

CAREERS

TURNING POINT A love of teaching leads to a position at a liberal-arts college **p.241**

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B. HANDELMAN



Middlebury College in Vermont is one of many liberal-arts colleges hiring researchers who enjoy teaching.

ACADEMIA

Small-school science

Undergraduate-focused colleges aren't known for research. But they are attractive to those with an interest in teaching.

BY KAREN KAPLAN

On a sultry morning in early July, two undergraduates are hard at work in Alison Holliday's chemistry lab at Swarthmore College, a four-year liberal-arts institution on a pastoral campus a few kilometres outside Philadelphia, Pennsylvania. As part of Holliday's research into environmental contaminants, senior-year student Daniel Pak hunches over a syringe, desorbing pesticides. Travis Mattingly, a junior, tests for melamine, an illegal additive in pet foods and

other products. During the ten-week summer break, research heats up in Holliday's lab.

The students and Holliday, an assistant professor in analytical chemistry, each spend about 40 hours a week in the lab over the summer. Like her colleagues at other liberal-arts colleges in the United States — institutions that focus on giving undergraduates a broad education in academic subjects — Holliday depends on the summer semester and her undergraduates to advance her research. Her teaching and other obligations at Swarthmore keep her from spending more than a few hours a week on research during the

rest of the year. And Holliday needs her undergraduates as lab personnel because the college has no graduate students and few postdocs.

Holliday and her students are aiming to develop faster and more efficient ways of measuring levels of environmental contaminants, although it is unlikely that any of the work will lead to a paper this year. She isn't worried, even though her most recent article came out in 2009. The 'publish or perish' edict that typically drives faculty members at large universities isn't the rule at Swarthmore and other liberal-arts colleges. At such institutions in the United States and, increasingly, elsewhere (see 'Europe embraces the trend'), teaching has as large a role as research in tenure review, and Holliday loves teaching as much as being at the bench. Her outlook is tied to her students. "It would be very difficult to go back to a research university and not have that level of interaction," she says.

Demand for scientific posts at these colleges is on the rise, suggest figures from the US National Institutes of Health (NIH), which funds biomedical research at undergraduate institutions through its Academic Research Enhancement Award (R15). In 2000, the NIH reviewed 501 R15 applications. By 2010, that had increased by nearly 50% to 992, although the number of grants awarded has not risen apace (see 'Increased demand'). During the same period, the number of reviewed applications for R01 grants — the NIH's primary research award — rose by 27%. Fierce competition for the few academic slots at universities, and a legitimizing of liberal-arts colleges as research institutions, have contributed to the rise in demand for positions at undergraduate institutions, says Howard Garrison, public-affairs director of the Federation of American Societies for Experimental Biology in Bethesda, Maryland. "We are seeing highly trained researchers taking jobs at the types of institutions that a decade ago would not have been likely destinations," he adds.

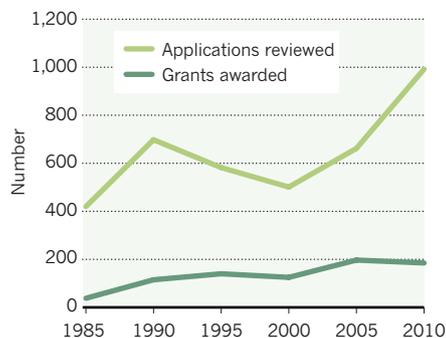
What's in it for an academic researcher who bypasses high-status, research-intensive universities for a tiny undergraduate college? A lot, say early-career scientists and veteran researchers at such institutions. They love doing actual bench research instead of being a de facto lab manager. They're relieved to be free of the panicked scramble for grants. And, like Holliday, they enjoy teaching and advising undergraduates.

A DIFFERENT WORLD

But being a scientific researcher at a four-year liberal-arts college is not at all the leisurely, indolent experience that some might ▶

INCREASED DEMAND

Applications for US National Institutes of Health R15 grants have increased in the past 25 years, but the number awarded has not kept pace with demand.



► envisage, warns Amy Cheng Vollmer, a microbiologist who has worked at Swarthmore since 1989. “It’s like comparing the winter Olympics to the summer Olympics,” says Vollmer, who frequently gives talks on career issues. “It’s not easier; it’s different.”

The teaching responsibilities are among the biggest differences. Specifics vary by institution, but junior faculty members typically teach two or three courses in the autumn semester and two in the spring, with a minimum of one lab section for at least one course. Along with teaching comes a raft of associated tasks: assembling a syllabus and selecting textbooks; developing lectures and lab sessions; and assigning exams, papers, lab reports and other classroom work. Although some of these tasks eventually become easier, others are perennially time-consuming. “I do all my own grading,” sighs Holliday.

Researchers also take on advisory obligations, including shepherding students through a thesis, counselling student organizations and

managing honours and independent-study programmes. And the small size of the colleges means that they may have to share equipment with another institution or even build their own — equipment that, at a larger campus, would already be in place or easily purchased. Anne Goodsell, a physicist at Middlebury College in Vermont, had to build her own apparatus for her work on laser cooling of atoms.

Goodsell has no thoughts of returning to a research-oriented institution such as Harvard University in Cambridge, Massachusetts, where she was a graduate student and postdoc, despite the greater number of nearby colleagues at such universities, and the associated ease of collaboration. Other researchers, however, do find the relative isolation at small colleges hard. “There certainly is collaborative work here, but typically you’re the only one who does what you do,” says Tiku Majumder, an atomic physicist at Williams College in Williamstown, Massachusetts. “I miss the opportunity for close collegial scientific exchanges every day.”

To beat the sense of isolation, Vollmer advises staying active in professional societies and attending as many conferences as possible. A resource for physicists in particular is the Anacapa Society, based at Amherst College in Massachusetts, which was created in 2003 in part to address that lack of connections.

Isolation isn’t the only stumbling block. “The research rhythm is different,” says Majumder. “It can take years to publish. As measured by how many papers I’ve authored, no way could I compete with my colleagues at big universities.” With undergraduates, researchers can also expect a smaller and less experienced team, which can detract from the science itself. “I am the sole source of continuity in my lab,” says Holliday. “I am the sole problem-solver and

troubleshooter-in-chief.” Scientists must also scale down their experiments to adapt to having less time in the lab. If a project doesn’t work one summer, it must usually be abandoned, at least until the following summer. Experiments that require more than a couple of months are typically not possible. “You’ve got to come up with small projects that you can quickly ramp up,” cautions Vollmer. “You can’t study the long-term effects of fire on a site. You can’t study corn, because it has only one growing season a year.”

Still, a research career at a liberal-arts college has its assets. Financial support is a huge benefit — many US liberal-arts colleges offer a start-up package, salary and internal funding that allow researchers to dodge the constant struggle for grants that their colleagues at research universities undergo. Bridge funding helps with grant gaps. Many liberal-arts colleges also provide funds for lab equipment. And researchers don’t have to support graduate students, postdocs or, usually, lab technicians. “I don’t worry about money — basically ever,” says Nick Kaplinsky, a plant biologist at Swarthmore.



Undergraduate student Travis Mattingly helps with research at Swarthmore College in Pennsylvania.

K. KAPLAN

A SPREADING MODEL

Europe embraces the trend

Although mostly a US phenomenon, liberal-arts colleges have started to gain traction elsewhere — notably in the Netherlands. “Here, we are moving away from an egalitarian past to create programmes for talented, motivated students who were otherwise becoming invisible,” says Harm Hospers, dean of University College Maastricht, a liberal-arts institution that opened in 2001. This is one way in which the country has responded to calls for higher-education reform and new degree standards across Europe, as outlined in the Bologna Process agreement of 1999.

To date, five Dutch liberal-arts and sciences colleges — University College Maastricht, University College Utrecht, Amsterdam University College, Roosevelt Academy in Middelburg, and Leiden University College — have grown out of existing research institutions. These colleges increasingly focus on science, yet they often rely on their parent universities’ infrastructure and research expertise to do so, says Marijk van der Wende, dean of Amsterdam University College.

In the Netherlands, positions for scientists can be based at the affiliated university or at the

liberal-arts college itself. Core faculty positions at the liberal-arts colleges typically require PhDs, but focus almost exclusively on teaching — so research is pursued elsewhere. But university researchers can boost their careers and their chances of tenure by teaching at the colleges. They also gain access to top students interested in pursuing graduate studies.

Scientists at such institutions have much-sought-after autonomy, says Terence Kealey, vice-chancellor of the University of Buckingham, UK, an independent liberal-arts college. Kealey believes that if

his institution is to ascend the university rankings, it must build up its research base. He hopes to double the number of science faculty members from 35 to 70 in the next few years, although the main focus will stay on teaching. Jacobs University Bremen in Germany, which opened in 2001, is another liberal-arts college with a science focus.

And Rotterdam University in the Netherlands and Freiburg University in Germany are creating their own liberal-arts programmes. Such institutions seem likely to see continued growth in several parts of Europe. [Virginia Gewin](#)

In the United States, several grant schemes are tailored to researchers at liberal-arts institutions. The NIH awards about 200 R15s each year; the maximum funding is US\$300,000 over three years. The National Science Foundation (NSF) has the Research in Undergraduate Institutions (RUI) programme, which allows eligible researchers in the physical and biological sciences to apply for NSF grants. Applicants must submit impact statements explaining how the grant would affect their research, their department and their institution. “You can include information about the students you have working with you and the educational activities interwoven into the research project,” says Robert Scott Fisher, programme director at the NSF’s division of astronomical sciences in Arlington, Virginia. “You have an extra chance to explain the impact of the award.”

The NSF also offers three- to five-year grants with no maximum through its Faculty Early Career Development Program for tenure-track faculty members who combine research with teaching. The Research Corporation for Science Advancement, based in Tucson, Arizona, offers two-year grants of up to about \$75,000 to early-career scientific researchers at undergraduate institutions.

There is also, in general, a less furious battle for tenure than at many big universities. “We hire with the intent that the person will become a permanent part of the community,” says Cecilia Conrad, vice-president of academic affairs at Pomona College in Claremont, California. “We provide resources and advice so that the assistant professor will be successful in earning tenure.” Pomona offers faculty members a fully paid year’s leave from teaching in their third year of employment, to let them focus on research. Still, Conrad says, Pomona’s tenure process requires excellence in both research and teaching, as well as evidence of contributions to the community.

The teaching emphasis, in particular, can have a big impact. At Swarthmore, candidates for tenure must have letters of review from 25 students. “If you have an aptitude for teaching, and for performing, which in some ways teaching is about, then tenure is almost more of a sure thing,” says Kaplinsky, who recently earned tenure.

Ultimately, say researchers at liberal-arts colleges, the biggest payoff is helping students learn how to become scientists. “They’re dry sponges — they’re new, they’re hungry to learn, and they’re full of ideas,” says Bruce Kohorn, a biologist at Bowdoin College in Maine, who in 2001 left Duke University in Durham, North Carolina. “I love that.” ■

Karen Kaplan is assistant Careers editor at Nature.

TURNING POINT

Sarah Schaack

Last month, evolutionary geneticist Sarah Schaack started a tenure-track faculty position at Reed College, a liberal-arts college in Portland, Oregon. She reflects on the decisions that led to this move.

How did your liberal-arts undergraduate experience influence your research pursuits?

I went to Earlham College, a liberal-arts college in Richmond, Indiana. I wanted to double-major in biology — Earlham was known for its strong biology department — and the humanities. My experiences there, including a trip to Kenya as part of the school’s international programme, shaped both my career and my love of Africa. One of my mentors encouraged me to pursue research in field ecology. Networking with other Earlham graduates led to research experiences around the world.

What prompted your switch from field ecology to molecular biology?

I went to the University of Florida in Gainesville with the intention of focusing on tropical ecology in Uganda. While there, I ran a journal club whose only rule was that you had to pick a paper outside your comfort zone. A paper on transposable elements, pieces of DNA capable of moving in the genome, blew my mind and prompted me to pursue a PhD at Indiana University in Bloomington, a stronghold for evolution and genetics.

How did you end up back in Africa as a graduate student?

I knew that moving back to Indiana might keep open the possibility of heading my alma mater’s East Africa programme. Sure enough, three years later — in 2005 — I was chosen for that post, and took a four-month sabbatical from my PhD. I led 16 students around Tanzania to teach them about evolutionary processes in Africa while they conducted their own research. I have leapt at every chance to get back to Africa, learning Swahili along the way. My experiences helped me to get a unique job — teaching bioinformatics in East Africa in a postdoctoral position funded by the Howard Hughes Medical Institute.

How did you navigate your way to a tenure-track position?

I applied to ten or so schools about a year before I knew I would need a job. They ranged from small, mostly teaching-oriented schools to larger academic-research institutions. I got an offer after my first interview, but didn’t accept it, mainly because attending scientific



D. S. FREY

meetings was not a priority for faculty members at that institution. For me, going to meetings is one of the best parts of academia. I had two more interviews and two more offers, so I was able to use those as leverage during subsequent negotiations with Reed. I accepted their offer, which included a start-up package on a par with what you would get at a research-oriented state university — it includes lab space, money for personnel, equipment and travel for meetings, and a pledge to support my bioinformatics workshops in East Africa. I work hard at teaching and I didn’t want to end up at a place where that was a liability.

Why do you think your application stood out at Reed?

It stood out because, in addition to leading the East Africa programme, I’ve taken advantage of several opportunities to explore different teaching venues. Some — for example, taking over an undergraduate ‘introduction to biology’ course when a professor became ill — fell into my lap when I was a graduate student. Other opportunities I created myself. As a postdoc at the University of Texas at Arlington, I organized a workshop on how to annotate transposable-elements data. After the workshop, I compiled a reference pamphlet now referred to as the bible in our lab. Part of how I learn a topic is to learn it well enough to teach it.

What is your single best career strategy?

I typically don’t apply for opportunities when I’m panicked. I apply just before that point. Then I have the luxury of being able to think clearly about whether or not I want a certain job. That is a hugely powerful position, much more so than waiting until I have to take the first job I’m offered. ■

INTERVIEW BY VIRGINIA GEWIN