

Since 1980, the percentage of biomedical grants awarded to 35-and-under investigators has plummeted from 23% to 4%

NIH Grantees: Where Have All The Young Ones Gone?

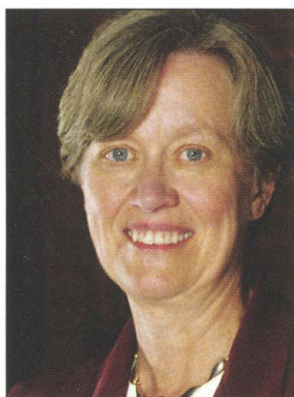
Douglas Robinson, like his peers, spent his 20s in training. After 5.5 years in graduate school, he received a Ph.D. in cell biology and then worked another 4.5 years as a post-doc under a faculty mentor. When he was 31, he got an appointment at Johns Hopkins School of Medicine in Baltimore, Maryland, enabling him for the first time to apply for his own funding to investigate his ideas. His initial application to the National Institutes of Health (NIH) didn't get funded, but he hopes his second try will. If he succeeds, he will join a select—and vanishing—group: those who win NIH grants before age 35.

In 2001, NIH gave out 6635 “competing” grants to investigators, but only 251 of them went to people age 35 or younger. This was slightly more than the year before (see graph below). But the 35-and-under group was much larger a decade ago and dramatically larger 2 decades ago. According to statistics released last month by NIH's deputy director for extramural research, Wendy Baldwin, the percentage going to the youngest age group has declined steadily, from 23% in 1980 to below 4% last year. Meanwhile, as Congress has pumped funds into doubling NIH's budget, the share of grants to scientists age 46 and older has grown sharply.

The trend is not new, nor has it gone unnoticed. But when biomedical leaders examined similar data in the early 1990s, they perceived a crisis. The National Research Council (NRC) launched an inquiry that produced two reports, one in 1994 and another in 1998. The authors called on government agencies to collect more data on young scientists and break the logjam that keeps many waiting until their 40s for an academic position. The 1994 report warned that “the implications ... for the future of biomedical research are extremely serious.”

The panel's co-chair, biologist Torsten Wiesel of Rockefeller University in New York City, is surprised to learn that this aging trend continues today: “You'd think with

all the money that's going into NIH, [young scientists] would be doing better.” His co-chair, biologist Shirley Tilghman, now president of Princeton University, says simply, “It's appalling.” The data reviewed by the panel in 1994 looked “bad,” she says, “but compared to today, they actually look pretty good.” She adds: “The notion that our field



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right now has such a tiny percentage of people under the age of 35 initiating research ... is very unhealthy and very worrisome.”

Of course biologists are worried, Baldwin says: Their concern stems from “the long-held observation that a lot of people who do stunning work do it early in their careers.” Baldwin says it's precisely because NIH wants to keep on top of the situation that “we crank out stats” like these. But she does not think that the trend has a simple explanation. Biologists typically spend more years than physicists floating between graduate school and full employment, but biomedicine also offers more job opportunities. And although some people blame NIH for creating this situation, Baldwin notes that NIH does not control employment decisions in academia.

Bottleneck

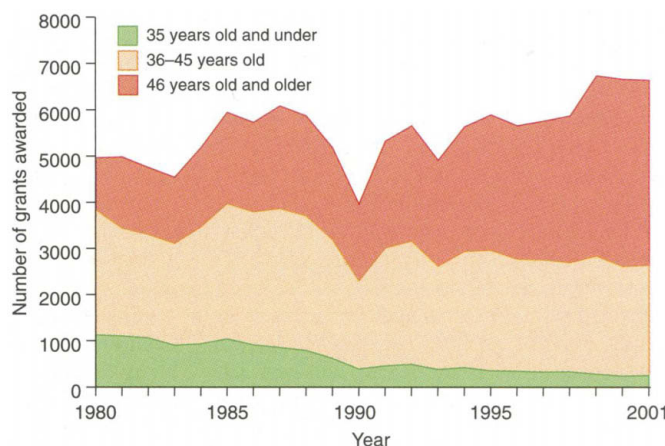
Experts differ on why older biomedical researchers are receiving a growing share of the pie these days and on what should be done about it. But they agree on the basic problem: The system is taking longer to launch young biologists.

Many observers see danger in this pattern.

The long wait for independence takes a heavy toll on the individual, says evolutionary biologist Michael Cummings of the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts, who participated on the committee that produced the 1998 NRC report. Many scientists must now work until midlife before they can obtain a stable income and clear benefits. It's tough on families, he says. “The whole system is plugged up,” says Joan Lakoski, assistant

vice chancellor of career development for health sciences at the University of Pittsburgh. She's worried that young people might “vote with their feet” and leave for jobs that recognize talent earlier.

But why is the pool of young investigators shrinking? It's not because the peer-review system is biased against younger people.

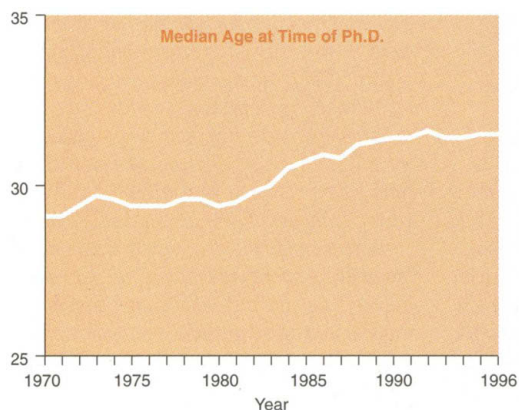


Endangered? The number of traditional NIH grants awarded to young investigators has declined, while those to researchers over 46 have grown.

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ple, Tilghman argues. When her NRC panel looked into this, she says, "we could find no data at all [supporting the idea] that young people are being discriminated against." Baldwin suggests that young scientists are spending more time in training because biology has become more complex, and that is



Older Ph.D.s. The median age of Ph.D. awardees in the biological sciences has climbed since 1970.

why they don't apply for grants until later. Marvin Cassman, a former NIH official who now heads the Institute for Bioengineering, Biotechnology, and Quantitative Biomedicine in San Francisco, seconds that view, saying, "You do have to take account of the increasing complexity of science."

Some say the trend reflects demographics and the tendency for professors to stay longer on the job now that mandatory retirement rules have been scrapped. There are fewer positions available in universities, says William Brinkley, vice president and dean of the Graduate School of Biomedical Sciences at Baylor College of Medicine in Houston, Texas. There was a boom of academic faculty hires in the 1960s, he says; jobs will open up when these scientists retire or go to the "happy laboratory in the sky."

But the decline in the number of awards to young investigators illustrates more than a demographic shift, says Orfeu Buxton, a University of Chicago postdoc and one of the founders of the fledgling National Postdoctoral Association. "It clearly reflects the lengthening of the postdoctoral on-the-job training period over the last several decades," he says. The postdoc has become an "obligatory credential, necessary but not sufficient to establish a young investigator's potential for other independent research jobs."

Frank Solomon, a cell biologist at the Massachusetts Institute of Technology in Cambridge, agrees. Solomon, co-author of a major study of biomedical training, says, "We interviewed postdocs in 20-odd prominent laboratories," and "virtually all" said they were functioning as research scientists and not getting training. The plight of post-

docs is "deplorable," says Mary Golladay, program director for the Human Resources Statistics Program in the Division of Science Resources Statistics at the National Science Foundation (NSF). "NSF has been concerned about this for 15 years."

According to NSF data, there were 28,688 postdocs in the biological and health sciences in 2000. (Typically, biologists can spend four or more years in postdoc positions now.) The count has risen since 1993, at a rate of about 750 postdocs per year. In contrast, there were only 5880 postdocs in the physical sciences (chemistry, physics, and astronomy) in 2000, a number that has remained stable since 1993. Patrick Mulvey of the American Institute of Physics also found, in a survey of the 1999–2000 class of Ph.D.s, that 52% of physicists said they expected their postdoc term to last only 2 years; another 28% said it would last 3 years.

Although NSF doesn't specifically target young investigators for grants, it does offer support to "teacher-scholars," including the Presidential Early Career Awards for Scientists and Engineers, designed to recognize and bolster people off to an impressive start. NIH doesn't earmark grants for young investigators either but asks reviewers to give special attention to proposals from first-time applicants. Baldwin says that in recent years NIH has increased funding for these grants to first-timers.

The United States is not alone in struggling with a system that makes scientists wait until their late 30s before they can establish an independent career. In Germany, the average age at which scientists receive their first grants from the German Research Council (DFG) is 40.4. But, in contrast to U.S. agencies, DFG has awarded a stable 10% of its grants in the under-35 category over the past 5 years.

DFG, according to Beate Scholz, program director for the promotion of young scientists, wants to pave a path to scientific independence at a younger age and has helped set up a number of funding schemes to make this possible. At INSERM, the French equivalent of NIH, a program launched last year called Avenir offers strong financial support to promising scientists as they transition from postdoc to independent investigator. The various research councils in the United Kingdom have taken similar steps to draw talented people into the sciences and help them launch successful careers.

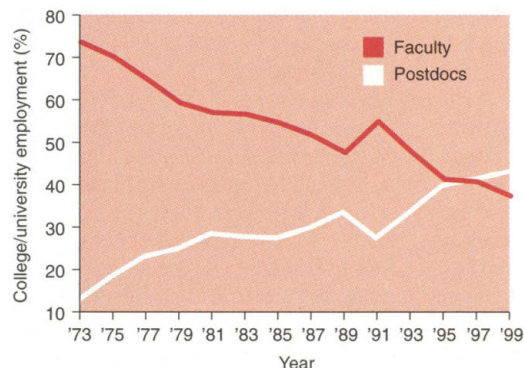
What to do?

No one doubts that the U.S. drift toward giving a larger share of funding to older investigators in biology should be reversed. "But people don't want to change a system that has seen a lot of success scientifically. And there is no magic button to push," says MBL's Cummings.

Tilghman is convinced, however, that the government should take the initiative: "I think there is a real failure of leadership at the NIH," she says. Tilghman claims that grantees are hiring young scientists as cheap labor. To end this practice, she argues, NIH grants should help establish a career track for technical workers in the lab, one that would offer "reasonable salaries" and benefits. She thinks this would help by reducing some of the competition for tenured academic positions.

NIH's Baldwin says that, to the extent the problem reflects a lack of job opportunities in academia, "that is something the universities have to deal with. We don't have any control over it." She notes that NIH has taken some steps to improve postdocs' welfare. It has increased the stipends of 7500 postdoc fellowships it funds by 10% in each of the last 2 years, and it aims to raise them 10% a year through 2006.

Postdocs, meanwhile, are taking matters into their own hands. Across the country, postdoctoral associations are cropping up at universities. A newly formed National Post-



Population shift. More young biologists (1 to 3 years post-Ph.D.) hold postdocs than faculty positions.

doctoral Association, in collaboration with *Science's* Next Wave (nextwave.sciencemag.org/pdn), seeks to advocate for change on a national level. Geoff Davis, a software consultant and mathematics Ph.D. in Raleigh, North Carolina, has launched a large-scale survey to collect detailed information from the U.S. postdoc population—something NSF has not done—to help influence national policy.

All these efforts may be needed. Cassman says he's beginning to think that, "if the trend continues, people will be applying for their first NIH grant the year before they retire."

—ERICA GOLDMAN AND ELIOT MARSHALL