

As astronomy shifts towards automation and collaboration, the nature of employment in the field is also changing, says Leslie Sage.



There has been no shortage of investment in astronomy since 1989. By 2004, close to US\$2 billion will have been spent worldwide on large ground-based optical observatories. Four space-based telescopes will have been launched for over \$10 billion. And numerous planetary missions will have flown, including the expensive Galileo mission to Europa and Cassini's trip to Saturn.

A generation from now, such investments could well be viewed as a 'golden age' of astronomy. Although this might be true for hardware and missions, for most of that time it hasn't extended to employment. The early 1980s through to 1999 are likely to be remembered as a bleak time for PhD astronomers looking for tenure-track academic jobs.

But is the investment in technology turning the employment tide? New missions and observatories have already created new jobs at the postdoc level, and these may eventually provide long-term jobs — although the resulting positions might be different from the academic positions young astronomers have historically pursued.

For example, astronomers used to visit a telescope for a few days or weeks, collect their data and then go home. Now, more and more get their data remotely, relying on technicians at the facilities. The new large telescopes coming online will mostly require remote observing, or even 'service observing', in which a local employee collects the data and passes them on to the astronomer. Space-based observatories always do this, and some level of processing is often done before the astronomer even sees the data. More data will also be archived for public access, which will lead to research projects that involve no new observations.

In addition, an increasing number of astronomers are involved in large collaborations. "For years, our model of success has been the brilliant scientist who toiled on independent research to the exclusion of all else, aggressively defended their results, and had a PhD adviser marketing them for a faculty position," says Andrea Schweitzer, chair of the American Astronomical Society (AAS) committee on employment. "Now the astronomical community needs to reassess what talents and personalities will produce the science in the twenty-first century. How shall we modify our filters so that intelligent scientists who have broad knowledge, good communication

skills and a spirit of teamwork stand out above the noise?"

This is true across the physical and biological sciences — if anything, astronomy is behind the curve. Yet there are still enough small groups for there to have been little evolution in the way that young researchers are assessed for advancement. This may be one of the greatest challenges to be faced over the next 10–15 years, as the criterion of primary publications becomes less relevant for hiring decisions, and the need for team players who can work within the constraints of large groups becomes more important (see 'Surviving collaborations', opposite).

MIXED SIGNALS

There are some indications that an investment in people commensurate with the investment in facilities is beginning, says Steve Beckwith, director of the Space Telescope Science Institute in Baltimore, Maryland. The November 2001 AAS job register lists 44 faculty jobs, another 10 for long-term support positions, and many more postdoc openings.

But graduate students and postdocs wonder whether this is a temporary situation. Today's astronomy graduate students are more pessimistic about their employment prospects than those who entered grad school in the early to mid-1980s. But many grad students still hope for a job either as a faculty member or as a researcher in one of the many institutes that have sprung up recently. Will there be growth in the number of faculty jobs? The signals right now are mixed.

On the bright side, Bruce Margon, associate director for science at the Space Telescope Science Institute, says that the end of mandatory retirement in the United States over the past decade has not changed retirement patterns dramatically. Moreover, there is increasing interest among the two-year and four-year colleges in hiring astronomers.

Technology may be a boon to these jobs, Margon points out. For example, the National Virtual Observatory (NVO) continues the democratization of astronomy that began with the establishment of the national observatories about 40 years ago. Someone with a high-end Unix workstation at a small college will have the same access to NVO data as senior members of large departments at bigger universities. What will be needed is talent in sophisticated

Bruce Margon sees opportunities for talented programmers to deal with the rising amounts of data being collected.



NASA/HUBBLE HERITAGE TEAM



Surviving collaborations

programming to extract the data from the collection.

On the other hand, Peter Strittmatter, director of the Steward Observatory at the University of Arizona in Tucson, sees little potential for new growth in faculty jobs.

But although there may not be growth, there is almost always demand, says Virginia Trimble of the University of California, Irvine. "There have always been more people than jobs, but more jobs than outstanding people, and, for whatever reason, no department ever seems to place an ad that says: 'The University of Realistic Expectations expects to appoint an average astronomer, who will get an occasional grant and not actually be stoned by irate students.'"

So what are realistic expectations for young astronomers, and how should they maximize their chances for getting stable, long-term employment?

SERVICE CHARGE

One solution may be to redefine what stable, long-term employment means. The traditional concept — tenure-track faculty position — may not be the most viable for many young astronomers. As the field moves towards bigger telescopes and larger collaborations, service positions — essential for collecting the data at big telescopes, and for doing the processing needed for collaborations — are becoming more important. These jobs require a lot of experience and judgement, and will generally provide stable employment for PhD astronomers, although probably with little or no time formally allocated for the employee's own research. The trade-off of greater stability early in a career — and of a job more likely to be 9 to 5 — has to be judged against the risk of disappointment later in life, as fellow students rise through the faculty ranks.

A path not considered by many students, but which has historically been one to success, is to specialize in instrumentation. Numerous panels from, and studies by, the AAS show that there is a constant demand for people working in instrumentation. Although Strittmatter and Beckwith agree that there is a traditional bias against hiring such people for faculty jobs, there are many other career opportunities open to them, particularly at major facilities.

Code development for the numerical simulations that are increasingly part of front-line research may be the 'new instrumentation'. But Adam Burrows, a

Large collaborations are creating jobs — but young astronomers need to ensure that they don't get lost in the shuffle.

This is especially true for postdocs, who must show leadership if they are to use their jobs as a way to land a more permanent position. They must make part of a large project identifiably their own, or expand it in a new direction that is uniquely their own, says Steve Beckwith, director of the Space Telescope Science Institute in Baltimore.

Postdocs must assert themselves if they want a traditional faculty job because the people who will interview them will consider that to be a

good characteristic.

But Charles Alcock, an astronomer at the University of Pennsylvania in Philadelphia, notes that distinguishing oneself in a large collaboration can be hard — especially if you're junior. The field is very conservative and tends to look for publications on which a job applicant is first author. But once the collaboration exceeds a certain size, there may simply not be enough good results to go around and give everyone a first-author paper. And important contributions may be made in technical, rather than scientific areas, so someone may not get the recognition they deserve.

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Steve Beckwith (right) encourages young astronomers to make their mark.



Lost in the crowd: Steve Beckwith notes that life in a large group can prove difficult (left).

Peter Strittmatter (below) feels there is little chance that faculty will expand.

theoretical astrophysicist at the University of Arizona, cautions that faculty jobs generally are open only to those who think deeply about the physics, and who push the research in new directions. There probably will not be many programming jobs associated with the NVO, though, because the consortium has decided that programming should come from highly developed existing sources, as well as from the information technology and mathematics communities.

Leslie Sage is *Nature's* astronomy editor.

American Astronomical Society ♦ www.aas.org

National Virtual Observatory ♦ www.srl.caltech.edu/nvo

