

STATUS

A REPORT ON WOMEN IN ASTRONOMY

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in Astronomy

A Tribute to Margaret Burbidge

By Vera C. Rubin

MARGARET PEACHEY BURBIDGE, born in England in 1919, was interested in astronomy as a youngster and read the books of Sir James Jeans, to whom she is distantly related. She attended University College, London, and was surprised to discover that a degree in astronomy was offered. She earned a B.Sc. from University College, and a Ph.D. from the University of London Observatory. In 1948 she married fellow graduate student Geoffrey Burbidge. She and Geoff have a daughter, Sarah, and a grandson.

In 1951, Margaret and Geoff left England for the U.S., she to Yerkes Observatory and he to Harvard College Observatory; by the next year, the Burbidges were both post-docs at Yerkes. Margaret's earliest research concerned chemical abundances in stars. In 1954, following their return to Cambridge, England, they approached Willy Fowler, there on sabbatical. Fowler affectionately recalled a day when a

"wonderful Charles Laughton replica" (Geoff) walked into his office at the Cavendish Lab and asked "Why not work on problems important for Astrophysics?" This query culminated in the now-classic work by Burbidge, Burbidge, Fowler, and Hoyle (famously known as B²FH) entitled *Synthesis of the Elements in Stars*.

When Fowler returned to the U.S., the Burbidges followed him to Pasadena. With their usual adaptability, Margaret was a postdoc at Kellogg Lab at Caltech, Geoff was a Carnegie Fellow at Mount Wilson Observatory (which was not available to females). Not surprisingly, whenever Geoff went off to Mount Wilson to observe, Margaret "coincidentally" appeared. In 1957 they returned to Yerkes, Margaret again as a postdoc, and continued their observations and analysis to understand the physics of stars. With the McDonald 82-inch telescope, their observations centered around both stars and galaxies.

In the early 1960s, with the founding of the University of California at San Diego, both Margaret and Geoff moved again, Margaret to

Continued on page 2



Margaret Burbidge



You-Hua
Chu

Women Editors of the Astrophysical Journal

By You-Hua Chu

I RECENTLY stumbled upon the fact that not a single member of the current Editorial Board of the Astrophysical Journal (ApJ) is female. Considering that the Editorial Board consists of an Editor-in-Chief, an Associate Editor-in-Chief, and 14-15 Scientific Editors, this missing-woman status could be statistically significant. My initial shock gave way to curiosity — how had women contributed, why were there currently no women on the Editorial Board of the ApJ, and how could the situation be changed? I did a few hours of

research in our department reading room to find the answers. Here I report my findings.

First, I will briefly review the history of the ApJ. The ApJ was founded in 1895, and was originally named "*The Astrophysical Journal, An International Review of Spectroscopy and Astronomical Physics*." The name was changed to "*The Astrophysical Journal*" in 1962. The ApJ belonged to the University of Chicago Press (UCP) until 1972 when the ownership was transferred to the American Astronomical Society (AAS). At about this time, the editing of the ApJ Letters (ApJL) was separated from the ApJ.

The editorial bodies of the ApJ and ApJL have gone through several changes since 1910 (the year our department's ApJ collection started). These are summarized in Table 1a, page 3

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Vera Rubin (left) and Margaret Burbidge in Cambridge, England, 1990's.

the Department of Chemistry and Geoff to Physics, for nepotism rules prohibited the couple to have appointments in the same department. I was working with the Burbidges during the 1963-'64 aca-

ademic year, and heard Margaret give her wonderful inaugural lecture on Astrochemistry. Shortly thereafter, with the change of rules, Margaret moved to the Physics department. In addition to her position as Professor of Physics, Margaret was for many years Director of the Center for Astrophysics and Space Sciences at UCSD.

Throughout her career, Margaret has been a leader in the study of galaxies, rotation of galaxies, QSO redshifts, and their interpretation. She has also played a leadership role on many national committees for space science and for setting priorities in astronomy. Her achievements have been recognized with numerous honors, prizes, and honorary degrees. She was President of the AAS, she shared the AAS Warner Prize with Geoff, she is a Fellow of the Royal Society (London), and in 1978 was the first woman astronomer elected to the U.S. National Academy of Sciences. In 1983, she was awarded the National Medal of Science.

Margaret Burbidge has met each challenge of her career with brilliance, with originality, with dedicated hard work, and with grace. She has been a mentor to students and young astronomers. She was a role model for many, even before we knew the word. Thank you, Margaret. ❖



Margaret Burbidge and Vera Rubin at the 1953 University of Michigan astronomy summer session, where they first met.



Vera Rubin has astronomy degrees from Vassar College and Cornell University and a Ph.D. from Georgetown University. She has been on the staff of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington for over 35 years. A longtime friend and colleague of Margaret Burbidge, Vera has been honored extensively for her work in observational cosmology, and like Margaret, is a member of the National Academy of Sciences and a recipient of the National Medal of Science.

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<http://www.aas.org/~csww/status>

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and Table 1b, page 4. Before 1952, the ApJ had a small number of Editors (2-4) and a large number of Collaborators (13-17) or Collaborating Editors (~9). From 1952 to 1978, the editorial office shrank to a Managing Editor, an Associate Editor, and five members of an Editorial Board. The number of Associate Editors grew to two in 1990 and then to six in 1994. In 1996, the Managing Editor was replaced by an Editor-in-Chief, and the Associate Editors were replaced by a still larger number of Scientific Editors (12-15). An Associate Editor-in-Chief joined in 1999, completing the current structure of the ApJ Editorial Board.

When the ApJ was owned by the UCP, the University of Chicago selected the editors and board of Collaborators until 1944. Starting in 1945, the board of Collaborators was replaced by "Collaborating Editors," who were appointed by the AAS on a rotating basis. After 1971, all ApJ and ApJL editors were appointed by the AAS. Starting in 1997, the Scientific Editors were selected from applicants who responded to the advertisements in the AAS Newsletter and Job Register.

I am not certain about the functions of "Collaborators", "Collaborating Editors", and the "Editorial Board" before 1979. These people probably aided occasionally in the review of papers, as implied by Abt's article in the AAS's First Century. The Publication Board from 1979 to present has been in charge of selecting the editors of the ApJ, but does not review papers or participate in the editorial work and is therefore not included in my accounting.

Since 1910, eight women have participated in the editorial work for the ApJ or ApJL (see Table 2, page 4). Their positions among the male peers are shown in Table 3, page 6. Cecilia Payne-Gaposchkin was the first woman editor of the ApJ, serving as a Collaborator from 1941-'44, and a Collaborating Editor from 1945-'51. It is interesting to note that the

Collaborators and Collaborating Editors were listed alphabetically in the ApJ's inside cover until 1947, then Payne-Gaposchkin became the leading Collaborating Editor. If the new, non-alphabetical ordering reflected the Collaborating Editors' efforts, Payne-Gaposchkin would have been the one that contributed the most. Anne Underhill made a brief appearance on the Editorial Board from 1962-'63. Vera Rubin was an Associate Letters Editor from 1977-'82, immediately followed by Sandra Faber, who served from 1983-'87.

The editorial office of the ApJ went through an accelerated expansion in the 1990s. Starting in 1990, the ApJ increased its number of Associate Editors to distribute the workload. Virginia Trimble was recruited in the first wave in 1990. Anne Cowley joined the Associate Editors in 1994. In 1997, a new Editor-in-Chief (E.i.C.) was hired to replace Helmut Abt but resigned before starting the position. Both Virginia Trimble and Anne Cowley continued to serve as Scientific Editors. Susan Kleinmann, originally appointed to be the

Associate Editor-in-Chief working with the new Editor-in-Chief, served as a Scientific Editor in 1998. In 1998, Virginia Trimble finished her term, Anne Cowley left the ApJ to edit the Publication of the Astronomical Society of the Pacific (PASP), and Susan Kleinmann resigned before the expiration of her term, leaving no women on the ApJ Editorial Board. In 1999, a new Editor-in-

KEY: Editors' titles used in Tables 1-3

ApJ	Historical order of use
Editor	(E)
Managing Editor	(ME)
Associate Managing Editor	(AME)
Associate Editor	(AE)
Scientific Editor (replaced 'AE')	(SE)
Editor-in-Chief (replaced 'ME')	(EiC)
Associate Editor-in-Chief	(AEiC)
Other ApJ:	
Collaborator	(C)
Collaborating Editor (replaced 'C')	(CE)
Editorial Board member	(EB)

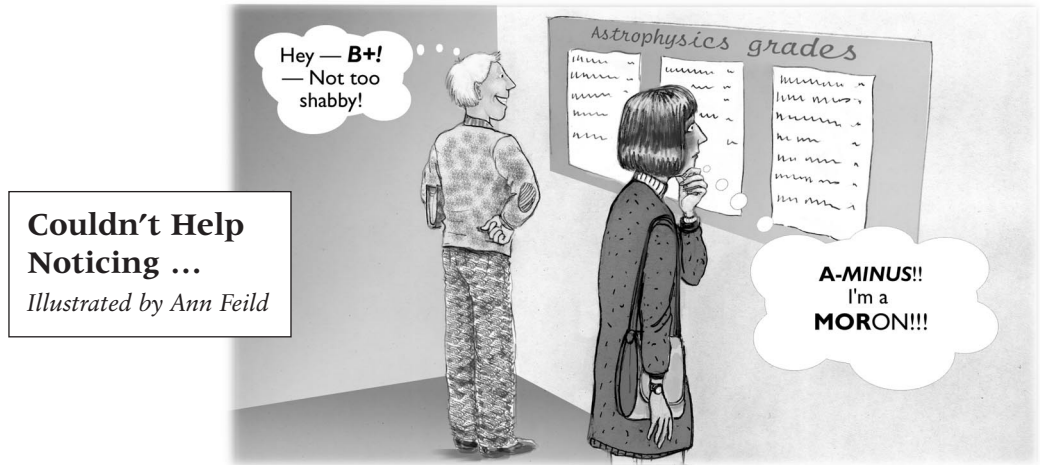
ApJL	Historical order of use
Letters Editor	(LE)
Associate Letters Editor	(ALE)
Deputy Letters Editor	(DLE)

Table 1a
Evolution of the editorial body of the ApJ

Year	Titles (see Key)	Number of incumbents
1910-1941	E	2-4
	C	13-17
1942-1944	E	4
	C	9
1945-1946	ME	1
	AME	1
	E	3
	CE	9
1947-1951	ME	1
	E	4
	CE	9
1947-1951	ME	1
	AE	1
	EB	5
1979-1989	ME	1
	AE	1
	Publication Board*	
1990-1993	ME	1
	AE	2
	Publication Board*	
1994-1996	ME	1
	AE	6-7
	Publication Board*	
1996-1999	ME	1
	SE	12-15
	Publication Board*	
1999-present	EiC	1
	AEiC	1
	SE	14
	Publication Board*	

*Publication Board selects editors but does not review papers or participate in editorial work.

Continued on page 4



Couldn't Help Noticing ...

Illustrated by Ann Feild

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Chief was appointed, but the Editorial Board of the ApJ remains woman-less to date.

Is the current lack of women in the ApJ's Editorial Board a statistical fluke that is temporary or a symptom of social problems that are now surfacing? There is currently a call for applications for Scientific Editors. If new women editors are appointed, the current lack of women among the ApJ's Scientific Editors would appear to be a statistical fluke. If no women are appointed, then the persisting situation might indicate a real problem.

To foresee whether to expect a problem, we can look further into the history and the qualification of editors. Prior to 1970, most of the main editors of the ApJ were also recipients of the Helen B. Warner Prize, the Dannie Heineman Prize, or the Henry Norris Russell Lectureship. In the 1970s, the number of astronomers (baby-boomers) grew steeply, but not the number of prizes; therefore, the correlation between editors and the prizes diminished. It is interesting to note that before 1990, the women editors that had completed their full terms (Payne-Gaposchkin, Rubin, and Faber) all belong to the elite group of women recipients of the Henry Norris Russell Lectureship or the Dannie Heineman Prize for Astrophysics. (Only four of the 74 recipients of these prestigious awards are women, the fourth being Margaret Burbidge.)

Advances in observational and computational facilities in the last two decades have driven the development of a rich interrelated set of highly specialized subfields within astronomy and astrophysics. Over this time, the volume of the ApJ

has grown almost exponentially. Consequently, it has become difficult for a small number of editors to oversee the reviewing of the ApJ, which has led to a rapid increase in the number of Scientific Editors in the 1990s. The qualifications required for Scientific Editors are a strong record of published scientific research and the willingness to commit a considerable amount of time to help maintain the scientific standards of the ApJ. Of the three women Scientific Editors of the ApJ, the two that completed at least one term are both senior astronomers with tenured positions.

If we extrapolate from the successful women editors of the past to predict the future, we might expect difficulty in finding new women editors simply because the percentage of women decreases with increasing seniority. The possibility of finding a new woman editor is further lim-

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Table 1b

Evolution of the editorial body of the ApJL

Year	Titles (see Key)	Number of incumbents
1971-1973	LE	1
	ALE	2
1974-1987	LE	1
	ALE	4
1988-present	LE	1
	DLE	1
	ALE	3

Table 2

Women editors of the ApJ and the ApJL

Year	Editor	Title (see Key)
ApJ		
1941-44	Cecelia Payne-Gaposchkin	C
1945-51	Cecelia Payne-Gaposchkin	CE
1962-63	Anne Underhill	EB
1990-98	Virginia Trimble	AE / SE
1994-98	Anne Cowley	AE / SE
1998	Susan Kleinmann	SE
ApJL		
1977-82	Vera Rubin	ALE
1983-87	Sandra Faber	ALE
1999-present	Anneila Sargent	ALE



Laurie McNeil is a professor in the Department of Physics and Astronomy and the Curriculum in Applied and Material Science at the University of North Carolina at Chapel Hill. Marc Sher is a professor of physics at the College of William and Mary, specializing in particle theory. Both authors are members of dual-career families.

The Two-Body Problem, Part II: Seeking Employment Solutions for Dual-Science-Career Couples

By Laurie McNeil and Marc Sher

ONE OF THE PRIMARY PURPOSES of our dual-career-couple survey was to look for interesting solutions and innovative responses to the problem. Despite the gloomy picture painted by many dual-career situations, such solutions do exist and can be used as models by institutions that wish to take a positive approach to the issue. In spite of the large number of different dual-career couple-situations, they do tend to fall into several broad categories. Either the members of the couple are in the same scientific field, or they are in different fields. Either they are at a similar stage in their careers, or they are at different stages. Either children are (or will be) a major factor, or they are not. The various suggestions provided will generally only apply to certain groups; split/sharing positions, for example, will not generally be relevant to those in different fields or at different stages in their careers; some of the ideas for commuting will not be practical for those with children. We hope to convince the reader that the dual-career couple problem is not always hopeless, that institutions and couples have come up with innovative and interesting solutions, and that the problem can be dealt with at all levels of the profession.

Shared or Split Positions

Perhaps the most difficult dual-career couple problem occurs when both scientists are in the same discipline. Jobs in physics are very rare, and the probability that two jobs which match the partners' subdisciplines will occur in the same department is very small. A solution which is being increasingly adopted involves shared positions. In a shared position, a single faculty position is shared by two individuals. Each has half of the duties of a full-time position. There are many issues in such an arrangement, including conditions of tenure and promotion, merit raises, benefits, start-up funds, voting rights,

etc., and a number of different ways of dealing with these issues — they will be discussed in detail below.

The main advantage to sharing a position is the additional time freed up for other pursuits. This is useful for those wishing to establish stronger research records, and is especially useful for those wishing to have a family. Shared positions are best for two people in the same field, at roughly the same level of training. In many cases, they provide the only mechanism for both partners to stay active in science, in mainstream positions, and still live together. When a position arises in a department, there is generally only one position available, and so a spouse will come along, often without support. The trailing spouse will often be able to play some role in the department, as a part-time instructor or post-doctoral associate. But part-time, non-tenure track positions are dead-end positions, without much future. Advancement in academia progresses in very specific steps, and it is hard for someone "off the track" to get back on. Thus, by splitting a position, both partners can be in tenure-track positions, continue to teach and to do research. It may very well be possible for the half-time positions to evolve into full-time positions in the future.

The primary personal disadvantage to a split or shared position, of course, is financial. As noted above, supplemental income can be obtained through summer salaries, extra teaching and outside consulting; and much money can be saved by not needed full-time child care. Nonetheless, two full positions will provide a significantly higher income. Another disadvantage is "the strong personal tendency to do more than the agreed-upon part-time work, and the (usually unintended) external pressure to assume that more can be done than the agreed-upon work load. To counter this, the split position faculty may need boldness to speak out when the workload goes beyond reasonable levels. There is, however, a fine line between being exploited, and being willing to accept some amount of overload as compensation for

In dual-career couples:



Laurie McNeil



Marc Sher

This is the second article of a two-part series on dual-career couples, the first of which appeared in the June 2000 STATUS. Both were excerpted from the full report, "Dual-Science-Career Couples: Survey Results" which appears at: <http://www.physics.wm.edu/~sher/survey.html>. A summary of the report was published in the July 1999 issue of *Physics Today*.

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Table 3

Editors of the ApJ		Women noted in bold italics
Year	Top editorial staff Incumbent (Title)	Summary of women on staff Woman incumbent (Title)
1910-11	Hale, Frost (both E)	
1912-32	Hale, Frost, Gale (all E)	
1933-35	Hale, Frost, Gale, Struve (all E)	
1936-40	Gale, Sears, Struve (all E)	
1941	Merrill, Shapley, Struve (all E)	Payne-Gaposchkin (C, one of 13)
1942-44	Merrill, Shapley, Struve (all E)	Payne-Gaposchkin (C, one of 9)
1945	Struve (ME), Chandrasekhar (AME), Merrill (E), Shapley (E), Moore (E)	Payne-Gaposchkin (CE, one of 9)
1946	Struve (ME), Chandrasekhar (AME), Merrill (E), Shapley (E), Mayall (E)	Payne-Gaposchkin (CE, one of 9)
1947-51	Morgan (ME), Chandrasekhar (E), Merrill (E), Shapley (E), Mayall (E)	Payne-Gaposchkin (leading CE , one of 9)
1952	Morgan (ME), Chandrasekhar (AE)	
1952-55	Chandrasekhar (ME), Kuiper (AE)	
1956	Chandrasekhar (ME), Blaauw (AE)	
1957-58	Chandrasekhar (ME)	
1959-61	Chandrasekhar (ME), Chamberlain (AE)	
1962	Chandrasekhar (ME), Chamberlain (AE)	Underhill (EB)
1963	Chandrasekhar (ME)	Underhill (EB)
1964-69	Chandrasekhar (ME)	
1970	Chandrasekhar (ME), Mihalas (AE)	
1971-78	Abt (ME), Mihalas (AE)	
1979-85	Abt (ME), Strom (AE)	
1986-89	Abt (ME), Gallagher (AE)	
1990-92	Abt (ME), Gallagher (AE), Trimble (AE)	Trimble (AE, one of 2)
1993	Abt (ME), Terzian (AE), Trimble (AE)	Trimble (AE, one of 2)
1994*	Abt (ME)	Trimble, Cowley (both AE, out of 6)*
1995	Abt (ME)	Trimble, Cowley (both AE, out of 7)*
1996-97	Abt (EiC)	Trimble, Cowley (both SE, out of 12)*
1998	Abt (EiC)	Trimble, Cowley, Kleinmann (all SE , out of 15)*
1999	Abt (EiC)	
2000	Kennicutt (EiC), Liebert (AEiC)	

Editors of the ApJL		Women noted in bold italics
1971-73	Osterbrock (LE)	
1974-87	Dalgarno (LE)	Rubin (ALE, 1977-82) Faber (ALE, 1983-87)
1988-present	Dalgarno (LE), Averett (DLE)	Sargent (ALE, 1999-present)

*Prior to 1994, there were one or two AEs per year; they are listed, by name, on this chart. In 1994 and afterwards, as the volume of the ApJ grew, AEs or SEs numbered six or more.

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ited by the pool of senior women astronomers who are willing to commit ~20% of their time to serve as Scientific Editors and whose research fields meet the current needs of the ApJ.

Even if it is not clear why there are presently no women on the ApJ Editorial Board, it is clear that this situation can be changed. I urge senior women to consider applying for this and future Scientific Editor positions. I also encourage the AAS Publication Board to actively seek out qualified women editors. Many of us would like to see a gender-balanced Editorial Board of the ApJ, and now is the time to make changes to reach this goal.* ❖

Acknowledgement

The author thanks Helmut Abt and Jay Gallagher for providing useful information and discussions, and Robert Gruendl for helpful comments and critical reading of the manuscript. She also wishes to thank her parents for eternal encouragement; the AAS, NSF, and NASA for financial support; and friends for moral support.

*Editors' Note:

We are happy to report that women applicants are already being sought actively by the ApJ.



You-Hua Chu was educated at the National Taiwan University in physics and at the University of California at Berkeley in astronomy. Following postdoctoral positions at the University of Wisconsin-Madison and Northwestern University, she settled in Champaign-Urbana, Illinois, where she was for twelve years a soft-money researcher supported by grants from the AAS (occasionally), NSF (initially), and NASA (continuously), all while raising three children. She is now a full professor in Astronomy at the University of Illinois, enjoying teaching and observing the multi-phase ISM with Chandra, XMM, FUSE, HST, and NOAO.



Ann Finkbeiner is a freelance science writer who writes often about cosmology and other astronomy topics. She currently teaches in the graduate science writing program of The Writing Seminars at the Johns Hopkins University. Being a woman and a science writer, Ann is often asked to write about women in science. Her articles have addressed "How few women are in science and no one knows why" and "What does a woman need if she's going to make it?" The present article is reprinted with permission from the November 2000 issue of Astronomy magazine.

"Good Morning, Gentlemen and Meg" **Astronomy: A Woman's Choice**

By Ann Finkbeiner

Women astronomers are now and always have been underrepresented, underpaid, and undervalued. This isn't the 1880s, when Wellesley College astronomy professor Sarah Whiting was asked by a colleague, "If all the ladies should know so much about spectroscopes and cathode rays, who will attend to the buttons and breakfasts?" This is now, a century later, when women are half of the labor force and a fifth of all scientists and engineers, but still under a tenth of all astronomers. Vera Rubin at the Carnegie Institution is nearing the end of her distinguished career and is, as she says, "getting fed up": "What's wrong with this story is that nothing's changing, or it's changing so slowly. For 20 years, I've been optimistic that things are getting better and better. But 20 years later, it's still 6 percent, and sure, that's better than 2 percent. But four percentage points in 50 years isn't saying much." And in spite of endless analyses, no one quite knows why.

What happens next depends on the woman. "At 16, I wanted to do math and science," said Gillian Knapp of Princeton, "and I thrashed around to see what was the matter with me. Then I just said, 'So there's something the matter with me. So what? I'll just go and do what I want.'" This is now a more interesting story altogether: how women manage to stay in astronomy anyway.

In the first place, things are indeed getting better. Women now win competitive professorships and postdoctoral fellowships, chair national committees, and direct national observatories; the numbers of young women astronomers are at an all-time high. "There has been a huge improvement," said Wendy Freedman of the Carnegie Observatories. But the bottom line is the same as in the bad old days: few women get in and fewer stay. One quarter of graduate students are women, but only 7 percent of tenured full professors are. (Rubin's 6 percent isn't necessarily a contradiction; besides, she says, "it

doesn't even matter — it's just pathetically small.") And when women do stay in, their salaries for a given rank are lower; they're unlikely to be on the track for tenure; they don't get promoted as quickly, they are scarce in the higher ranks, their offices are smaller, and their voices less audible.

The reasons for women's underrepresentation have been the subject of countless surveys, articles, committees, websites, newsletters, and symposia in innumerable departments, journals, professional societies, and agencies. The results of all this brainpower have been a little vague. One reason that's often given: Women aren't encouraged by those whose job it is to encourage young scientists: parents, teachers, advisors. Another reason is that women are bent socially to be cooperative and consensual, to be less self-confident, less self-promoting, less competitive. Another is that women most often marry their colleagues, and then face all the tricky balances of a two-career marriage.

Analysts now say that women's discouragement comes from no one great obstacle, but from years of accumulating small, subtle ones. "Each incident is nothing," says Gillian Knapp, "but together they erode you." The incidents include trivialities like standard masculine pronouns; being addressed not as Dr. but as Mrs.; and "saying something in a meeting and it's ignored," says Stefi Baum at STScI, "then the guy next to you says the same thing and it's great." Such incidents are incremental, said Megan Urry, also at STScI, "and only after a while do you feel the weight of them."

Most simply, women are seen to be different. From the time they were college students, they



Sandra Faber

Photo by R.R. Jones



Daniela Calzetti

STScI

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both partners being employed in the same place in a highly competitive job market."

Shared and split positions are similar in that a single FTE (full-time-equivalent) nine-month faculty slot is occupied by two individuals. In principle, however, they are very different. In a shared position, a single position is shared by two people. This one position is considered for tenure (either both get tenure or both do not) and promotion, a single salary increase applies to the position and the salary is divided evenly, the two individuals can negotiate the division of responsibilities. In a split position, a single position is divided into two separate, independent, half-time (0.5 FTE) positions. Each half-position has a separate contract to do half the teaching, research and service, each is eligible for tenure and promotion independently, each receives a separate raise, each has separate benefits (note that half-time positions might not be eligible for full benefits).

The differences between shared and split positions can be quite significant. Each has different advantages. In a split position, the independence of the two positions leads to much greater flexibility in research, as each partner can pursue separate research goals, and dividing up the responsibilities of a single position is not necessary. In a shared position, dividing the responsibilities can be an advantage — if one partner wished to take some time off (to rear an infant, for example), the other can take on full responsibility for the position.

In practice, we have found that split positions are much more common than shared positions. However, there is a significant variation in individual contracts, and many arrangements that dual-career couples have made with their institutions have aspects of both types of position. In some, for example, each member of the couple in a shared position is evaluated separately for tenure (as in a split position), but if one is denied tenure, the other can convert their half-position to a full-time position.

Split positions are much more common than shared positions. In discussions with various college administrators, the most serious concern about shared positions is the "all-or-nothing" aspect of the tenure decision. It could turn out that one member of the shared position is very good, and the other is very poor, putting the institution in a very difficult situation. As a result, many so-called "shared positions" treat tenure as if it were a split position (with each person evaluated independently).

In recent years, the number of these positions has grown to the point where their novelty

has worn off, and they are becoming part of the standard menu of options for those seeking positions in academia. Yet our survey showed that a large number of dual career science couples seem unaware of this possibility.

When is the best time to discuss the possibility? Our respondents seem divided on this question. Elsewhere in this report, we point out the serious problems that can occur by mentioning one's spouse's situation too early in the search process, and argue that it is generally best not to discuss the matter until after the interview process. Split positions are different. If a couple is set on such a position and would not accept anything else, then one should bring it up early, possibly in the initial application. After all, it is a condition of employment, and is only fair to alert the employer at an early stage. In mentioning the position, however, it would help (if the institution does not already have one or more split positions) to make a specific proposal — or give some explicit examples — thus showing the institution that these positions are feasible and not uncommon. On the other hand, in many cases, the couple is not specifically set on a split position, and is willing to consider other options. In that case, it is probably not best to mention it too early in the process (although waiting until an offer is made might not give the institution time to respond). Alas, there do not seem to be any hard and fast rules for when to bring up split positions.

Spousal Hiring Programs

Shared and split positions are a potential solution for couples in the same department, however, in the majority of cases, a dual-career couple will be in different fields. Many institutions have recognized that the dual-career couple problem makes hiring more difficult, and have established formal spousal hiring programs. The checklist for the Spousal Hire Program at the University of Wisconsin-Madison says, in its preamble: "Increasingly, University professionals are part of dual career couples. Thus, decisions to accept a University position are often made based on the availability of employment for a spouse or partner. The following steps are provided to assist departmental chairs and other administrators in arranging a needed spousal/partner hire. The spouse may be hired as faculty, academic staff, or classified staff. The terms used apply to a spousal hire within an academic department. (The process is analogous for spousal hire in administrative and support units: substitute 'supervisor' for 'chair;' 'unit' for 'department,' 'director' for Dean, etc.)"

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have heard the equivalent of the words — sometimes kindly meant — with which Urry's graduate classes began: "Good morning, gentlemen and Meg." Occasionally, the words are unkind: Knapp says her undergraduate classes in physics had three women "out of 60 or 70. One professor would harangue about women not belonging here until we burst into tears and then he'd leave. We learned to burst into tears really fast." Sometimes no one says anything particular: during Lisa Storrie-Lombardi's first postdoctoral fellowship, she said, "The department was all men. I was startled that I noticed it. I didn't handle it well — I just didn't feel connected." The point is, such incidents, whether outright illegal or barely noticeable, are evidence to women that they're outsiders.

The other point is, such incidents are the universal reactions to someone different. "It's human nature," said Rebecca Bernstein, a postdoctoral fellow at the Carnegie Observatories, "and any change will be a long time coming." Sandra Faber, who was hired at Lick Observatory about when Bernstein was born, agreed: "It's the way it is. So then you say, 'So what?'"

I interviewed 15 women astronomers who are now at nine of the country's best astronomical institutions. They ranged from postdocs to senior faculty; they looked like anything from corporate lawyers to suburban parents to — quite frankly — nerds. They agreed that the basic problems of career-building in a difficult science were the same for men and women, but that women had this extra problem of difference. "You do stand out and that can either hurt or help," said Bernstein. "But I don't think being different always helps. There's not an animal on the planet that feels relaxed standing out like a sore thumb."

They disagreed, according to their own personalities, on styles of handling the difference. For instance, Anneila Sargent, who is at Caltech and is the president-elect of the American Astronomical Society, said, "It doesn't hurt to be an engaging person. 'Compromise' is not a dirty word." But Daniela Calzetti at STScI said, "I start the fights. I'm quite aggressive." They did converge, however, on a broad rule for staying in astronomy: define yourself as an astronomer. This rule has several sub-rules.

1) Fit into a mostly male community.

Most of those I interviewed stayed in by paying less attention to the word "male" than to the word "community." After Knapp said that in graduate school she'd learned to cry fast, she

added, "But it was a relief, for the first time being around other nerds." And now, she says, her men and women colleagues "are all pretty similar — vain, hard-working, and fortunate, extremely fortunate." Astronomy "needs a passion, an ability, a single-mindedness," said Wendy Freedman of the Carnegie Observatories, "and that's all true for men and women both." These women weren't trying to change gender: "I don't go into this wanting to be a man," said Anne Kinney, director of the Origins program at NASA; "the goal is to do good work." Rather, they included themselves and their male colleagues in a larger category, the community of astronomers. Such "redefining is not hard where people so love the field," Kinney said. "It's the main coping mechanism." Crystal Martin is at Caltech on a post-doctoral fellowship: "I'm in the community now. It's one I enjoy being a part of."

Fitting into the community, however, also means competing for limited resources. The National Science Foundation funds about one astronomical proposal in four. STScI grants telescope time to one in five. Ten Hubble postdoctoral fellowships receive 140 applicants. In this field, Urry says, "the personality filters screen out the diffident. The aggressive get through." Freedman said she has to "defend my science against people who want me off my own telescope, get me uninvited from meetings, and call me incompetent publicly. Our field is not gentle."

Everyone I interviewed was conscious of how she handled competition.

Freedman dissociates the scientific from the personal: "In the Hubble constant controversy, I look at my male colleagues jostling around and hurling things at each other and I don't feel singled out at all. It's not because I'm a woman." Rubin avoids the jostling and hurling: "I couldn't take the sociology," she said, and instead picks problems no one else worked on "but results they'd be pleased to have." Rosemary Wyse at Johns Hopkins jostles and hurls: "I was brought up Catholic on the [Protestant] east coast of Scotland, so I am used to asserting my right to be where I want, doing what I want." No one handled competition in any one way, of course. But they all seemed to take Sargent's father's motto: "It's a great life if you don't weaken."



Anne Kinney

Photo by Paul Hayward



Wendy Freedman

Photo by Raleigh Souther

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This makes clear that spousal hire programs do not just apply to situations in which both persons are ready for faculty positions, but also to cases in which one member of the couple is not suitable for a faculty position but is qualified for an academic or classified staff position. Many institutions have programs that assist in finding non-academic positions for spouses. How do spousal hiring programs work? Typically (and there are wide variations), the spouse's salary is split, with 1/3 coming from the original hiring department, 1/3 coming from the spouse's department, and 1/3 from the Provost's office. This arrangement lasts for a number of years (usually three to five, but sometimes permanently), and then the spouse's salary comes entirely from his/her department.

Many institutions have these programs; our survey respondents mentioned programs at University of Wisconsin, UC-Davis, Purdue and the University of Illinois at Urbana-Champaign. The program at UW-Madison was established as part of a five-year Faculty Strategic Hiring Initiative, and was designed "to support a faculty, academic staff, or classified staff position for the spouse/partner of a new faculty member". The funding arrangement mentioned in the above paragraph is in place for three years, after which the spouse's department assumes full responsibility. This funding arrangement assures "quality control", since it is unlikely that a department would hire someone who is not appropriate for a mainstream faculty position if they will be providing funding for 27 years of the typical 30-year faculty career. It is particularly advantageous if the spouse's department anticipates retirements within the next few years. The Chair of the department interested in hiring someone with a spouse/partner who needs an appointment initiates the process, contacting the unit or department that might provide such an appointment, and (if both departments or units are in agreement) goes to the Dean's office with a formal proposal. Special funds are available for start-up packages, if needed. The department hiring the spouse can get a formal waiver (to hire someone without a formal search) from the Office of Human Resources. The offer to the spouse is contingent on the first hire's acceptance.

There are difficulties involved with asking candidates about their spouses. How does Wisconsin bring the program to the attention of a candidate, without causing these difficulties? They have a sheet on "Some 'Best Practices' for Spousal Hiring" that explains how they inform candidates. The procedure described seems opti-

mal. All candidates are treated equally, and the candidate must be the one to bring up the issue of a spouse. The Program has been quite successful to date.

At the University of Illinois, there is a Dual Career Couple Program. It is aimed at "enhancing the ability of the campus to recruit and retain faculty members when the appointment or retention of one person is contingent upon employment of another. The program recognizes that the Champaign-Urbana labor market, compared with those where many peer universities are located, offers limited employment opportunities for a faculty member's partner. The result is that UIUC is at a competitive disadvantage in the recruitment and retention of faculty. The Dual Career Couple Program addresses this problem by provided a waiver of search and by allocating resources to the unit that hires the accompanying partner."

The procedures are similar to that of Wisconsin. The executive officer of the first unit is responsible for contacting the appropriate unit for possible employment of the partner. This executive officer must provide justification to appoint the partner in order to successfully recruit/retain the faculty member and must be willing to provide 1/3 of the salary of the partner. The executive officer of the second unit must be able to justify the appointment on the basis of legitimate unit needs and the candidate's qualifications, and must be willing to support 1/3 of the partner's proposed salary. Upon approval of a proposal from the two units, the Provost will provide a waiver of search and the remaining 1/3 of the partner's salary. Nominations are accepted for tenure track and tenured faculty prospects. Although the policy is geared to appointments to the faculty, requests for partner appointments to academic professional positions will be entertained.

At UIUC, the salary arrangement is permanent. Research funds can be requested. For positions other than a faculty position for a spouse, an office on the campus assists the Dual Career Couple Program in finding suitable employment.

Purdue University has an extensive Spousal Relocation Assistance Program. This is designed to find spouses of newly-hired faculty employment in the area. An evaluation of the program recently noted "The existence of a Relocation Assistance Program serves to humanize a university. Such a program tells the world that Purdue recognizes and understands the needs of the whole person and is concerned with more than just the skills and expertise of that individual ... We believe that programs of this type are necessary in a competitive environment and a worth-

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while expenditure of funds ... To be competitive, we need to be viewed as a family friendly employer, sensitive to the difficulties of relocation ... From a recruitment standpoint, it can help with meeting minority and female hiring goals and create a more diverse work force. From a retention standpoint, we know that the primary hire will only be comfortable if the accompanying spouse is happy with his/her situation ..."

The office has a permanent half-time staff member, who actively helps spouses find positions. Every year, they have successfully placed approximately 50 spouses of newly-hired faculty or staff. This program is somewhat different from those at Wisconsin and UIUC mentioned above in that they do not deal with assisting spouses of newly-hired (or newly-offered) faculty in obtaining a faculty position, but do help them in obtaining other University positions (see following section on alternative academic positions). For those looking for a faculty position as well, Purdue has a "Spousal Bridge Program". The program is described as follows:

"To help academic departments recruit and retain dual-career couples when both spouses seek faculty positions, Purdue established a Bridge Program in 1992. The program's intent is to achieve partnership between the academic department hiring the recruit and an academic department that would be appropriate for the accompanying spouse. The administrator responsible for hiring the recruit can attempt to locate a partnership with an appropriate department for the accompanying spouse. When an appropriate academic department wants to consider hiring the accompanying spouse but needs assistance, the academic departments and schools work in partnership to try, in some cases, to achieve an appointment for the spouse of a recruit. In certain situations, the Executive Vice-President for Academic Affairs also provides assistance through a special Bridge Program. The Spousal Bridge Program is also available for one academic department when both spouses are in the same discipline."

This is, of course, considerably more vague than the programs at Wisconsin and UIUC. Many institutions prefer to be deliberately vague, to allow for more flexibility of action. There is some tension here. It is important for institutions to have some specific policy or program in place, and to be prepared to deal with dual-career couples; yet too much specificity can constrain the institution and make it difficult for them to be flexible.

At the University of California, Davis, there was a policy several years ago that the university

should assist partners and spouses find employment. However, there was no formalized method for finding or funding partner employment, and UCD realized that it were losing potential and current faculty because it was unable to effectively implement this policy. So, in 1996, the Partner Opportunities Program was started to address this issue. Each year, it works with approximately 100 spouses and partners.

The Program assists partners/spouses in finding academic and non-academic positions. In the case where the Program feels that the partner/spouse should be considered for a UCD faculty position, the appropriate dean and department chair are contacted and asked to review the CV. If there is the possibility of a position, the Program arranges for the partner/spouse to meet with the dean and chair. Partners/spouses being considered for faculty positions go through the regular faculty appointment review process. They find that having a central office to handle these placements is very effective. Even in the case of same department appointments, the Program often provides funding; when successful recruitment or retention involves two different departments, the Program can work to make sure that all parties know what is happening and assist in authoring agreements. Assistance in funding is done on a case by case basis with sensitivity to department funding issues. The Program has bridging funds available with a negotiated term of 1-3 years. In most cases, the Program pays only a part of the salary with the faculty member's department and the employing department paying a share.

This program does define "partner" as domestic partners who are the same or opposite sex. Our survey did not elicit information about the additional difficulties of same-sex partners, which can be quite significant (most states will not recognize them for standard family benefit packages). Only four of our 620 respondents said that they had a same-sex partner.

Perhaps one of the most important things that spousal hiring programs can do is to provide bridge positions until the next retirement occurs. This can get around the difficulty that so many dual career couples have in timing. Often the department appropriate for the spouse will be interested in hiring him/her, but will not have a position (or at least a position in the spouse's subfield) that year. If a bridge program can provide funding until a particular retirement, then this difficulty can be alleviated.

We see that spousal hiring programs can be of great benefit to dual-career couples. Note that all of the above institutions are large universities. Only such institutions are large enough to justify

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having special offices dedicated to spousal hiring programs; only at large institutions can special funding be set aside for bridge positions. In many cases, smaller institutions simply don't have the resources. A possible solution might involve a federal program designed to support bridge positions. For an investment of a couple of years of salary, such a program could "save" a scientist's position for a lifetime.

Alternative Positions (academic)

Although split/shared positions and spousal hiring programs can be invaluable for couples who are both at the same stage in their careers (and both ready for faculty positions), a more common situation occurs when there is a disparity in either the respective stages of their careers, or in their respective talents.

One of the problems is that there usually is an imbalance in talent and/or years associated with the two-body problem. As an example, we can cite the situation of one of the authors of this report. As a faculty candidate, the author was about four years further advanced in career than the spouse. The author managed to get a job at a reasonable institution, but the spouse is still at the postdoc stage of establishing credentials within the physics community, making it hard to ask the institution for anything at the present moment.

This problem is especially acute for women, who typically have older spouses (in our survey, the mean age difference was 2.1 years); the male partner will typically be further along in his career, and thus when the two-body problem strikes, she is more likely to lower her expectations.

Universities have a number of soft money positions (teaching and/or research), and there is much less difficulty in getting a two to three year position for a spouse than in getting a tenure-track position. Of course, the position that the spouse obtains may not be the best for his/her career. He/she will then have the choice of taking a position that is not the best from the career point of view, and living with his/her spouse, or taking a better position, and commuting. In the next section, we will discuss various ideas to make commuting somewhat more palatable. In any event, any separation would be for a limited period of time.

Of greater concern is the situation when one spouse obtains a faculty or other "permanent" position, and the other can't get something similar. This is the situation that causes more physicists, especially women, to leave the field. It will occur when the two are at different stages of their careers, when the "trailing spouse" is either not qualified for a long-term position or has research interests that don't match the needs of the institution, or when the institution has a hostile or indifferent response to the needs of dual career couples (as described in the last section). Possible positions available include short-term (2-3 year) postdocs, soft money research positions, and adjunct or part-time teaching. Each of these will be discussed below, but it

must be emphasized that there is no general procedure for arranging such positions. Thus it is difficult for couples negotiating with an institution to know what to expect or even what they can ask for.

Short term postdoctoral research positions for a "trailing spouse" are (at research universities) not particularly difficult to arrange. Assistance from the administration can generally provide full or partial funding for a couple of years. Many of our respondents were able to get such positions. Of course, the obvious question is: what happens when the postdoctoral position ends? At this point, the department will be aware of the research potential

of the "trailing spouse"; if he/she has been wise enough to volunteer to teach a course or two, they will also be aware of the teaching potential. Assuming these are good, then they will have a strong incentive to create a tenure-track position, in order to avoid losing both partners. In many cases, our respondents "solved" their two-body problem in this manner. The details varied — some only had part-time positions for a couple of years, for example — but the basic pattern persisted.

It is advisable, BEFORE the original offer is accepted, to learn about future hiring plans for the department. If no hire is expected in the trailing spouse's subfield for many years, then this should have an impact on whether the offer is accepted. Of course, even if a hire in the subfield is possible in the next few years, no institution would (or should) be expected to make any promises about that position.

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From the Trenches

Views from Young Astronomers

OVER THE LAST YEAR, we received letters from several readers, mostly young astronomers, who describe a side of professional astronomy that may not be familiar to everyone. Here we recount five stories, from an undergraduate student, two graduate students, an observing technician, and a university postdoc. Their views are different, as are their experiences in astronomy, and readers may or may not find common ground. This is far from a comprehensive survey of life in astronomy, much less any kind of universal truth; rather, it is meant to be a window, a tool for understanding our different attitudes.

In the following reader-contributed stories, the authors' names have been withheld (and a few details changed) to protect the identities of those involved.



"You Will Hold Up The Progress"

At age 12, I knew I wanted to pursue astronomy. I had a romantic vision of the science, perhaps too romantic, and a great amount of interest in the field. Unfortunately, I was a little girl unaware of the harsh reality of pursuing an applied science as a female. My first warning flag came during a senior year undergraduate physics class. On the very first day of class the older, male professor looked directly at me (the only female in the class) and loudly scoffed, "The business classes are down the hall!" Next class he asked me to solve a random problem at the board. After no more than a minute he began yelling at me, saying I did not know what I was doing. He erased my work and began to redo the problem from scratch, repeating the exact same steps I had just done. At another class meeting, we had a pop quiz. I felt very comfortable with the material and was shocked to receive only 2 out of 10 points. I compared quiz answers with a male lab partner also in the class. My lab partner received a 9 out of 10 for the same answers I had.

The following class meeting, the professor picked on me continuously, each time stating my answer was incorrect before I could finish my response. Other students shook their heads in disgust. After class I approached him in private, asking him why I had been graded unfairly and why he was treating me with such disregard. With each question, he became more livid and offended, finally offering: "I feel you are too stupid to be taking this class. I don't want you in there, you will hold up the progress." Still, I

pleaded with him, saying he hadn't given me a chance and that I had a right to take the class. He replied, "Look, young lady, I have tenure here. Don't try and tell me how to run my class."

I went directly to the Dean and explained the entire story and also mentioned that I was contemplating legal recourse with help from my parents. I was then placed in a self-taught class; sitting in a physics graduate student's office I would read the text and complete various assignments and exams while proctored by the student. Any questions I had, I would ask him and he would do his best to explain things to me. I was deprived of a regular class setting, lectures, and a faculty instructor. Much to my professor's dismay, I received an A in the course, the highest grade of all students enrolled in the class. I was so proud of my accomplishment. When the professor approached me at the conclusion of the semester I felt the urge to convey a few choice words to him, but restrained myself. Young and naïve, I chalked it up to his lack of interaction with women and the fact he was an older instructor, backward in his thoughts.

Time passed and my skin hardened, as I experienced many other troubling, gender-related situations. My first job out of college was at a telescope observatory. A tour of university professors was making its way through the site. As the tour guide introduced me and mentioned the university I received my degree from, a man in the back spoke up in a proud voice, "I am a professor at that university!" As he approached me happily and completely unaware, I recognized him immediately as that physics professor! Two years had passed, but I had not forgotten one thing about the confrontation I had with this man. Amazingly, he was oblivious as to who I was. What mattered to him was that fact that one of the school's alumna represented them so well in front of all the visitors. He actually approached me and asked what my major had been! It was all I could do to remain patient and calm, as I was well aware he was showing off for the others. As they walked away, he loudly stated, "Great to see one of ours here!"



Objective Measures

I'm a 4th year graduate student, and a CSWA and AAS member who truly appreciates the articles detailing the status of women in astronomy. I just finished reading Meg Urry's article in the AAS newsletter (October, 2000), and decided to comment about my own perceptions as a woman in astronomy.

I've never felt any overt discrimination; no one has told me women are inferior as a matter

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Competing requires self-confidence, which also seems to be a prerequisite for fitting into a male community: "What it really takes is a male ego," Bernstein snapped. "When you're trying to compete with the top three percent in your



Photo by Bob Paz

Anneila Sargent

business, you're going to hear 'no,' and you can't go around feeling bad about it," said Lisa Storrie-Lombardi at the SIRTf Science Center at Caltech. They all said they consciously constructed confidence. They said time helped. Daniela Calzetti has been on tenure-track for several years:

"I've built confidence over the years. Now I have an indestructible self-confidence." Experience helped too. Urry said she'd earlier "imagined everyone else was as good as I was or better. Now, after 20 years' experience, I rarely feel that same intimidation." Anne Kinney: "When you're

from a small town, you stitch together your own world. That builds your self-confidence. Nobody else is going to do it." Faber is blunt: "I've never really failed at something that mattered to me."

2) Be tough as nails.

For all their determination to fit in to the community, they didn't do so seamlessly. Some handled the resulting isolation or intimidation by seeking out other women; some didn't. They all seemed to have a central resource, a core of determinedness. Rubin recited a fast list of discouragements: her high school physics



Photo by Laura Miller

Meg Urry

teacher told her to stay away from science, and Princeton University answered her request for a catalog with, "Inasmuch as we do not accept women, we will not send you a catalog." And then said, "The point of all these stories is, I desperately wanted it. They just didn't understand and I didn't care if they did."

Freedman said that as a student, one of her male classmates told her, "Women belong in the kitchen and in the bedroom," and I thought, "There are jerks in this world." And at the end of the course, he had the D and I had the A." Storrie-Lombardi's colleagues noticed she was older than other postdocs and told her, "If you haven't done your work by age 35, you're not going to do it." And I say, "Well, stuff it. I didn't figure it out until I was 33."

Along with universal determination was universal hard work. "It takes luck, hard work, complete concentration," said Faber. "My strategy throughout life is, how few minutes can I give to this, and still feel 40 hours is a slow

week. Bernstein says, "most of my colleagues work a hard six days, if not seven days a week, and 12 hours a day." When "there's something big," Freedman says, "I work from 3 a.m. to 7 a.m. The kids get up at 7 a.m., we get them out the door. Come home from work at 6 p.m. Go to bed 10ish. Weekends, 3 a.m. to 11, it doesn't impact the kids. My sister said, 'you're nuts, you better slow down,' and I took her advice for a few days. But I enjoy working hard. Those work hours sound horrendous but they're not. If you love it, it's not hard."

3) And that's the last sub-rule: love astronomy.

For some of them, the love started young. When I asked Calzetti when she knew she wanted to be an astronomer, she said, "since ever." Knapp, as a child, had asthma: "The nights I couldn't breathe, I just spent watching the stars go by and thinking about them." Rubin said much the same: "At age 10 or 12, I had a bed under a north-facing window and watched the stars, and soon I would rather watch the stars than sleep." Sally Oey, a post-doc at STScI, had "a two- or three-inch refractor. The first time I looked at Saturn — the light from it lands on your eye so it's really there — I was just so excited. Something clicks when you see something elegant." Freedman: "For me, I came into this field because I loved it. I can't believe I'm paid to do this. When it's time to go home, I can't believe the whole day has gone by."

Variants on this last were nearly universal. "It's really a privilege to be paid to do this," said Storrie-Lombardi. "Being paid to do this is not normal." Sargent: "I feel astonishingly successful. I can't believe I'm here." Calzetti's English is her second language: "I think my job is a call more than it is a job. In fact, I don't think it's a job at all. It's a liberation, a joy."

Rubin must be the prototype of how women manage to stay in astronomy. "Nothing discouraged me," she said. "It's an incredible universe we're in and how could you do anything but try and learn about it?" About 15 minutes into the interview, Rubin said she was bored telling me her life story, she'd rather talk about an elegant observation she'd made about spiral galaxies that behave like ellipticals. "That's what I like to do," she said, "go off and find a nice result. Just sit here and look at galaxies and nobody bothers me and I can get a result no one expected. I just love it. I can't imagine having more fun. The fact is, we really don't know what the universe is doing. We

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might die thinking we know some things that turn out to be wrong. And that's ok."

Why is that ok?

"Because then the children can have the fun."

So what does it take to stay in astronomy?

Storrie-Lombardi: "Fortitude."

Oey: "A thick skin." ❖

Addendum:

The One Large Imbalance

by *Ann Finkbeiner*

When I asked 15 women astronomers what it takes for women to succeed in astronomy, they usually answered, "about what it takes for men to succeed." The added discouragements are cumulative, they said, but tractable. Small disadvantages "make you uncomfortable," said Daniela Calzetti at the Space Telescope Science Institute (STScI), "they don't destroy your career." The one large imbalance they saw in women's situations is in the broad and nebulous area of sex, marriage, and children. Sandra Faber at the Lick Observatory said it flatly: "The careers of women are never going to look like the careers of men."

Nobody would recount for publication the non-consenting sexual incidents — usually overt propositions — that are inevitable when women and men work together. "This doesn't happen every five minutes," said Anneila Sargent at Caltech, "but it happens to all of us sooner or later." "You need the resilience to ignore or to deal," said Wendy Freedman at the Carnegie Observatories. Everyone who told these anecdotes said they first got uncomfortable and worried, then behaved as though nothing happened and hoped for the best. "Most of it doesn't turn out negatively," said Freedman. What they worry about, of course, is the effect on their careers: "Someone being attracted to you is always an obstacle, especially if they're senior," said Sally Oey at STScI. "You don't want to say, 'screw off,'" said Sargent, "because you might want his good will."

When sexual attraction is mutual, the next obstacle is what the field calls "the two-body problem:" couples who want geographically neighboring jobs. The two-body problem is worse for women: women scientists tend to marry men scientists, but not the reverse. "My boyfriend is in astronomy, unfortunately," said Lori Lubin at Caltech. The likelihood of finding two good jobs in the same area is small, but all nine of the married women I interviewed had done it anyway. They were split fairly evenly among those who followed their husbands to jobs, those whose husbands followed them, and those who did a little of both. Most had periods of living separately, usually a year or so; but Daniela Calzetti and her husband have been mar-

ried eight years and "lived together about four," she said. "Neither of us wanted to give up our careers." Rosemary Wyse at Johns Hopkins has been in a bi-coastal relationship for ten years: "It doesn't seem unstable. We'd prefer to live together, but I'd also prefer to be a multimillionaire."

Kinney is unmarried, "and it's not unrelated," she said. "It's a luxury to be in this field, and the two-body problem is one of the prices. That's just life."

Children raise the price higher. Some women — especially older ones — accepted the greater share of parental responsibility, meaning that their hours were longer and professional contacts lower: "I always got home by 5 p.m. and came back at 8 p.m. when the kids were in bed," said Sargent. "What I missed was having time to shoot the breeze." Other women are what Megan Urry at STScI calls "co-parents." "When the kids went into school," said Gillian Knapp at Princeton, "my husband and I just switched off getting home. It's like Wendy said once, we're a two-person one-parent family." "It's extraordinarily, pleasurable busy," says Wendy herself; but even so, "you have to be extremely scheduled." All these women become, as Faber says, "ruthless about minutes." "When I was younger," she explained, "I had less time than my male colleagues. I was absolutely ruthless in saying only two things I would do. If I'd picked three things, I'd have given up astronomy."

None of these women was complaining. On the contrary, they expressed deep, real gratitude toward their husbands — for taking up the slack during observations or deadlines or travel, and for general moral support. When I asked Vera Rubin at the Carnegie Institution how women managed, she said, "Number one is to have a supportive husband." Their gratitude might also come from comparing their own husbands to other men they knew, though only Knapp was explicit about it: "If your husband doesn't cooperate, you have a stark choice. The wrong man is a disaster."

They all noticed, as Lisa Storrie-Lombardi at Caltech said, "women who want to have families have a harder time than men who want to have families." One graduate advisor, she said, "would say that from now on, he'd accept only graduate students with children because they were used to staying up all night and could multi-task. Nobody could believe I catch up on sleep during observing."

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of course. I've never before had a problem with people recognizing my worth as a sharp and reliable person. But as time moves on, I'm beginning to notice something very disturbing. I am no longer taking classes, which I felt were a very objective measure of where I stand among my peers. I think the people who have known my class history have respected that, and me, I hope.

In the past couple years, I have encountered a strange perception of me and my abilities by certain people, one that clashes with what I perceive of myself. As an example, I recently finished a course with two other students, both male. We are very good friends, and have taken many classes together over the years. I have received better grades than both of them on many exams we took together, and I know that they respect my ability to "kick their butts" in some really tough physics courses. But students coming in after us usually assume that the guys did better than I did in classes, which I take to mean they think my male colleagues are more intelligent than I am. I infer that all, or most, of the younger students think this, after an illuminating conversation with one of them. He told me he had assumed that my male friends had done much better than I had, and was very surprised to learn that it was the other way around. And this was perhaps the last person I would imagine would have a gender bias! I guess it hurt me even more because I wouldn't have expected it from him; I felt he knew me well enough to have an accurate opinion of me.

There have been other similar, though less obvious, incidents in which my opinion of my intelligence and capability was higher than the one others held of me. I was not nominated for a student leader position in our department while both my male colleagues were. That irked me for a year, and this year, when I was nominated as sort of a joke, I ended up winning by one vote.

I'm coming to the conclusion that it gets tougher because the objective measures are gone. No more classes. People evaluate you on how you act, what you say, how you write, and perhaps, if you're a woman, on how you dress. I've always envied the European women, who seem to look great and sexy every day, and noticed how different women scientists dress here. I wondered if it was a selection effect. Maybe you can't make it looking like that here. But that, I hope, is a side issue. So maybe most women have a different way of going about things, one that our male colleagues don't recognize as easily? It's hard to see someone's worth if you're not on the same wavelength.

Thanks for your time, and keep up the great work! I hope to still be reading those articles in 10 years as an AAS member and assistant professor somewhere.



Women Have Inferior Ph.D.'s

I am a female student in an astronomy Ph.D. program. As a reader of STATUS, I wanted to share with you a rather unpleasant, but enlightening, conversation I recently had with a male colleague.

I was talking with a fellow Ph.D. student and somehow the conversation turned to racial and gender bias in various professions. I had just read Meg Urry's article, "The Status of Women in Astronomy" in the June 2000 issue of STATUS. I was impressed with the scientific approach taken to examine the question of how women progress in our field. So I told my friend about the article, saying that Meg had looked at statistical data and found that, in general, women astronomers do *not* do better than men when looking for post-docs and faculty positions, and also that they are underrepresented in the pool of AAS awardees. I was thinking (naively) that because those findings were based on scientific data, the scientist I was talking to would at least be open to the idea that despite anecdotal evidence to the contrary, he, as a white male, would not be cheated out of a job by his female colleagues.

Almost immediately the conversation turned to the possible reasons behind the differences between men and women's success in astronomy. This man said it was very possible that women do not do as well because they are "not as good as men" at astronomy. I pointed out that it would make sense to me that the women who are getting Ph.D.s in the same programs as men, i.e., taking the same courses (and presumably doing well enough to earn a B or better) and qualifying exams, and doing Ph.D. thesis research at the same time and in the same department as their male colleagues, are probably as good as the men with whom they graduate. He told me he didn't believe that was necessarily true.

I said that I thought it was possible that there was some sort of distribution (a Gaussian??) of male astronomers according to their skill level and talent, with most being of about average talent compared with the others, and some being very good and others not very good. I said that if that is so, it is likely that the pool of women has a similar distribution, just with smaller numbers in it.

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He responded by saying that the distribution of women may be skewed so that the overall quality of the women is inferior to that of the men; therefore, he hypothesized, women Ph.D.'s do not do as well as men in astronomy. When I asked him why this would be true, he outlined several possible reasons:

- Women graduate students are more often married and therefore spend less time at work than their male counterparts, because they want to get home to their husbands/families.
- Female graduate students are unable to develop as close a relationship with their advisors as male students, because they are not "like" them (though how this indicates inferiority is unclear).
- Women do not have as strong a background in math and science, because from the time women are in the early stages of elementary school, they are taught not to like math and science (by their female teachers), and therefore make worse astronomers later in life.
- Fewer women get into the "best" Ph.D. schools; thus more women have inferior Ph.D.s and are consequently not as successful in their subsequent careers.

He concluded that the fact that women are not doing as well as men overall is likely just a reflection of the comparatively poor quality of the pool of women available. He said that women shouldn't be given extra encouragement or special advantages just because they are women, because it's possible that they are simply not as good as the men.

I was completely surprised by this conversation. I have been replaying it in my head since it happened, trying to make sense of it and of my reaction to it.

What I find ironic and strange about this whole exchange is that I happen to *be* a woman, and I have done very well in the Ph.D. program that I, and this student, are both enrolled in. I earned the highest possible grade in every one of my graduate courses here. I was the only woman in my Stellar Physics course, and I earned the highest score on the exam in that class. I did well on my qualifying exam, and I have been awarded a full fellowship to complete my thesis work. But the point is that I am *not at all* out of the ordinary. I know of many female graduate students who are doing as well or (often) better than their male colleagues in graduate school.

But none of this seems to matter. What I learned from this recent conversation (and this is what bothers me most about it) is that no matter

how well I do in this field, and how many times I prove my ability, there will always be people who think that I am not as good as my male counterparts, and/or that I came by my successes in part because I am female. (Exactly how the fact that I am female would help me during an exam on Stellar Physics, I have no idea!) Perhaps I am naive, but I just had not thought of things in quite this way before. I thought that by working hard and writing papers and giving good talks that eventually I would be able to make my own niche in this field, and that I would succeed or fail based on my merit and ability as an astronomer, not on my gender.

Perhaps I can learn to discount the opinions of people such as the person I spoke with. Or I hope I can get to the point where I can objectively assess the particular point of view he was presenting without having such an emotional reaction to it. (I was, embarrassingly, nearly in tears by the time the conversation ended.)

I wanted you to know (and perhaps this is not news) that things down here "in the trenches" of grad school can still look pretty bleak at times. It's going to take a lot of work on all of our parts to change attitudes and remove barriers so that we can begin, as Meg Urry said in her article, "attracting and retaining and fostering success among the best minds in astronomy."



Sexual Harassment at Every Turn

My first job after receiving my degree was at an observatory. I paid little attention to the comment made by the site manager during the interview, "What's a nice girl like you doing in a field like this?" But maybe I should have. For the entire first month on the job, 90% of the men on site flirted with me. One male employee even brought a mattress in one evening, laid it on the floor next to me and beckoned me over. I thought to myself, is this place a pickup joint or an observatory? Was I hired to make it convenient for the men here to find dates? On more than one occasion, our married supervisor asked me to accompany him on "business trips." He bought me extravagant gifts whenever he traveled to foreign locales. He would call me into his office, shut the door and present the gift, and then hug me and occasionally kiss me on the cheek. Many of the other staff members would sheepishly make sexual remarks; I would always change the subject or walk away. I was young and I was afraid I would ruin my future if I reacted negatively to any of this.

Several years later at a different observatory the harassment from a male colleague began

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practically my first day on site. Every night I was in the observing room, he would enter uninvited and talk about himself for hours. The topics included his ex-wife, women he was sleeping with, women he would like to sleep with, his fiancé, specific details of his exploits with certain women, all leading to how much he 'liked' me. On one occasion he sat behind me on a couch and said, "You look like you could use a back-rub," and grabbed me from behind. I jumped up quickly and left the room, completely frazzled and scared, thinking only that no one could get to the site in less than one hour. Many times I was alone at this remote site with this man 2.5 times my size, 20 miles away from any town.

On another occasion while taking a coffee break with another co-worker, the same guy interrupted us, walking toward me and blocking my path. As I tried to walk around him, he grabbed me and pulled me towards him, and kissed me on the head, in front my coworker, no less! His total disregard clearly demonstrated his lack of respect for policy and for me. He continued to harass me all evening until I slammed the door to the observing room. Sitting in the closed office, I was overcome by tears, wondering if I would be blamed for his actions.

Later that day I related this story to a female colleague who was also a close friend. This guy had done the same thing to her and to another woman at another institution, and was never reprimanded. He was leaving a trail of harassment at every site and the worst part was, he was getting away with it! I took this information directly to our site manager, thereby becoming the nail in the coffin. The university that runs the facility has a very strict harassment policy. The outcome: he was not allowed to return to the site for any reason. Also, a warning was given, or, as I like to say, "a slap on the hand and run along." As an aside, he denied everything and insisted I provoked it.

Only a few months later, a research group was visiting our facility for a few days. The first day this group was on site, one of the young male members inquired if he could tour the grounds with me. As we walked, we discussed various research topics, our educational background and such. Our conversation was polite and casual, not at all inappropriate. The next day, as I was about to begin walking, he asked to accompany me again. A mile away from the site, his dialogue turned to courtship, dating, and romance. I became flushed as his discussion continued with comments like, "I thought I was going to be stuck here with a bunch of bearded, out-of-shape, men; instead, I find a beautiful girl." Nauseated from stress, I made every effort

to get us back before he could try anything. Just before the observatory came into view, he stepped in front of me, put both hands on my shoulders to prevent any movement, and said, "We have a lot in common and I really like you and I think we should keep in touch after I leave." I tried to back away, and made it clear to him I was otherwise involved. I said his actions were inappropriate, and announced I had just recently dealt with a situation similar to this, hoping this would make him rethink his actions. Instead, ignoring my negative response, he cited his ability to fly across the country to visit me. Panicking, I made a comment about the setting sun, provoking our hurried return. The same improper questioning occurred every time we were alone that evening. I reported this incident to my superior, who in turn, relayed the events to the lead researcher of the visiting group shortly after their departure. The male visitor was reprimanded by his research team lead, which prompted him to attempt to contact me via e-mail, although I would not respond to his mail. I feel that the controversy was not dealt with properly.

I have since left that observatory to take up another position. I have been asked to speak at Elderhostels, College for Kids, Women's History Month festivals, and Conferences for Women in Higher Education, never once missing the chance to describe and discuss the awe-inspiring fascination astronomy kindles in most people. When asked why I left "such cool jobs", I reply truthfully. My conscience will not allow me to promote the field without imparting all the facts. Encourage possible students to toss reservations to the wind, and scurry off to follow their dreams? It proved impossible for me. Astronomy has not made me bitter; at times, it has made me wish I was a different gender, but quite literally, it has allowed me to see more deeply and clearly. Male or female, isn't that what all astronomers desire?



Leaving Astronomy

I'm writing to let you know of my recent decision to leave astronomy. I had been thinking about this possibility for some time, since I had always wanted to be prepared in case I *had* to leave astronomy. Just prior to my most recent postdoc ending I had gone through the usual process of applying for another position elsewhere. I was offered a very nice postdoc position as a spacecraft scientist, with a team leader who has a reputation of being an excellent person to work for. The position was extendable up to four years

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with the ability to move up in rank throughout that time.

Shortly after accepting this offer, I began sending out my resume to businesses and posting it on "techie" web pages, just to see what kinds of bites, if any, I would get. I ended up getting a very nice offer from a local company for approximately double what the postdoc position was offering me. Soon after, I was called by a recruiter who saw my resume on the web to interview with another company. They were forming a high-tech research group in a large metropolitan city to study new and emerging technologies that could be utilized by their firm. I was made an even better offer there (about 3x the postdoc offer). Seeing that an astronomer could get such nice jobs in industry made me rethink the whole astronomy thing. I have a little girl, almost two years old. Taking into consideration my age and that I *might* be able to be considered for a *possible* faculty or other permanent position once my postdoc ended, along with the huge debt my wife and I have accumulated over the years, made me lean towards leaving astronomy. The salary these jobs were offering I couldn't possibly expect for another 10 years or so in astronomy. Sadly, I called to reject the postdoc offer. I believe I made the right decision for my family, despite all the years I spent preparing for a career in astronomy, because my family, after all, is the *most* important thing to me.

In the end, I also rejected the offer for the higher-paying job mostly due to considerations of living convenience and my wife's overall happiness. Living in the outskirts of a large metropolitan city is much less convenient than living in the suburbs near my wife's extended family, who have kids the same age. So, we have moved and I am now working for the small contracting company. This stuff is nowhere near as exciting as astronomy, but it is interesting and utilizes my physics background extensively. I am still thinking of transitioning over to software development at some point, which is easier in some respects than my current work and pays a lot more money, but I'll stick with this job for a while. We are very close to my wife's family here, which will make her life much easier with the baby (and any other babies we may have in the near future). And of course, a happy wife is the key to a husband's happiness!

I want to emphasize that unlike many other sad cases I've heard in recent years, I *chose* to leave the field of astronomy rather than being forced out. I had a goal a long time ago to become an astronomer, and despite the resistance I encountered along the way, I needed to reach that goal, regardless of what came next. In the end it came down to family or career, and I chose family. I GREATLY appreciate all the help and support I have received from colleagues over the years. I don't think that it was all wasted, since I will always value my time as an astronomer and the friendships that I have made along the way. ♦

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Since the job market is so tight, it may very well be that the spouse who gets the offer has no real choice but to accept it, and that the prospects for a tenure-track position for his/her partner are very dim. In that case, one can still consider long-term soft money positions. Many research groups do have very long-term positions, which can last for decades (this is especially true of high energy physics groups, where experiments can last for half a career). There are also positions involving systems management — one respondent got a "permanent" position which was half-time research and half-time managing the departmental server.

Although a soft-money researcher (SMR) does have access to research facilities (although to a somewhat lesser extent than tenure line faculty), the above study cautions about the psychological stresses of these positions. "The stress of the difference in status between their positions

and those of regular tenure-track faculty, can further reduce research capabilities. SMR's can be especially stressful if there is a sense of entitlement or expectation that is not matched by institutional actions. As one respondent noted verbally, it is very hard not to take personally the lack of institutional recognition. These stresses can become exacerbated for many academic couples because differences in access to resources are combined with the perception that the spouse with an SMR is somehow not as good as the spouse with the tenure-track position. It is still further exacerbated for women, because they are more commonly the "trailing spouse" and still subject to the many micro-inequities of gender discrimination. As one respondent put it, "It is very frustrating for female Ph.D. spouses to be second class citizens at home campuses and yet enjoy national/international recognition by peers globally. The stress of such

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a position is serious and ignored!" Nonetheless, an SMR position may very well be the only way for the "trailing spouse" to continue in his/her scientific career.

The ultimate "soft money position" has nothing to do with research. It is adjunct or part-time teaching. Adjunct teachers are typically paid between \$500 and \$1000 per credit hour, and it is usually possible for a faculty spouse to obtain such a position. The pay is absurdly low (a full-time three course per semester load would typically pay at most \$24,000 per year for a Ph.D. scientist!), and the positions are extremely unstable, requiring the spouse to "beg" for courses semester by semester. The stresses discussed in the above paragraph are significantly worse for adjuncts; they aren't even considered second-class citizens by other faculty, but often non-citizens. Institutions typically offer little or no support for adjuncts to do research.

Anecdotal evidence indicates that adjunct/part-time teaching is the first step on the road out of science for many women scientists. The inability to do research causes them to lose touch with their field; the low status within departments causes them to not be seriously considered when faculty positions do materialize. Nevertheless, they do offer one of the few ways in which a faculty spouse who wants to only work part-time for a few years (say, due to very young children) can keep his/her brain cells active. The challenge is to keep the spouse from the depression that their low status in the department tends to induce, keep them actively involved with the field and to provide some method of re-entry.

There are several possible ways to improve the status of such positions. Having longer-term contracts (even just a couple of years at a time) would help the morale of adjuncts, by giving them some sense of stability; most institutions can make such a commitment, even if it might mean occasionally creating a new course or two. Institutional recognition (say, through opening up teaching awards to non-tenure-track instructors) would also be a low-cost way to boost adjunct morale, as would giving adjunct faculty access to institutional resources, such as career counseling. Even if formal research funding is not available, some departmental funding for travel to conferences would help keep the adjunct involved in their field. Finally, re-entry funding, which exists on a small scale through federal funding agencies, can facilitate entry back into the post-doc market.

Alternative Positions (Non-academic)

In the above discussion, we have focused on dual-career couples in academia. This is understandable, given the relative paucity of positions in academia compared with industry. One should note, however, that most of the members of the American Physical Society are not in academia, and a "one-academic, one-industrial" situation (or even a "two-industrial" situation) provides a common solution to the dual-career couple problem.

One problem that many of our survey respondents noted was that many colleges and universities provide virtually no assistance at all in helping spouses of newly-hired or soon-to-be-hired faculty obtain positions outside of the institution. Fortunately, a growing number of institutions are doing what these respondents suggested. The spousal hiring programs mentioned previously (at Wisconsin, Illinois, UC Davis and Purdue) all actively help spouses obtain positions in industry. As an illustration, we will discuss the program at Purdue, but one should keep in mind that the other programs are very similar.

The Spousal Relocation Assistance Program at Purdue has a half-time relocation specialist. The specialist, Tari Alper, has a comprehensive knowledge of local companies, industries and organization, and will identify resources in the Greater Lafayette area, suggest networking possibilities, and alert appropriate companies and organizations of the availability of the talents of the accompanying spouse. She will assist spouses in finding employment by generating network leads, making referrals, facilitating and coordinating contacts, and developing job search strategies.

The relocation specialist serves as a resource to deans, VP's, directors and chairs in their recruitment efforts, works with Personnel Services and other University offices, and periodically updates information on employment opportunities in the community. In short, the Program does everything suggested in the above comments (and the relocation specialist is the "headhunter"). During a job search, when finalists are selected for on-campus interviews, the administrator will send them the Program brochure. No specific questions about spouses are asked during the actual interview process. Should the candidate be interested in getting assistance from the Program, they ask the hiring administrator. The hiring administrator then contacts the relocation specialist, who can then begin to work with the spouse. Formally, the spouse becomes part of the Program once an offer to hire is made in writing and the hir-

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ing administrator has requested spousal assistance. At that point, the specialist will meet with the candidate, and will assist the accompanying spouse by generating network leads, facilitating and coordinating contacts and circulating the resume.

The Program has been very successful. Last year, over 60 spouses of newly-hired faculty used the Program. Most obtained employment, some at Purdue, and some in nearby industries. The total cost of the program is relatively small (requiring only a half-time hire plus some office equipment) and comes out to be much less than the cost of an extra recruiting visit for each new faculty hire. This extremely productive, and "family-friendly" Program can greatly facilitate solutions to the dual-career couple problem. Of course, many of the functions of these programs can be performed by concerned department chairs and faculty members. Physicists should be much more aware of the possible industrial contacts in the area. It is important for department chairs to make contacts with companies before job searches even begin. Companies that hire scientists welcome close ties with Physics departments, since these departments can be sources of highly-trained future employees, and such contacts can lead to co-operative internship opportunities and funding. Establishing close contacts between industries and college and universities can be very beneficial independent of any dual-career issues. Then, when a dual-career issue arises, the contacts will already be there. Departments can also work closely with programs like the above Relocation Program or Career Counseling offices to develop expertise in scientific/technical job searching. Thus, it is crucial for departments to take a proactive role in establishing close ties with companies in the area, for the sake of undergraduates (through internships) and graduates (through possible positions) as well as dual-career couples.

Commuting

One of the most difficult aspects of the dual career couple problem occurs when the only way the couple can both continue their careers is to live apart from one another. We did not specifically ask survey respondents whether or not they had been lived apart. However, the large number of respondents who mentioned that they had done so, as well as overwhelming anecdotal evidence, indicates that a sizable percentage of dual-career couples have spent at least some time living separately. Commuting becomes a major factor in the lives of many dual-career couples. (By "commuting", we refer to relatively long-dis-

tance commuting which requires maintaining two residences, not day-to-day commuting.)

For couples without children, commuting for a limited period of time, while unpleasant, can be tolerated, although it certainly can put a severe strain on the relationship. When the positions are permanent, some couples simply accept commuting as a long-term aspect of the relationship. With children, however, the situation is much more difficult. Many couples are forced to either give up the idea of children, or drastically scale back a career, rather than live apart.

Alas, there do not appear to be any simple solutions to this problem. There have been some fairly creative approaches, however. A well-known couple, Joseph Weber and Virginia Trimble, have faculty positions at Maryland and Irvine, respectively. Every fall quarter, she is on leave from UCI and visits Maryland; every spring semester he is on leave from Maryland and visits UCI.* Both institutions basically pay each a half-salary (this varies slightly over the years). The arrangement has been informal, but has continued for a quarter of a century. They do sacrifice some benefits (retirement and sabbaticals), and lose a month of summer (UCI is on a quarter system while Maryland is on a semester system), but have successfully managed to deal with the commuting problem. In a sense, this arrangement is similar to two shared/split positions, discussed earlier. If a couple has two permanent positions separated by some distance, they could suggest a similar arrangement, alternating semesters. For a large department (which can adjust to having two faculty members during one semester, and none for the other semester), such an arrangement can have many of the positive aspects of shared/split positions. It certainly can't hurt to suggest the possibility.

Conclusions

We have summarized the responses to a survey of the experiences of dual-science-career couples, and many of the institutional responses that they have received. Many of these responses either made the situation worse or did nothing to improve it. We have argued that it is in the interests of institutions to instead take an active, positive role when faced with potential hires who seek employment for their spouses. Such actions will benefit not only the job candidate and the institution, but also the physics profession as a whole. For institutions that choose to aid themselves and the physics community in this way, we have offered recommendations for

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*Professor Weber passed away in October 2000, after the original publication of this article.

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action and sources of information, as well as examples of successful programs and policies. We hope that institutions will decide to meet this challenge, and thereby achieve their hiring goals and also enhance the representation of qualified women in physics. The "two-body problem" will inevitably worsen in the future, and forward-looking institutions will choose to take appropriate action. As physicists who have experienced the dual-career situation ourselves, we hope that an increasing number of institutions will choose this path.

Recommendations

We have argued that it is in the interests of both the hiring institution and the physics profession as a whole that institutions take an active role in addressing the dual-career situation of the physicists whom they wish to hire. Such efforts can help an institution to hire and retain the candidates they choose, and will also help to ameliorate the significant barriers experienced by talented women entering the profession. Since women represent a much larger fraction of younger physicists than of the more senior population (14% of physicists 31 and under vs. 3% of those over 40), the number of new hires who will face such a difficulty can be expected to increase dramatically in coming years. It therefore behooves all institutions to take appropriate measures to address the situation. Below we recommend various of actions which institutions and individuals should consider.

(a) Recognize the existence of the dual-career situation and choose to deal with it

This is the obvious first step, but as responses to our survey reveal, many institutions have yet to take it. As the statistics cited above indicate, institutions of all types at all levels will be increasingly faced with potential hires whose partners are in need of help in finding suitable employment in the area. It is crucial that institutions choose to make an appropriate response. That response may involve anything from establishing a formal, institution-wide office with specific responsibility for such assistance (as in the Spousal Hiring Programs described above), to informal efforts on the part of faculty members to learn of potential physics positions in local industry. But the problem will not go away if institutions ignore it.

(b) Take action before beginning a search

Institutions need to take action in a timely fashion. Once an offer has been made to a candidate, there is generally too little time left to

begin an investigation of local employment opportunities or possible model policies for split/shared positions. Institutions, upon recognizing that the problem is likely to affect their next hire (not to mention subsequent ones), need to determine what kind of assistance they will be willing to provide, and obtain the necessary information. Responsibility for this effort should be specifically assigned, whether to an institution-wide office or a faculty member. If assistance with dual-career problems is everybody's responsibility, it tends to be nobody's.

(c) Establish policies regarding split/shared positions, nepotism, etc.

As our survey responses have shown, many institutions have been asked by a candidate to consider a split/shared position but were unable to do so in the time frame of a specific hire. Therefore it is important that institutions explore the various models for such positions beforehand and discuss them in the context of their own needs, present and future. By working out some of the details of such policies in advance, an institution can be prepared to act quickly when such an arrangement becomes desirable in a particular hiring situation. The same is true of nepotism policies; department chairs and other responsible parties have a duty to investigate the actual policies in force in their institutions (not just what they believe them to be), and to discuss the status of these policies with the institution's legal counsel. Given that these policies appear to have a negative impact on the recruitment and retention of women in physics, physics departments should consider measures to remove or modify such policies. But such actions must be taken in advance of a specific hiring situation.

(d) Seek information

In conjunction with this report, we are establishing an internet site (<http://www.physics.wm.edu/dualcareer.html>) to provide institutions with access to information about actions they can take in response to the dual-career situation. On this site we have posted specific policies for split/shared positions, spousal hiring, and the like which have been adopted by various institutions. The site also contains the names of contact points at these institutions for those wishing to learn more about the implementation of specific policies and the effects they have had. We invite individuals and institutions that have found creative approaches to the dual-career situation to contact us with information they are willing to share, which we will then post on the site. Links to and from other relevant sites (such as the

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Notes From a Life

Contributions from our readers

NOTES FROM A LIFE, first printed in the June 1999 issue of STATUS, are anonymous vignettes describing the quotidian life of a woman in science. Here are more "Notes" sent to us by our readers. We continue to welcome submissions of "Notes" for publication in future issues of STATUS.

♀ While working at an observatory I advertised for a temporary summer staff position to fill a vacant position. I helped hire and train a competent young man who had recently graduated. We became good friends and we worked well together. At the end of the summer I learned he was to be hired as a full-time, permanent employee. I discussed the details with him and was overwhelmed to hear he was hired at a substantially larger amount of pay. He was also reimbursed twice as much for relocation expenses. He moved only his vehicle 1000 miles while I moved my vehicle and all home furnishings 3000 miles. Site policies only offered the amount I was given, but mysterious funds emerged to double his compensation. He was given a place to live at no charge, while I was traveling extended distances with no reimbursement, and had a mortgage payment to contend with. I had previously asked for financial assistance for my travel, only to be refused. He had just completed his Bachelor's degree, and this was his first observatory job, compared with my ten years prior experience, additional education, AND I trained him! Never had I felt so betrayed. I spoke with two different discrimination attorneys who both believed this to be a clear-cut case of discrimination, however, both advised dropping the case and moving on, stating: "The field you are in is small; if you proceed, you will definitely blackball any chances you may ever have of working in the field again." Within a week, I made the decision to resign and obtain a position elsewhere. It was one of the hardest, most unsettling decisions I had ever made.

♀ I am a female Ph.D. astronomer involved with sending e-mail letters inviting national and international astronomers to participate in an astronomy conference. The letter addresses each astronomer as 'Dear Colleague' and is signed by myself, then I also add the composition of our entire department, specifying who is who. About 30 percent of people reply with: 'Dear Ms. Smith...!' Of course this does not include astronomers who know me personally, but almost all astronomers outside my specific

field of study address me in this way. I note that men and women alike made the supposition that I am a secretary. This is surprising, as the invitees have all the information about my status right in front of them: they know that I am a colleague and they know I am an astronomer at my home institution. But the fact that I am a female goes way above the rest, and I cannot be anything but a secretary. One person over the phone even asked me if I was in a staff position or just a postdoc, or if I was a secretary.

♀ From time to time I post on my bulletin board interesting articles about women in science or related topics. The most recent was a newspaper piece by a young man describing the benefits of having grown up with a working mom. Since the usual fare is the opposite, emphasizing the many problems for children of working parents, and since I am a mother of two young kids, I found this article very encouraging and so I pinned it up on the bulletin board outside my office. Later I noticed several people reading it closely, with puzzled expressions. No wonder! Someone had turned the article around, leaving visible part of some real estate story. How should I interpret this? Was it a gentle joke or a more hostile response?

♀ During graduate school I took an astrophysics course from an exuberant young instructor who projected great enthusiasm for the subject matter. I was the only female enrolled in the course (as was the case for many of my physics and astronomy courses). After two weeks of class, I approached the professor to let him know how interesting his lectures were. He reacted so strangely, backing himself against the wall as I stood ten feet away from him. His answers were curt, and I felt very uncomfortable. One of the other students in the class, my study partner, discussed these strange actions with me. He chuckled because he had noticed them prior to my mentioning it. He explained that the professor was a newlywed, and his wife was possessive, but I wondered what his marital status had to do with me. After all, I only wanted to discuss the class. The rest of the semester, I refrained from approaching him to avoid creating feelings of tension. ❖

Send your
"Notes" to
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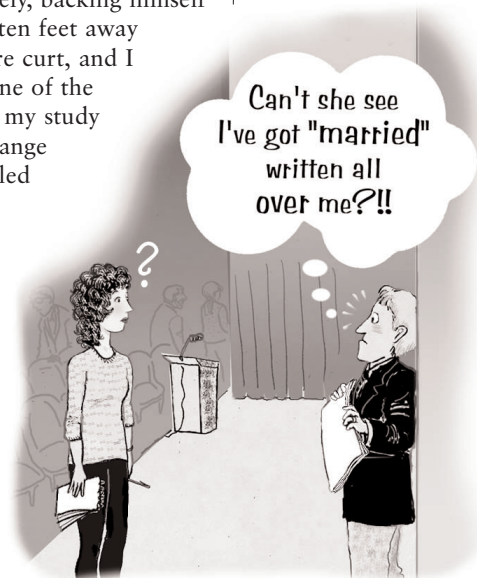


Illustration by Ann Feild

home page of the APS Committee on the Status of Women in Physics) will be provided.

(e) Federal policies

It is clear that the dual-career-couple problem is one of the major factors in slowing the growth of the percentage of women in physics. Yet, to our knowledge, there are no federal policies or programs aimed at helping dual-career-couples. Some programs, such as the Professional Opportunities for Women in Research and Education (POWRE) program, can give valuable short-term help, but such programs are woefully underfunded. One can imagine programs similar to this program specifically aimed at dual-career-couples (yes, such programs discriminate against single scientists, but we have seen that the entire system discriminates against married scientists). In any event, programs that offer flexibility in location (such as the POWRE program) or that can supplement a partial college/university salary could certainly alleviate some of the difficulties faced by dual-career-couples.

In addition, funding agencies can be more sensitive to the needs of dual-career-couples. For example, the agencies are reluctant to provide support for an individual who has a particular soft-money-research position for the long term (more than five years). The reasons are that the salary eventually becomes too high, and that the individual gets trapped into the position and has difficulty finding employment elsewhere. However, in a dual-career-couple situation, such

a position might be the only way a spouse can stay in science, and thus a more proactive response of the funding agencies in such cases (perhaps, for example, with gradually increasing institutional support) would be helpful. In general, it would help if funding agencies would be as flexible as possible in dealing with dual-career-couples. Finally, the ruling that anti-nepotism laws in male-dominated professions are illegal was a ruling of only the 8th circuit and thus only applies in that circuit. A more widely-applied ruling would be welcome.

(f) Develop contact networks for hiring

Because the number of physics-related positions in a given area is usually low, it is important for institutions to be able to provide contacts for job-seekers in their area. As discussed above, such contacts may benefit a department in other ways (such as job opportunities for their graduates). Simply being aware that "Company A might be willing to hire a physicist" or "Department B might need a part-time instructor" is not enough. Job-seekers need to be provided with names and phone numbers of specific individuals with whom they can explore what opportunities might actually be available. Although that individual may not be aware of a position that suits the job-seeker's qualifications, s/he should be able to direct the job-seeker to other points of contact. While it is the individual's responsibility to "land the job," the institution can at least tell her or him where to place the hook. ❖

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