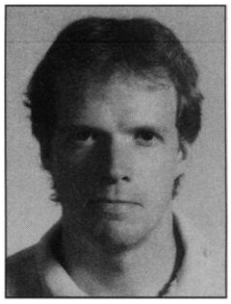
REAL LIFE IV

Postdocs: Tales Of Woe From the 'Invisible University'

You've hung that Ph.D., framed and laminated, right next to the old bachelor's degree. That piece of sheepskin is proof positive that you've mastered some arcane piece of science, perhaps the intricacies of signal transduction or the mysteries of quantum mechanics. A few years past 25, you're finally free of the tiresome student way of life and ready to take your rightful place within the scientific community. Don't plan to settle down though, and wipe that smile off your face. It's postdoc time.

"No teaching, no coursework, no grants..."

–Marc Perry

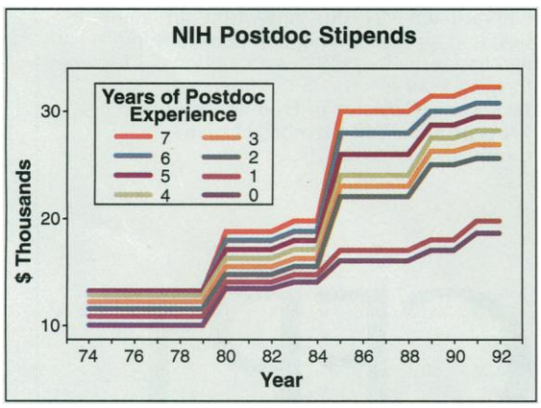


"Postdocs are rapidly becoming the burger flippers of science; they're cheap, temporary, and highly trained laborers."–*John Sahr, member of the Young Scientists' Network and assistant professor at the University of Washington*

The postdoc seems like such a good idea: a dedicated research position for a few years to kick-start your career before becoming a faculty member—or a corporate bench scientist. But this blissful version of reality applies only to the lucky ones. They're the blessed minority who expand their contacts a hundredfold or more, tackle new research challenges, and publish often, blazing away on the scientific fast track to a top school or research lab.

But how about the rest? How about those who struggle to raise a family on a postdoc stipend; those stuck on the treadmill, taking multiple postdocs because universities do not have faculty positions to fill; and those who are falling out of love with research altogether?

With this article, *Science* offers a snapshot of the lot of the postdoc. If our view is distorted in any way, blame it on our totally unscientific survey. The postdocs mentioned here spoke out in diverse ways—by phone, by fax, and by computer. For instance, an enormous electronic mail response came from scientists participating in computer bulletin boards like Bionet, Usenet, and the Young Scientists Network. These modern watering holes seem to provide some sense of community for the postdoc world, and, from the woes documented on them, further evidence that misery goes best with company.



Poverty row. Trends in NIH postdoctoral stipends according to years of experience.

Among those polled, complaints about salary, health benefits, and doing multiple postdocs were typical. Clearly, however, the greatest concern on the mind of almost everyone was what one Ph.D. called the "abyss of the future." With almost every faculty posting producing not dozens but hundreds of applicants, competition for a full-time academic job is fierce, and many well-qualified scientists search fruitlessly for a permanent position. Perhaps most disturbing in *Science*'s talks with postdocs was the number of angry Ph.D.s, some afraid to speak on the record for fear of backlash down the road, who felt their plight was being ignored.

"Most of us never realized that one could work hard, contribute to science, do all the 'right' things, and still end up unemployed before turning 30."
–Mark Lee, physics postdoc

One guy who's learned to live in the present is Marc Perry. He understands the downsides of postdoc life but prefers not to dwell on them. He's getting paid reasonably well to do research he enjoys, and he doesn't really have to answer to anyone. "No teaching, no coursework, no grants," says the University of Colorado molecular biologist. "Being a postdoc is better than graduate school and better than being an assistant professor."

Perry, who graduated from the University of Toronto, achieved his apparent Nirvana by giving up on his initial plan—to find a postdoc position working on mice—for one of the "worm labs" that proved much more receptive to his letters. He now works on sex determination in *C. elegans* at Colorado, and he's fully funded. No, funding was not provided by the university—that's one way to winnow out applicants, he explains: "The good labs tell you to bring your own money." But Perry luck continued when he won both an NIH fellowship and one from Canada's Medical Research Council. (He took the 3-year Canadian grant because it paid more and carries great prestige in Canada, where he may end up.)

Despite his good fortune so far, Perry's postdoc has not all been a bed of roses. One big problem has been that the type of work he's been doing hasn't led to rapid publication. Early on, for example, he did some genetics work to expand his scientific repertoire. He now calls that time a "waste." "It's probably not worth spending more than a month, some say a day, doing anything that won't lead to a paper," he warns. Nor can you afford to spend much time managing graduate students or helping write proposals—it means next to nothing to academic search committees, says Perry. He speaks from experience. The score from his job search so far: 40 applications, two interviews, no offers. Among postdocs today, that's not only not unusual but is actually a decent batting average.

"It's a pretty bizarre situation when the people doing most of the medical research in this country can't afford health insurance."–*anonymous postdoc*

We used to do it for love, say some veteran researchers, but more than today's postdocs would like, Ph.D.s now must take finances into consideration when they choose a position. Postdoc remuneration varies dramatically, sometimes within the same lab. Those *Science* talked to had salaries ranging from $18,000 to $48,000, although between $20,000 and $25,000 seems typical. The case of David Norris, who studies recombination in yeast, is not unusual. In 1988, he started his postdoc at the Dana-Farber Cancer Institute in Boston on an American Cancer Society fellowship that paid $20,000. Each of the next two years saw $1,000 increases in the sti-

pend. For this fourth and final year, before he takes an assistant professorship at Rutgers University, Norris found another grant carrying a relatively luxurious salary of $27,000. "As a fourth-year postdoc, I'm making less than our lab secretary," he says.

Among the many salary complaints heard by *Science* were a slew directed at the National Institutes of Health (NIH), a prime benefactor of the postdoc system. And a quick look at how slowly NIH stipends have risen backs up those cries. In 1974, a new postdoc could obtain $10,000 from NIH. Almost 20 years later, a postdoc can expect only $18,600 from NIH the first year and a grant of just $19,700 the second—regardless of where one lives (see chart, p. 1738).

Case in point: 32-year old molecular biologist Tony West, a colleague of Norris' at the Dana-Farber Cancer Institute, who will soon leave the Boston area for the less expensive surroundings of the University of Colorado Medical School. Even though his fellowship pays slightly more than NIH levels, West told *Science*, "one of the reasons I'm leaving is because I'm not getting paid enough for this area." And it's not because West is in a slow field—he does AIDS research.

The financial frustration may be driving him, and others, to the biotech arena and away from an academic lab bench he loves. "Most of my friends say it's 50-50 whether they'll continue to be academic scientists. I can go into industry right now and get a pretty good job," he says. Then again, money's not everything—West expects to make less in Colorado, but the lab there offers excellent research opportunities, and he wants to stay in academia if possible.

So while today's postdocs may complain about money, they are trying mightily not to let it determine their future. The current plight of the economy even has some counting their blessings. "As the job situation has gotten worse and worse, I find myself grumbling less and less about my current job," says Brian Moore, now on a second postdoc in physical chemistry at the University of British Columbia. "In this economy, $23K plus benefits is beginning to sound better and better."

"Being a postdoc in Europe is definitely better than working for a living."
–Robert Jacobson, postdoc at CERN

Thinking of running away? You're not alone. A small contingent of young Ph.D.s packs their bags and book a flight abroad, drawn by higher salaries in general (although England can be even more stingy than the United States) and the desire to experience a new culture before settling down. The traveling postdocs *Science* talked to say it's relatively easy to find a position in Europe—but not a permanent job. In most countries, including England, regulations make it difficult for foreigners, especially nonmembers of the European Community, to take faculty positions. Exceptions are made for American "stars"—researchers with a legacy of papers and an entourage of workers—but rarely for a normal postdoc.

And since your permanent options in Europe are few, never forget that you'll probably be returning. "If you intend to come back to the United States, you must be very careful not to disappear for 1 or 2 years," explains computer scientist Wayne Citrin, who recently had a position with IBM in Zurich. "Publish, attend conferences, and in general let people know you exist and that'll you'll be coming back." Even after following his own advice, Citrin had a tough time before he landed a tenure-track position at the University of Colorado.

Kevin Meyer, who did his first postdoc in solid-state physics at the University of Cambridge, agrees that "it's difficult to come back." And your job search usually must wait until you've returned. "There were not too many places willing to fly me over for an interview," says Meyer, who is now at IBM's Almaden Research Center.

Being out of contact with the United States can also cause some unusual problems. Ask Adam Messer, an American who has been enjoying an NSF postdoc in Japan studying insect physiology. "I recently received a letter from the Florida state employment service, telling me they could not consider me for a job at the University of Florida because I am an alien," Messer recalls. "You'd think they could read past the return address..."

"When you're 30, married, and considering having a family, temporary positions aren't all that great."
–Andy Drews, postdoc at the Naval Research Lab

Another alternative for many new Ph.D.s is a postdoc in industry or with a government lab. In many ways, the experience can be similar to a postdoc abroad. The salaries tend to be considerably better than in academia, the benefits decent, and the quality of science still top-notch. A number of postdocs mentioned salaries over $40,000: For many of these, taking an assistant professorship might even entail a pay cut. But even these safe havens for Ph.D.s may slowly disappear as industry downsizes and funds for defense research shrinks.

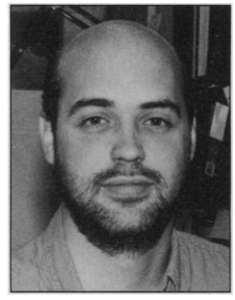
Meyer, the IBM postdoc, does have one complaint. "I'd like to see companies offer fewer postdocs and more permanent positions." That criticism is echoed by many others, who suggest that industry is taking advantage of the postdoc glut to go with cheaper temporary employees rather than expanding the permanent staff. In effect, they say, postdocs enable companies to test prospective employees without obligation.

Moreover, returning to the academic world may be difficult for the industry postdoc. Proprietary considerations may slow the publication of the papers that are needed so desperately to impress an academic search committee. And one can lose touch with the helpful old boys' network: "The tenuous connection to academia makes it difficult to ever make enough contacts to return," says John Byrd, who has a 3-year postdoc working on accelerator physics at Lawrence Berkeley Laboratory. Byrd himself doesn't plan to make that return trip; he hopes to stay at his lab permanently.

"The coming faculty shortage? It's like the cure for AIDS—perpetually 5 years down the line."
–anonymous postdoc

Dave Eliezer just landed his second postdoc, a high-paying position working on quantum electrodynamics at Lawrence Livermore National Lab, and he's unhappy. Not at the money, or the job, but at the idea of beginning all over. "The aspect of being a postdoc that really stinks, as I found out 3 years ago and am going to see again, is that I have to uproot myself again and lose all

..."as a fourth-year postdoc, I'm making less than our lab secretary."
–David Norris



of my hard-won friends each time and start from scratch. When it happened the first time, the despair took me by surprise," says the young physicist, who is finishing up a 3-year postdoc at the University of British Columbia. This "postdocum depression," as Eliezer calls it, is not insignificant. He says that if something solid doesn't show up soon, he will leave physics.

And Eliezer's tale is by no means unique. Almost every Ph.D. interviewed by *Science* either expected to do multiple postdocs or was doing a second or third one. "Morale is really very low. It's just taking longer and longer to get where you want to be. Most people are getting jobs at 36 and 37," says Dana-Farber's Norris. And most believe—whether or not it's true—that just one postdoc is not enough. "In general, to get a faculty position in biological science the tacit requirement is no fewer than two postdocs, and three is not at all unusual," says Josh Hayes, who's on his second one, doing computer modeling of complex biological systems at the University of Washington.

"Virtually everyone I know who's not a real high flyer is considering leaving physics."

–Andy Drews (here pictured with his wife, Sue Inderhees)

DARROW MONTGOMERY

But it's a Catch-22 situation since search committees may wonder about those with multiple postdocs. "It becomes kind of a curse, if you take too many postdocs," says Andy Drews, who, with his wife, Sue Inderhees, has been postdocing in a superconductivity group at the Naval Research Lab in Washington, D.C. The holding pattern of multiple postdocs takes its toll in other ways: "The choice now seems to be whether to start a family before one has geographic stability or put it off indefinitely until long-term positions materialize," explains Katherine Benson, a particle theory postdoc at the Institute for Advanced Study in Princeton. "Women do have tighter constraints in terms of the biological clock, and a couple of postdocs after a Ph.D." obtained at, say, 27, "is starting to push things."

Some Ph.D.s, disgusted with their current situation, are being pushed out of research altogether. Patent law, health physics, software engineering, and accounting are just some of the fields into which postdocs are considering shifting. "After doing 4 years as an undergrad, 6 as a grad and 2 and a half years as a postdoc, I'm getting a little tired of bouncing around in the job market," says Drews, who resists the idea of a second postdoc. "Virtually everyone I know who's not a real high flyer is considering leaving physics."

"Sure, a postdoc makes no money and gets little respect, but at least she gets to watch crystals grow or make molecules dance on a computer screen ...and she can talk to her sweetie on the computer at 3 am and complain that nothing is working and everything is crashing or blowing up."
–Vivien Yee, chemistry postdoc

Vivien Yee is spending an unusual engagement. The 27-year-old Canadian chemist is in Seattle for a second postdoc; her physicist fiance, who taught in Nigeria before they got engaged, has hopped continents to Australia for his second postdoc. It's a deadly combination of multiple postdocs and the notorious "two-body problem," where both members of a relationship are scientists.

The two-body problem is quite common, and affects a greater proportion of female than male scientists, since women are more likely to marry other scientists. And it is rare to find couples who have made the situation work with both members staying in science. The temporary world of the postdoc does at least sometimes delay difficult choices involved in trying to fulfill dual academic careers. Some partners alternate having jobs, some follow the spouse, hoping to find a nearby job, some take part-time research positions.

But many others, like Yee and her fiance, reconcile themselves to a temporary separation. And to supplement "snail mail" (the ordinary post) and costly phone calls, the couple at least has one advantage that is shared by most scientists— "We e-mail and computer 'talk' virtually daily," says Yee. "I don't imagine that such a long-distance relationship could remain healthy otherwise." Yee remains optimistic about a dual-career marriage, although she's aware that both could well end up leaving science. "Perhaps one day it will be only the stereotypical 'geek' with no family, friends, leisure, or life who can afford to be happy being a scientist," she says. But " I still have a hope that somehow I will find a way to make a living looking for answers to a few important questions."

"If some talented undergrad comes to me as a professor and asks whether to go into science, I could not say unambiguously yes. And that's a shame."
–David Norris, fourth-year postdoc and soon to be assistant professor at Rutgers University

While Yee's sentiments, and those of most of the postdocs in this article, may shock some veteran scientists, they do not surprise veteran MIT physics professor Lee Grodzins, who more than a decade ago produced the report "Postdoctoral Appointments and Disappointments" as chairman of a National Research Council panel. "It's déjà vu all over again," he says, adding that the anger and discontent voiced by today's postdocs has the "same tone and same frustration" shown by the researchers his panel talked to in the late '70s. And the problem goes even further back, Grodzins says. Borrowing from the title of the classic 1960s report on postdoc life, he says: "They truly were then, and are now, the 'invisible university.'"

But though he's "appalled" at the low salaries, and sympathetic to the postdocs' job plight, Grodzins says the fundamental problem is the old one of expectations versus reality. "We haven't learned from history at all. We're back to feeling that there should be jobs if you work that long and that hard," he says. The brutal truth, according to Grodzins, is that a Ph.D. does not guarantee a career in science.

How to survive and flourish in this less-than-nurturing atmosphere? Above all, says Colorado postdoc Perry, don't get discouraged by the sad tales of others. When you see fellow postdocs having trouble finding a job or bailing out of science, he advises, put on the blinders. "You have to look at your friends and convince yourself that won't be you," Perry says. "This is a pretty good time, but it's not clear to me that there's any way to remove the insecurity."

–John Travis