

NEWS

Self-doubt plagues female astronomers

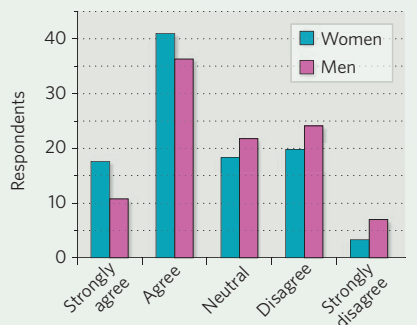
Women in US astronomy graduate programmes are considerably more likely than men to fear being exposed for a lack of astronomy knowledge or ability, according to the American Institute of Physics (AIP) in College Park, Maryland, and the American Astronomical Association (AAS). The results, part of the first ever longitudinal study of astronomy graduate students in the United States, raise concerns that these fears have been driving women to leave the field in large numbers. Initial study results were released at a 4 January AAS meeting session in Washington DC.

These report that almost 60% of female respondents agreed or strongly agreed with the statement "Sometimes I am afraid others will discover how much knowledge or ability I lack". Only 47% of male respondents agreed or strongly agreed (see graph). Figures compiled by the AIP show that female astronomers held only 17% of all US astronomy faculty positions as of 2006, the most recent data available. Attrition is hard to determine, but in 1992, according to the AAS, around 23% of US astronomy graduate students were women. According to the recently released National Science Foundation indicators, 34% of astronomy graduate students were women in 2006.

Study co-lead researcher Patricia Knezek, an associate scientist at the National Optical Astronomy Observatory and deputy director

CRISIS OF CONFIDENCE

Astronomy graduate students respond to the statement: "Sometimes I am afraid others will discover how much knowledge or ability I lack."



of the WIYN Observatory, both based in Tucson, Arizona, wonders whether the 'impostor syndrome' is forcing women to drop out of astronomy prematurely. First described in 1978 by two clinical psychologists, the impostor syndrome — in which the sufferer believes himself or herself to be inadequate in his or her field despite evidence to the contrary — has been documented across scientific fields in both women and men (see *Nature* **459**, 468–469; 2009). Knezek hopes that subsequent data sets will indicate whether the incidence of impostor syndrome correlates with the number of women and men who drop out of astronomy.

The findings also underscore the importance of effective mentoring at all career stages. "The people who feel that they have knowledgeable and helpful mentors tend to be much happier and much more likely to take chances, maybe to apply for a job that they might not necessarily think they're qualified for," Knezek says, adding that this information could be used to combat the impostor syndrome and possibly help keep more women in astronomy beyond PhD level. "This is one of the things that we hope will come out of the data," she says. "Then we will feed all of it back into the system and use it to try to improve how we train, promote and retain."

The longitudinal study also seeks to identify the ultimate occupations of postgraduate astronomers, including those outside of the traditional destinations of academia and national observatories. The initial survey has 1,143 respondents, and about 800 of these have agreed to participate in the full-length project, which will follow the astronomers for 15 years, from 2008. The next data collection will begin in 2011 and collections will continue every three years after that. "We have no long-term data of this type," says co-lead researcher Rachel Ivie, assistant director of the AIP Statistical Research Center. "We need to learn who goes where and what kind of job they're going to get."

Karen Kaplan

SOURCE: AIP/AAS

Q&A

Chemist **Richard Zare** is winner of the 2010 Priestley Medal and the 2009 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.



Your father tried to dissuade you from following a career in science. Was this what attracted you to the field?

Absolutely. Science was 'forbidden fruit' in our house. My father failed graduate school in chemistry and he told me to leave his chemistry books alone because they would only bring me unhappiness. Being a rebellious child, I quickly discovered I was good at science and chemistry. I spent my youth making gun powder, explosives and fireworks.

How did you get into laser chemistry?

When I got to the University of California, Berkeley as a graduate

student, lasers had just been discovered. The physicists were saying it was a solution in search of a problem, but I thought it was the most exciting device. I was immediately struck by the many potential chemical applications of lasers and at once had ideas about using photons to break down chemical compounds — which I have worked on throughout my career.

What is your favourite piece of advice from a mentor?

At an American Chemical Society meeting early in my career, theoretical chemist Joe Hirschfelder received an award and in his address shared the fact that his equation for success was

the integral of ability over time. He made it clear that even the most talented scientists have to work hard too.

Which of your scientific achievements has had the most impact?

It's hard to know, and always scary to sum up your life in one thing, but the discovery of laser-induced fluorescence, whereby we used lasers to excite molecules and then measure the light they emit, had a remarkable effect. First, we used it to look at the structure of molecules. Later, we used it to look at reaction dynamics because we were able to see the internal states of chemical products directly. Soon, we began to apply

the technique in conjunction with chromatography, which led to a single-molecule fluorescence approach — a development that paved the way to using lasers to help sequence the human genome.

Of the two high-profile awards you've recently won, which are you the more proud of?

They are different types of award — one, the lifetime achievement award, is scary because I plan on living, and working, much longer. But in terms of lifetime achievement, it's easy to measure one's scientific success by the number of papers, patents and applications or discussions of your research. The impact of mentoring is less easy to measure. I've mentored more than 100 PhDs and postdocs and taught numerous courses, but no matter how much you try, you simply can't affect that many people, and