CAREERS

TURNING POINT Accelerated training helps ecologist to land major grant **p.131**

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EDUCATION

A sense of community

US scientists passionate about teaching can find rewarding work at community colleges.

BY NEIL SAVAGE

Chad Knights used to see his professional future laid out before him, and it basically involved cancer research. Then a colleague told him about a part-time teaching position at Northern Virginia Community College in Alexandria, not far from Washington DC, where Knights was doing a postdoc at Georgetown University. He took the job for extra money, and ended up falling in love with the work.

Despite the objections of his principal investigator and his thesis adviser, Knights took a full-time job at the community college in 2007. "The ability not just to teach the students but to inspire them to share in my love of science gave me a new purpose," he says, recalling a student from Ghana who told him what a privilege it was to attend college, and a woman in her forties who teared up when she first saw a cell through a microscope.

Teaching at a community college may not be a career option that occurs to many scientists. It certainly wasn't on Knights' radar. But it can be a rewarding choice for scientists passionate about teaching who enjoy working with students from a wide variety of educational, cultural and socioeconomic backgrounds.

In the United States, community colleges are generally publicly funded institutions offering a wide range of educational programmes, from remedial work to job training or associate's degrees. Some students are recent high-school graduates, or those who did not finish high school but took a test to earn the equivalent of a high-school diploma. Others are adults who want retraining in a specific field such as nursing, or military ▶

veterans trying to join the civilian work force. Some plan to transfer to a university after completing their programme. And some are immigrants for whom English is a second language.

Faculty members spend most of their time teaching; they rarely run research programmes and are not required to publish. Tenure is possible: review committees look for effective teaching and participation in other aspects of the college, such as serving on committees. However, the US Department of Education found that in 2009 only 12% of community-college teachers were tenured, full-time faculty members; another 4% were on the tenure track. By comparison, 26% of faculty members at conventional universities were tenured, with 12% on the tenure track.

In the 2011–12 academic year, average pay at community colleges ranged from US$45,894 for a lecturer to $73,333 for a full professor, according to the latest *Annual Report on the Economic Status of the Profession* by the American Association of University Professors in Washington DC. At universities that grant doctorates, the average pay ranged from $56,891 for a lecturer to $130,803 for a full professor.

INTO THE CLASSROOM

Community-college science teachers are in demand. The United States has 1,132 community colleges with a total of 13 million students, many of whom will take science courses for an associate's degree or a certificate in a technical field. Others plan to transfer to a bachelor's degree with a science major elsewhere, or are working on business or humanities majors and need a science course such as astronomy or introductory biology to fulfil requirements.

Part-time adjunct faculty members fill many of the teaching slots, allowing college administrators to add or subtract course sections on the basis of student demand. Nearly 69% of community-college faculty members were part-time in 2009, the latest year for which figures are available, compared with 41% in universities, according to the US Department of Education. Some adjuncts are graduate students earning extra money or exploring teaching as a career option. Others are successful business people willing to share their expertise. And some commute between part-time jobs at several schools to effectively create a full-time job.

One benefit of teaching at a community college rather than a high school is that the students are adults, who tend to be more focused and driven than teenagers. It can also appeal to teachers who prefer the shorter academic calendar of a college. "I feel it gives you a lot of the benefits of working in the college environment, while at the same time focusing on teaching," says Jeff Schinske, a biology teacher at De Anza College in Cupertino, California.

The required educational qualifications vary by state, but in general a community-college teacher needs a master's degree or higher. "We like to have PhD-level credentials," says Donald Brady, assistant dean of science, technology, engineering and mathematics at Middlesex Community College in Lowell, Massachusetts. Mary Rittling, president of Davidson County Community College in Thomasville, North Carolina, says that faculty members need the same educational background as they would to teach undergraduates at a university. The qualifications of their teachers can affect whether a community-college student can transfer their course credits to a university programme.

Applicants should demonstrate currency in their field with, for example, recent graduate study or a publication record, says Brady. "When we look at applications for full-time positions, it's good to see a CV with what the individual has published," he says. However, he adds, the most important criterion is proven teaching ability.

Knights, who sits on his college's hiring committee, says that experience as a university teaching assistant does not help candidates, because it does not generally involve managing a class alone. Teachers need to know how to develop a curriculum, deal with disruptive students, handle different educational backgrounds among students and administer classroom budgets for supplies, as well as understand when to assess students with tests and quizzes. Knights recommends that people looking for full-time jobs get some experience as an adjunct faculty member. That will also allow the existing full-time faculty members to get to know their prospective colleague.

MICHAEL FALESKI

"The first couple of years, it's well understood that your primary responsibility is learning on the job."
Scott Schultz

Unlike primary and secondary schools in the United States, community colleges do not require their teachers to be certified. However, varying levels of educational training are available, usually through universities. Northern Arizona University in Flagstaff, for example, offers a master of arts in science teaching, which is open to science graduates who want to teach at community colleges. George Mason University in Fairfax, Virginia, offers a doctor of arts in community-college education. And North Carolina State University in Raleigh offers a doctorate, a master's degree and a graduate certificate in community-college teaching. The certificate caters mostly to those who already have a master's degree in their field, says Chad Hoggan, who runs the programme. Participants learn concepts such as differences in learning styles and how to work with them, and how to teach online courses, which are becoming common. Such skills are important, says Hoggan, but he does not promise anyone that a certificate will land them a job. "It might set you apart from an applicant pool of 60 people," he says.

Mentoring support can be thin at smaller community colleges and novice teachers can feel as if they have been thrown in at the deep end, says Scott Schultz, chair of the science division at Delta College in University Center, Michigan. "If you go to a larger school, there's often somebody who's going to take you under their wing," he says. But at small institutions, a new faculty member might receive little more than a list of class objectives and a copy of the textbook used by the previous instructor. "The first couple of years, it's well understood that your primary responsibility is learning on the job," says Schultz.

TEACHER TRAINING

To help newcomers to cope, Schultz leads the Two-Year College New Faculty Training Experience, an 18-month programme run by the American Association of Physics Teachers in College Park, Maryland. The experience includes online discussions and two weekend conferences: this year, one is at Delta, and the other at the University of Minnesota in Minneapolis. The programme covers teaching strategies and introduces new teachers to more-experienced faculty members. It is important to build such networks, says Schultz. Of the community-college campuses that teach physics, 58% have only one physics teacher, or only part-time ones, according to a survey conducted last year by Susan White, a researcher at the American Institute of Physics in College Park.

The population of biology teachers across community colleges is much larger, but the job can still get lonely, says Schinske. In primary and secondary schools, teachers form communities of peers by grade level. In universities, those in the same research area collaborate and attend conferences. But such organizing forces do not exist at community colleges. So Schinske and Kimberly Tanner, who studies biology education at San Francisco State University in California, used a US National Science Foundation grant to launch Community College Biology Faculty Enhancement Through Scientific Teaching, a programme held at local colleges and San Francisco State University that runs monthly workshops and a week-long summer institute on teaching strategies and techniques. It also partners biology instructors with their peers to help them to become better teachers.

The difficult economy has actually boosted demand for community-college science teachers, as some students look for educational options that are cheaper than universities and

others want to retrain. A 2009 study by the American Association of Community Colleges in Washington DC found that enrolment in for-credit courses had increased by 16.9% between autumn 2007 — before the economic downturn — and autumn 2009. "You see a surge when the economy goes down, mainly because we provide access and affordability," says Rittling. "The change in the economy has really impacted us in science," agrees Sarah Quast, a professor of chemistry at Middlesex Community College. "Our science courses, if they haven't doubled, are close to doubling."

Although the US national unemployment rate remains high — at 7.9% as of January this year — there is a need for 'middle-skill jobs' with community-college training, says Matthew Meyer, associate vice-president for science, technology, engineering and mathematics innovations in the North Carolina Community College system, based in Raleigh. Nurses, for example, are always in demand, and many get their training at community colleges, where they take courses such as anatomy, physiology and microbiology. Dental hygienists, radiology technicians and lab technicians all take biology, engineering or physics courses. Meyer also sees a growing need for employees with training in aeronautics, nanotechnology, advanced manufacturing and life sciences such as pharmaceuticals.

Those trends will mean more openings for science teachers, as will demographic changes. "Our faculty on average are in their upper forties or fifties," says Meyers. "We're going to have to be able to replace them."

Although teaching at a community college is not research-oriented, scientists can still use their training. Schultz says that it is not uncommon for community-college instructors to publish in educational-research journals. "Although we are not doing research on subatomic particles, we are constantly collecting data and doing research on how to improve learning in our classroom," he says.

Teaching appeals to the researcher in Schinske. Assessing his class involves gathering data from students about what they know at the beginning of the course, getting feedback on what concepts they understand and which ones they struggle with, and measuring how they have changed by the end. In some ways, he says, the experience is not unlike his graduate work in monitoring fish populations to study their evolution. "There are times when I view my students very similarly to my study organisms," he says, "and I mean that in only the most respectful way." ■

Neil Savage *is a freelance writer based in Lowell, Massachusetts.*

TURNING POINT
Jörg Wiedenmann

Jörg Wiedenmann, head of the Coral Reef Laboratory at the UK National Oceanography Centre, Southampton, won a €1.29-million (US$1.7-million) European Research Council (ERC) Starting Grant in December. He will use the money to investigate how nutrient starvation influences coral bleaching, in which the symbiotic microbes that give corals their colour are damaged.

Did you have an aquarium as a child?
Yes. My grandmother took me to the local aquarium, where I became fascinated with corals and saltwater invertebrates. Eventually I got my own seawater aquarium. This childhood hobby developed into an important skill set: I am one of the few people in the field who can maintain long-term coral collections and use them as experimental models in an aquarium.

Describe your first research finding.
It was for my senior thesis at the University of Ulm in Germany. I came across anemones in the Mediterranean Sea that had red fluorescent proteins, even though they were non-luminescent. I realized that, as an ecologist, I would need to gain skills in biochemistry, genetics and structural biology to study these proteins.

How did that set your research direction?
I was lucky. I worked with open-minded biomedical researchers who taught me techniques that opened up a new horizon — exploring the use of fluorescent proteins in biomedical applications. It was very exciting, collaborating with experts in different disciplines.

You have moved through your career quickly. What motivated you?
I finished my PhD in three and a half years when colleagues were taking four to five. I realized that moving on would help me to further my career. After my PhD, the head of the department offered me a group-leader position at Ulm. One is expected to move around and gain experience, but having worked in an interdisciplinary environment gave me the confidence to lead a group. In 2005, I got my habilitation, the prerequisite to become a professor in Germany; I was three and a half years younger than average. Trying to complete tasks in a short time was probably an important decision in my career.

Do you think skipping a postdoc helped you to get established?
I do. It is instructive to have early independence, but it can be hard. I needed to get my own funding: I could not rely on a senior figure with a grant. As a result, I applied for, and got, many prestigious fellowships. I think demonstrating independence helped my ERC application.

How has moving to Southampton helped you?
I needed a change. The move allowed me to explore questions about coral biology — such as what drives stress responses. In my first years there, I got a number of small grants, but after three and a half years, my lab needed a big proposal to continue to do good science.

How did you put together your ERC proposal?
I was convinced that I had a very exciting idea that would fit perfectly into the ERC funding scope. My collaborators and I collected data to convince a sceptical scientific community that we could combine lab experiments with field-based approaches to get useful answers for coral-reef management (J. Wiedenmann *et al. Nature Clim. Change* **3,** 160–164; 2013).

What did it feel like to get the grant?
It is a game changer. It gives me the freedom to do science and produce papers that would otherwise be delayed. I am happy to invest this time in science instead of another proposal.

What part does outreach play in your job?
We have a strong outreach culture at the National Oceanography Centre. I built a coral aquarium in the reception area, to educate visitors and students. Researchers can use it to explain how the coral changes with light level. Pressing a button changes the illumination of the tank from white to blue to bring out the fluorescence of the corals, which gives us the opportunity to explain the biomedical applications for those proteins. ■

INTERVIEW BY VIRGINIA GEWIN