Young Investigators at Risk

Starting out in any career is tough, but in the current bleak funding environment, even the best and the brightest young scientists are struggling to make it in academic science

KATHERINE L. WILSON would seem to have it made. The 34-year-old cell biologist, who has credentials from some of the nation's leading universities, runs her own new lab at an international mecca for biomedical research, the Johns Hopkins University School of Medicine in Baltimore. Just outside her office, new buildings are going up to provide additional space for a campus bulging with top scientists.

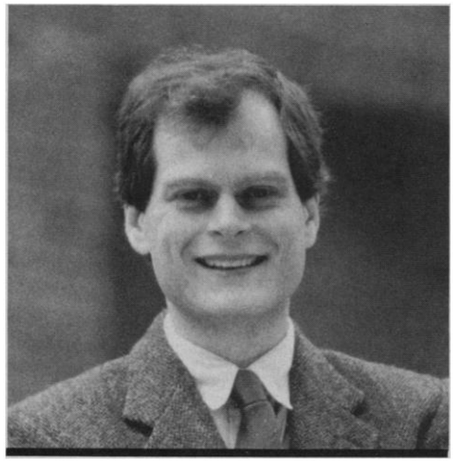
Yet, despite these hallmarks of success, the future for Wilson is still a question mark. She has a grant from the American Cancer Society that has enabled her to take on graduate students and start functioning as an independent researcher. But the big prize, her first National Institutes of Health grant, has so far remained elusive. A grant from the American Cancer Society gives her a bit of breathing room so she can start gathering data to bolster her NIH application when she reapplies. But young scientists like Wilson can only survive so long on awards designed to provide researchers a toehold on the research ladder. David Blake, senior associate dean at the school of medicine, puts it bluntly: "If I have an assistant professor who can't get funded for 3 years in a row, it's unlikely that they are going to stay at an institution like Hopkins."

Wilson's plight is hardly unique. At universities around the country, in the biological, physical, and social sciences, dedicated, determined, talented young investigators who have breezed through graduate schools and postdocs and into junior faculty positions are being stopped dead in their tracks as they seek funds to begin research careers.

Times have been tough for everyone lately, with grant funding rates at both the National Science Foundation and NIH at all-time lows (*Science*, 24 November 1989, p. 988, and 6 July, p. 17). But experienced researchers have a tremendous advantage over newcomers: it's far easier to stay in the system than to get in. Even in these tight economic times, scientists seeking to renew existing grants are successful about twice as often as newcomers seeking a first grant. Maybe that's the way it should be. Why encourage a marginal scientist who really ought to be looking for something other than an academic career? But now, it seems, even the very best are having a hard time.

Take Ian Walmsley. He recently became an assistant professor at the University of Rochester in New York. But he's not just your average young physicist. He was one of only 211 researchers chosen this year for the prestigious Presidential Young Investigator award from the National Science Foundation, an award for the country's most promising young scientists. So Walmsley would seem to have little doubt about his future. Not so. He's just started scrambling to find money to pay graduate students and operate his lab equipment, and he knows it won't be easy. Though there were career options in industry, Walmsley wanted an academic career. "I wanted the opportunity to teach and have a shot at doing my own research," he says. "I'll do physics while it's still fun. If it stops being fun or it gets too stressful, I suppose I'll quit it."

The threat that a talented scientist like Walmsley might quit academic science altogether has policy-makers worried. They know that in the next decade a wave of retirements will create openings throughout the academic science establishment, but if



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young people can't hang on, who will step in to fill these positions?

"In spite of the problems, we've got to keep new blood coming into the system," says Melvin Fish, special assistant to the director for extramural research at NIH. "There's no way that we're going to stick with the old boys we've had all this time."

And it's not only the retirement problem that has science manpower experts worried. Dwindling science enrollment figures for American students at both the undergraduate and graduate level have raised the specter of the United States lacking the human resources to compete in high-tech fields it has traditionally dominated.

Why do young investigators suddenly seem to be having such a hard time getting funds? Blake says the answer is that in the past decade a bulge occurred in the pipeline of new researchers just as funding started to dry up. Instead of going straight from graduate schools to an academic post or a 1- or 2-year postdoc, young scientists wound up in nontenure research positions for several years, working under others; only now are they beginning to seek independent grants for themselves. "I think we are now seeing the front edge of a massive problem," he says. "That edge is very quickly going to be followed by two very very bothersome, tragic, catastrophic things. One is we're going to turn off an entire generation of new biomedical scientists just at a time when we need them. And secondly, it isn't going to be limited to the first time applicants."

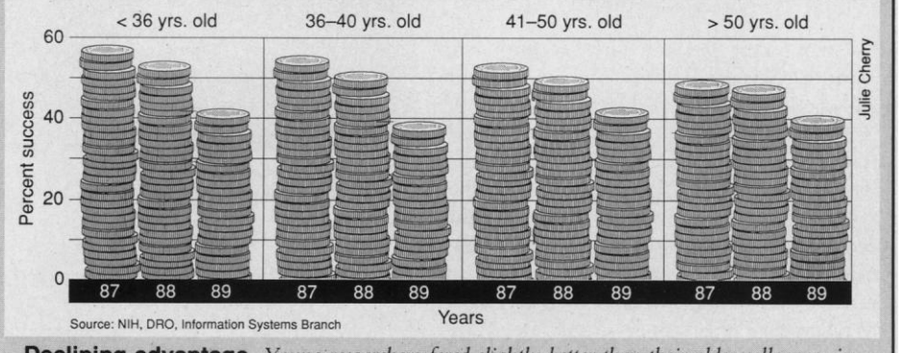
NSF, NIH Apply Band-Aids

How does the young investigator with little or no track record in a particular research area compete with more senior researchers for money? With difficulty, is the simple answer. That's why both the National Institutes of Health and the National Science Foundation have established a new granting mechanism to try to level the playing field.

Four years ago, NIH launched the First Independent Research Support and Transition (FIRST) awards. As the name implies, FIRST grants, which provide 5 years of support with a total upper limit of $350,000, are intended for first-time applicants. Though there's nothing to prevent young investigators from trying for a traditional award (an R01 in NIH-speak), they stand a better chance of getting a FIRST grant. According to figures compiled by NIH, in 1989 the FIRST award rate—the proportion of approved grants that actually receive funding—was 32.0%, compared to 20.3% for new R01 applications.

NSF has launched a similar effort called Research Initiation Awards, in addition to its Presidential Young Investigator program. Intended for new faculty, Research Initiation Awards provide up to $60,000 for 2 years, plus an additional $10,000 for equipment if the host institution agrees to match the funds. NSF awarded 125 of these grants in 1989, chosen from 726 applications. NSF had good reason to launch this program: in 1984, only 21.4% of first-time applicants got funded, while 36% of their more seasoned colleagues were successful. The gap has since narrowed. Last year, the success rates were 20.4% and 30.8%, respectively.

There's at least one bright spot: NIH officials have come up with evidence suggesting that once young investigators do get an NIH grant, they fare no worse than their senior colleagues in getting their grants renewed (see chart). Indeed, in 1987 they were actually more successful but, as funds have tightened, the difference has disappeared. ■ J.P.



Declining advantage. *Young researchers fared slightly better than their older colleagues in getting NIH grants renewed in 1987. Now the renewal rate is about the same for all age groups.*

But while legislators and agency officials struggle to find solutions to the broad funding problems that are squeezing research, the difficulties at the lab bench are frustrating and immediate. Wilson's case is typical. She graduated from the University of Washington in 1979 and applied to graduate school at Stanford, Harvard, the University of Washington, and the University of California at San Francisco. She was accepted at each institution, ultimately deciding on UCSF where she worked on yeast genetics with Ira Herskowitz. She completed her graduate work in 1985 and headed off to the University of California at San Diego where she took a postdoc in the lab of John Newport. There she worked on nuclear envelope assembly, supported initially by an NSF fellowship and then a training grant from the Damon Runyon/Walter Winchell Cancer Research Fund. In December 1988, she took an assistant professorship at Hopkins where she intended to continue the work started with Newport.

To get her started, Hopkins kicked in $110,000 to buy equipment and set up her lab. Then she applied for her NIH grant. She got an excellent priority score—but no money. The rejection was a blow, but Wilson is undaunted. Having come from top-rank labs at premier research institutions, she says she and her peers at San Diego and San Francisco were imbued with the idea that they were destined to be the next generation of biomedical researchers. "When we slam up against this problem, we have the self-confidence to say 'this is unjust,' not 'I am unworthy.' In a way, it takes an egoist to persevere," says Wilson.

Trina Schroer, 31, is in the same boat. She and Wilson were grad students together at UCSF. Schroer headed off to St. Louis in 1986 for a postdoc at Washington University with Michael Sheetz on the molecular basis of how organelles move within cells. Like Wilson, she has ended up at Hopkins. And, again like Wilson, her first NIH grant application got top marks but no money. She worries that senior faculty will regard her failure to win an NIH grant as a comment on her abilities as a scientist.

Schroer has won one of 18 1990 Searle scholarships good for $180,000 over 3 years, but her research requires expensive imaging equipment and the Searle money just doesn't stretch very far.

Both Wilson and Schroer feel that the current situation calls for playing the political game, buttering up senior researchers and NIH review panel members who could help their chances of getting funded, something neither is happy about. "When good science could get you a grant, you didn't need to do it," says Schroer. "Now you have

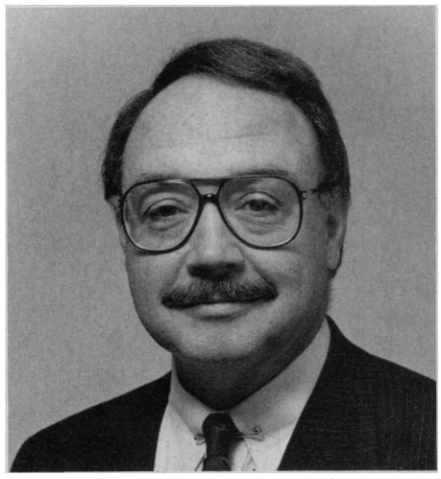
to, and that's turning many people into cynics." For her part, Schroer is prepared to remain in the hunt, but she's glad she didn't know what she was facing before she started her career: "I had no idea that things would be this bad. I would have questioned seriously what I was doing."

Both private research foundations like the Searle Scholars Program and the federal government have been taking steps to try to help young researchers get a leg up on their scientific careers. In 1985, for example, the Lucille P. Markey Charitable Trust began a fellowship program that provides a maximum of $60,000 per year in research support to junior research faculty. But private foundations can only shoulder so much of the burden. The Markey program only supports 16 new fellows each year, and it will be phased out of existence by 1997.

The federal government also foresaw the need to give young scientists additional support. In 1986, NIH began the First Independent Research Support and Transition (FIRST) awards for first-time applicants. NIH's Fish says review panels—although they are not supposed to weigh financial constraints in their deliberations—tend to judge applications for FIRST awards favorably because they are about half as expensive, on average, as traditional investigator-initiated awards, or R01 grants. "It's two for the price of one," he says. Donald Payan, a researcher from UCSF on sabbatical at Stanford University and a member of a review panel for neuroscience, adds that those applying for FIRST awards get "the benefit of the doubt" from reviewers who realize that young scientists won't have the same track record as their older colleagues. These impressions are backed up by NIH statistics, which show that FIRST awards are easier to get than first-time R01s (see box, p. 352).

NSF has also been doing what it can for new investigators. In 1983, the agency established the Presidential Young Investigator (PYI) award. These are designed to "attract and retain outstanding young scientists and engineers in academic positions, especially in fields where there is a shortage of faculty," according to Terence Porter, director of the division of research career development. The approximately 200 PYIs awarded each year can be worth up to $100,000, but there's a catch. NSF only guarantees $25,000, with an additional $37,500 in federal dollars if the award winner can find matching support.

Although NSF says 70 to 80% are finding matching funds, it isn't always easy. Physicist Walmsley has high hopes that he'll be able to attract the necessary funds from industry, but biochemist Madeline Shea, 34, another PYI winner at the University of



David Blake: *"We're going to turn off an entire generation of new biomedical scientists just at a time when we need them."*

Iowa College of Medicine in Iowa City, is not as sanguine about her prospects. She says she's been told that she ought to concentrate on getting a 5-year NIH grant.

Shea is yet another young scientist who has faced rejection from NIH. Shea came to Iowa after a decade of doctoral and postdoctoral work at Johns Hopkins. She applied for a FIRST award last year for her work on regulatory proteins, only to have her application turned down because, she says, the review panel wanted to see preliminary data proving that she could actually do the work she was proposing. "It's extremely frustrating to think that I've trained for 10 years, done everything but the experiments themselves, and then get told when you've already done the work, come back and we'll see." An award from a block grant to the University of Iowa Medical College and the PYI are keeping her going for now.

Shea believes that the current funding climate is making people conservative in their grant applications, choosing projects that have a better chance of obtaining some publishable results rather than breaking new scientific ground. Payan agrees: "People are getting more conservative in what they are proposing to do. . . . They aren't willing to stick their necks out quite as far as they used to in proposing really novel things. The herd mentality is being stimulated, and caution is beginning to set in. And that's not good."

Basic biomedical researchers have been crying the loudest lately, perhaps because they've suffered acutely in the past few years. But other disciplines that rely on NSF for funding have also seen grant approval rates shrink steadily over the past decade (*Science*, 4 May, p. 541). James Valles, 31, a new assistant professor in physics at the University of Oregon, is all too well aware of the funding squeeze at NSF. Valles, who studies the behavior of disordered superconducting films, completed his doctoral degree at the University of Massachusetts in 1988 and then took a 2-year postdoc with Bob Dynes at Bell Labs in New Jersey. He has an Alfred P. Sloan fellowship that is helping him to set up his lab, but he still looks to a federal agency for long-term funding support. "I grew up believing that you use NSF grants to run your lab," he says. "If there's some other money out there that you can get, you try for that as well." Several federal agencies have expressed interest but so far no commitments. The discouraging funding climate makes it hard to keep going. "I have to close my ears to stories from colleagues around the country about funding uncertainties, because it can just be paralyzing," he says.

University of Arizona astronomer Jill Bechtold, another PYI awardee, knew the funding picture in her discipline was bleak, but she didn't realize just how bleak. NSF presently supports about 100 researchers in the field of extragalactic astronomy, but only about ten new people were able to win grants this year, and she wasn't one of them. That means a lot of running around looking for funding. "It was a shock to me when I became an assistant professor and had to support students and had to generate funds how much time it took to write grants," she says. That's time she can't spend doing research.

Is there any good news to encourage those scientists starting a career? The Bush Administration has been making noises of late that it is aware of the problem. Presidential science adviser D. Allan Bromley has been assuring groups of scientists that the Administration will take steps in its 1992 budget proposal to provide additional money for individual investigators. The Public Health Service has launched a long-range planning effort that is rumored to include a doubling of the number of NIH research grants over the next 5 years.

In the meantime, young researchers will have to struggle to hang on. But how long can they be expected to put in the long hours and make the personal sacrifices with only a small hope of getting the money to pursue their research goals. There are limits, even for someone as dedicated as Madeline Shea: "I work 6 or 7 days a week, I work until midnight almost every night and I come in by 9. There's only so long that you can do that before you just say, well, there are other ways I could be intellectually stimulated and financially compensated."

Still, she plans to stick around. "In my heart of hearts before I got the NSF [PYI] award I was getting pretty nervous," says Shea. "I figured I would give it another year." ■ **JOSEPH PALCA**