an academic job, but feels he's "adaptable enough to cope with a job in the real world." Patel laments the direction of research budgets: "While funding cuts in the business world are forcing companies to be more creative and try new ideas, I think a possible danger of cuts to science is that funding institutions will become less willing to entertain projects that don't fit into conventional fields."

Can cope with a real-world job. Aniruddh Patel *(left)*.

ALLA RYABOY, 24
Undergraduate, biology
New York University

Ryaboy, a senior at New York University, already has her future mapped out in a cutting-edge field: the interface of math and biology. Aiming for a combination M.D.-Ph.D. program, Ryaboy is working on computer simulations of molecular DNA and proteins. She plans to model the activity of biological molecules and their interactions with various drugs and carcinogens. With 3D pictures, "you can see exactly how it works," says Ryaboy. "It's absolutely amazing. I didn't think that human imagination could extend that far."

Ryaboy, who immigrated to the United States from Russia 4 years ago, says she worries "a lot" about the future of biomedical research funding. Whatever happens, though, "there is no way that I wouldn't do [my] research. I would definitely find a way to work in the lab."

–Constance Holden