

STATUS

A REPORT ON WOMEN IN ASTRONOMY

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A Publication of the American Astronomical Society Committee on the Status of Women in Astronomy

Gender Inequality and Cultural Change

By Catherine Pilachowski and Anneila Sargent

A Preface to the accompanying article by Alice Huang

CULTURAL change happens slowly. The Committee on the Status of Women in Astronomy was formed more than 20 years ago, following two "decadal" studies that summarized the status of women in our profession. Looking back at the statistics from these studies, and those from the proceedings of the 1992 Women in Astronomy conference at Space Telescope Science Institute, it is hard to avoid the conclusion that progress is not just slow, but downright glacial. Add to the statistics all the anecdotal reports of biased or discriminatory behavior that we still hear today and conditions today don't seem very different from those that prevailed in the '60's and '70's.

Nevertheless, change has occurred. Gender inequity may still exist, but today most people recognize it for what it is. Professionally, it is now unacceptable, and the problems of an inhospitable workplace are being addressed at all levels. At the more personal level, support networks have grown out of our recognition of the importance of working together and thanks to technology of the internet. No woman need be isolated in her own institution. We are learning to empower ourselves.

In the accompanying article, Alice Huang, former Dean of Science and Professor of Biology at New York



Catherine Pilachowski



Anneila Sargent

Continued on page 2

Valerie Kuck is a chemist who recently retired after a 34-year career at Bell Laboratories, Lucent Technologies. She has been active in the American Chemical Society holding leadership positions at both the national and local level and has received several awards for her activities.

This article was given as a talk at the Committee on the Status of Women in Physics meeting in Washington D.C. on May 1, 2001.

Women Physicists and Chemists are Making Slow Progress in Academe

By Valerie J. Kuck



Valerie J. Kuck

SINCE THE MID 1960s, there has been a steady rise in the number of women seeking and achieving doctorates in the physical sciences. In spite of their success in reaching this level of accomplishment, women are still very under-represented in the ranks of faculty members in the physical sciences at leading institutions. Even in the 1990s, a decade when many people have argued that gender discrimination has been

successfully attacked, this situation continued. Today the representation of tenured or tenure-track women faculty at Ph.D. granting institutions in the physical sciences remains woefully below the doctorates awarded to women.

The progress that women physicists have made in attaining tenured positions has been well documented by Ivie, Stowe and Czujko of the American Institute of Physics (<http://www.aip.org/statistics/trends/highlite/women/women.htm>). Similar studies on chemists have been conducted through the years by the staff of the American Chemical Society (ACS), with Jordan (Women Chemists 2000 published by the ACS) and Long (Chemical and Engineering News, Sept. 25, 2000) addressing this matter recently.

Since comparisons of hiring practices in physics and chemistry based on the composition

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University, and now Faculty Associate in Biology at Caltech, discusses strategies that can be effective in the professional arena. Most importantly, these are not confined to advice on coping with the workplace but describe how women who have achieved a degree of success in their careers can make enormous contributions to improving conditions for those who follow. Among the physical sciences, astronomy stands out as having a high percentage of women in senior or high profile positions. There is an unusual opportunity here!

**Gender inequity may still exist,
but today most people recognize it for what it is.
Professionally, it is now unacceptable,
and the problems of an inhospitable workplace
are being addressed at all levels.**

Senior women in particular have already been helped by other women, as mentors, as role models, or as colleagues. We all share a responsibility to help those who come after us. Make every effort to be a good mentor yourself. Take advantage of your own success to help bring more women into positions of visibility in your own institutions and in the broader community, as invited speakers, as prize winners, as members of important committees. Huang's advice is sound and wide-ranging. We encourage all of you to read what she has to say and to think hard about how to incorporate her ideas into your lives and into your careers.

Yes, change occurs slowly. But each one of us, by taking on the responsibility for making changes happen, can also make a difference. ❖



Catherine A. Pilachowski studies the chemical composition of stars and star clusters in the Milky Way. She served for more than 20 years on the staff of the National Optical Astronomy Observatory in Tucson, and now holds the Daniel Kirkwood Chair in Astronomy at Indiana University in Bloomington. Dr. Pilachowski is President-elect of the American Astronomical Society.



Anneila I. Sargent is Professor of Astronomy at the California Institute of Technology, and Director of Caltech's Owens Valley Radio Observatory and the Caltech/JPL Interferometry Science Center. Dr. Sargent's research has concentrated largely on understanding how stars form in our own and other galaxies, and how extra-solar planetary systems are created and evolve. Dr. Sargent is the current President of the American Astronomical Society.

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Things Your Professor Should Have Told You

By Alice S. Huang

Learning from 30 years of experiences about gaining more power for women scientists

AS RECENTLY as thirty years ago, when the Association for Women in Science (AWIS) was founded, it was not uncommon for male professors to ask female graduate students "Why do you want to go into science when you can be at home raising beautiful babies?" A lot has changed since then. Over 60% of married women and 78% of women with children now work outside the home. Many jobs previously thought to be unsuitable for women are now available to them. Women visibly participate in every part of society. Yet recent surveys show some disturbing trends. A larger percentage of women entered the science professions in the 1970s than in the 1990s. Barriers to women's career advancement, although they are more subtle, still exist. How can we remove those barriers? How can we encourage young women to enter the sciences and become successful science professionals?

Gaining Opportunity, Equality, and Power

In 1995, then Secretary of State Madeleine Albright said in Beijing that women will contribute fully when they have opportunity, equality, and power. In reviewing changes over the past thirty years, we can say that women have largely gained equal access to opportunity. But equality and power still elude many. Without full equality and effective power, we cannot contribute fully to society. More importantly, we cannot better our own lives or those of our daughters. To gain full equality, we must gain power. Therefore, power should become our next focus.

How do we gain power? It is not a disgrace to want power and to wield power, especially when it is for a common good. We tend to forget that having power, being in control, can be exhilarating. To gain it, we can try to shame others into giving up power, but those men who have it are not likely to give it up voluntarily. We can lobby government agencies to pass laws that will protect and help women, as we have done effectively in the past. However, such laws cannot effect a transfer of power. We can ask both public and private funding agencies to provide grants as incentives or rewards for hiring and promoting women into positions of power, as has been done with limited success. We can provide a list of "best practices" to help institutions attract, retain, and promote more women. But all these efforts depend on persuasion, and effecting real change is likely to take decades.

Because external power is not readily within the reach of many women, we need to focus on self-empowerment. This is within our control but, unfortunately, it is not often done. Much can be gained if we practice self-empowerment as well as empowerment of one another. Self-empowerment means celebrating and supporting women as well as sharing our experiences and educating each other about what leads to success. This empowers each other and ourselves.

Let me share with you what I have learned in my career as an academic scientist and university administrator about power and empowerment. It is important to understand power and how to gain power in our own right. My examples are from the biomedical sciences because that is what I know best. Nevertheless, the ideas are applicable to women-and some men-in other areas of science and beyond academia.

Learning the Academic Structure

My advice begins with understanding the structure and culture of the working environment. In higher education, as in many professions, individuals pass through specific gates in the natural progression of careers. Each

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of these gates is marked by a title change and an increase in salary corresponding to years of experience. We are familiar with the academic ladder beginning with postdoctoral fellow, promotion to assistant professor, to associate professor, and so on. If one chooses not to follow this well-defined path, there are other routes to take, but it means getting off the academic ladder. Defining a new career structure can be rewarding, but often getting off the ladder results in difficulties and disillusionment. For example, a research associate position is commonly sold as a job with less stress and more freedom to pursue research. In truth, there may be less stress, but freedom is illusory. Proceeding along this path provides a chance to gain research experience but not commensurate increases in salary or public recognition. As the years go by, increased professional isolation takes its toll; despite maturity and experience, reversing this projection and getting back on the academic ladder is extremely difficult.

Self-empowerment means celebrating and supporting women as well as sharing our experiences and educating each other about what leads to success. This empowers each other and ourselves.

Another reason to leave the usual career path is financial. Sometimes, there may be an offer to be a research associate or a laboratory director. Taking a lucrative but subordinate position with a faculty member at the university can be a compelling incentive to jump off the academic ladder. Often this move is based on promises of increased responsibility. However, the once lucrative salary quickly reaches a ceiling. Further advancement is limited and job stability depends on the tenure of the faculty boss at the institution. Should the faculty member not gain tenure or decide to move to another institution, it may be difficult to gain an equivalent well-paid position with another faculty member.

Leaving academia and joining another structured environment, such as the biotechnology industry, offers financial rewards and unusual challenges. However, once this route is taken, proprietary information may limit publication and getting back on the academic ladder becomes more difficult if not impossible. If one succeeds in returning to the university, however, there is a substantial reduction in income.

Although there may be good reasons for taking these different paths, it is important to be fully aware of the consequences of such choices, especially when they are made early in one's career. In the academic culture, falling off the academic ladder means leaving the usual path to

advancement, security, and recognition. More importantly, these other routes do not lead to power within the academic structure.

Starting Off Right

Once the structure of the organization is understood, it is necessary to be successful within that organization. To do so means fulfilling the expectations of the organization. The first independent position, usually as an assistant professor, is very demanding. It becomes necessary to teach, attract, and mentor trainees, to set up a laboratory, and to organize independent research. This is a crucial time for concentrating on one's career. Personal issues that intrude at this time may be detrimental.

Unlike students and postdoctorates, an assistant professor cannot accomplish her responsibilities alone. No individual, no matter how capable, can do all that is needed at this stage as a loner. Team sports teach about cooperation and interdependence- use that knowledge. Building support, seeking out advisors, and forming meaningful relationships with colleagues are essential at this time in your career. There are many ways to accomplish this.

First, other women, especially secretaries and technicians, are there to offer support, and they can be tremendously helpful, especially if they think they are respected in return and are appreciated for their contributions. Delegate, delegate, delegate! Delegating routine, time-consuming tasks is necessary, no matter how well or easily you can do them yourself. When I was an assistant professor the all-female typing pool supported me and worked on my grants and manuscripts first. Through them, I learned about the subtle, nontransparent value system at Harvard Medical School. When I discovered that my starting salary was lower than that of men hired at about the same time, these long time staffers helped me to negotiate a salary adjustment quietly and behind the scenes, so that I did not embarrass my supervisor. They saved me from appearing to be strident and demanding.

Support can come from peers as well. All too often, we compete against other assistant professors, because in some institutions only a few survive the promotion process. A way around this competition is to seek out those at the same stage in other departments or institutions, particularly women or individuals who share similar scientific interests. We all need reality checks with peers so that we can judge whether a situation that is new to us is unusual or expected. Peer support can also provide relief in fulfilling obligations during emergencies: when I could not give a lecture, a

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fellow faculty member from another institution filled in for me. The students welcomed this change and my supervisors were none the wiser about my dereliction.

Support from mentors and senior professors must be cultivated, especially support of thesis and postdoctoral advisors. I am surprised at how many trainees burn those bridges unaware that future employers and promotion committees will return to old advisors and department chairs for recommendations. It is not enough, however, to maintain cordial contact with these mentors. Seek out scientific leaders and those whom you respect in your chosen field. Make sure your department chair and your dean know something about your work. It never hurts to send a packet of your reprints to all these individuals. Even better, send them preprints because those are more likely to be read. Ask them for advice and help when you need them. Most senior faculty are flattered when asked and are more than willing to help.

Avoid a Common Pitfall

It is likely that male professors will become your mentors, so it is important to be aware that the ugly head of sexual tensions may turn up when you least expect it. Such topics are usually not discussed because they are difficult. A good mentor is likely to become a friend. Be business-like and professional at all times. Sometimes it will be up to you to defuse tensions and make the men around you feel comfortable. Remember that you can be friends with your mentor's wife and show that you are not a threat. Jealousy on her part will inhibit mentoring by her husband. Any sexual innuendo can diminish your credibility and ruin your career. Be very careful! These are sensitive issues and it is better to be aware of them than to turn a blind eye.

A Word About Extracurricular Activities

Assistant professors before tenure need to use extracurricular time judiciously. Do not volunteer to be on any more committees than you have to. Gauge the value of the committee in terms of career networking and advancement. Committees to gather data on other women, to help run joint service centers like animal facilities, or to advise graduate students are often offered to women faculty. These are time-consuming and should be avoided if possible. It may be difficult to say no to some of these committees, but at this point in your

career it is necessary to stay focused on the academic ladder. Pick visible, leadership roles within the institution as well as those that will enhance your national scientific reputation.

Join professional organizations and volunteer for leadership positions in those organizations. Professional gatherings provide a wealth of informal information beyond the scientific exchanges and permit you to compare your situation with many others. Information gleaned at such meetings will make you more effective on the job and the colleagues you meet may become part of your national support team.

Be a Good Mentor

Learn how to be an effective mentor yourself. Do not be more critical of female students than of male students. Do not be a perfectionist; many women scientists set extraordinarily high standards for themselves and for others. Promoting the best in your students will ensure a stream of trainees. However, being critical of their every effort will frustrate and turn off students. At a time when students are still unsure of their own capabilities and prioritizing their own commitments, particularly young women, they need all the encouragement they can get in order to stay in the race. They do not need what is called "tough love". Learn to compliment your trainees and junior women faculty. Compliment them not only in their presence but also in their absence. You will empower them by these actions. All too often, women faculty and students do not receive the positive feedback and recognition they deserve.

Make Your Work Visible, Known, and Valuable

Do not imagine that by simply working hard and being an excellent scientist you will be recognized and promoted automatically. Publishing is essential. Do not delay publication waiting for that piece of data that will make it more perfect or that will make a more complete story. Your work is your life's blood and communicating it whenever and wherever you have the chance will advance your career.

Even that is usually not enough. Helping someone else get a job done may be gratifying, but unless you lay some claim for what you have done, the credit will go to others. Some self-promotion is necessary. Seek credit. Make oral or written annual reports letting department chairs or deans know about your accomplishments and awards. Ask for promotions and salary increases. Do not expect them to come your way unless your organization has a transparent policy applied evenly to everyone. Notify the

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school paper or magazine when an award comes your way so that it will be properly publicized. Ask supportive colleagues to make award nominations or to suggest you for better positions.

Finally, do not ignore the finances of everything you do. Money talks. Bringing in an extra grant or an umbrella grant will empower you. Obtain a fair salary that reflects your importance in the organization. If your salary provides extra income, try contributing to your own institution or to philanthropy and see the added benefits such actions will bring. In fact, understanding and using the power of money is one of the first steps to rising into powerful management positions.

Once in Power . . .

Although some power will accrue at every level in academia, the power to change institutions really exists at the full professorial or administrative positions. There is a caveat. Polly Bunting, a past president of Radcliffe, said, "Once you are in a position of power do not forget that you are still a woman." She was afraid that in climbing the academic ladder women would adopt the masculine culture and identify only with the male power structure. I advised that early in your career you need to focus primarily on the imperatives of the academic ladder, but once in power there are many things a woman can do to help other women. Besides hiring and promoting more women, the lives of women faculty can be empowered by powerful individuals acting in ways noted in the following list:

- Review compensations, start-up packages, office and laboratory spaces, and access to institutional resources every now and then to ensure equity between male and female faculty.
- Provide discretionary dollars to faculty from an institutional source when special circumstances dictate the need.
- Introduce faculty to lucrative consulting activities or other extramural opportunities as appropriate.
- Make women faculty aware of such opportunities and how to qualify for them.

- Avoid overloading women faculty with teaching and committee responsibilities.
- Provide effective mentoring and timely reviews.
- Nominate women for awards and other kinds of recognition.
- Develop complete intolerance for the casual discrediting or minimizing of women's contributions and accomplishments.
- Make sure that the bar is not set higher for women than for men.
- Cooperate with other institutions to provide jobs for accompanying spouses.
- Provide a menu of benefits for all.
- Provide well-run, inexpensive daycare centers, as well as emergency childcare.

Many of these recommendations are found in recent national reports on the status of women and resonate with women who have long been in the academy. Some institutions have already incorporated some of these "best practices" and have found that doing so did not bankrupt the institution. Practicing all these recommendations will go a long way in improving the "chilly climate in academia for women" and will help retain more women for the long haul. Only when more women gain and use power can we bring about real and lasting change. ❖

Recommended Readings:

N. Barcelo. *National Initiative for Women in Higher Education: Improving campus climates and the status of women in higher education*. Executive Summary (see www.umn.edu/women/wihe/home.html).

S. Estrich. *Sex and Power*. New York: Riverhead Books, Penguin Putnam, 2000.

E. J. McCaffrey. *Taxing Women*. Chicago: The University of Chicago Press, 1997.

V. Valian. *Why So Slow?* Cambridge, MA: The MIT Press, 1998.

*This manuscript was presented, in part, at the Conference on Shaping a National Agenda for Women in Higher Education, University of Minnesota, March 27-29, 2000. Reprinted with permission from AWIS Magazine, Vol 30, Num 2.

Making Slow Progress *continued from page 1*

of the entire faculty would be biased towards the past, this study focuses on recent hiring at the assistant professor level. For the physics departments, Schabel of Bell Laboratories, Lucent Technologies directly contacted each school by phone and/or ascertained the information on the Internet. Long's faculty analysis by gender was used for chemistry.

Preliminary work using the ACS 1999 Directory of Graduate Research for the top twenty-five Ph.D. granting institutions in chemistry showed that a significant number of the faculty members had received their doctorates from a small number of schools, about half having received their degrees from one in the top ten. (The 1995 National Research Council rankings were used.) At the top ten universities, 70% of the faculty members had obtained their Ph.D. degrees from that elite group of schools. Strikingly, nearly 80% of recent hires, the assistant and associate professors, had doctorate degrees from that same group of schools. Since these ten universities had such a great impact, we concentrated on the hiring practices in the chemistry and physics departments at these same institutions.

As a conservative approximation for the candidate pool used in filling these assistant professor positions in 2000, the gender distribution of the doctorates awarded by the top ten schools between 1988-92 was provided by Joan Burrelli at the National Science Foundation.

In physics, the percentage of women assistant professors hired at the top ten schools was higher than their representation in the candidate pool (see Figure 1). In chemistry, even though the pool of women was more than 2.5 times larger, the percentage of women hired was smaller than for physics, and substantially smaller than their representation in the candidate pool.

Considering the total number of tenured or tenure-track women faculty members at the top ten institutions, the representation of female physics faculty members was 9.1% of the total in the year 2000, giving an average of 3.5 women per school. In chemistry the average was 2.8 (9.0%). For all Ph.D. granting universities, the

number of tenured and tenure-track female faculty members is about the same for physics and chemistry. This is striking because four times as many women have earned Ph.D.'s in chemistry since 1966.

These findings bring into serious question the validity of the often-voiced statements justifying the low number of women faculty members in the physical sciences at these institutions on the small size of the available pool of women. Currently, for all Ph.D. granting institutions, female faculty members are about 6% in physics and 11% in chemistry. The challenge of having faculties mirror the female composition of the graduate student population (14% for physics and 32% for chemistry), requires that dramatic changes be made in the hiring, retention, and mentoring of women.

The Ph.D. attainment rate for men and women in graduate school was also examined. The yield of women scientists for a school was determined by dividing the number of doctorates earned by women between the years 1994-98 by the number of full-time female graduate students enrolled between 1988-92. The data used in these calculations were also obtained from the National Science Foundation. Corresponding yield values were determined for men, and a parity index was then calculated by dividing the yield for women by that for men.

At the top ten ranked universities, the yield for women physicists was somewhat greater than that for chemists. In both disciplines women graduate students were slightly less successful than men in achieving a doctorate (see Figure 2). Expanding the study to the top twenty-five universities, female doctorate yields changed slightly, decreasing for chemistry and increasing for physics; in both fields, women continue to lag behind men in receiving a Ph.D. At the 11-25 ranked universities, female graduate students in chemistry fared more poorly than their male counterparts.

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Figure 1:
Hiring of Tenure-Track Women by the Top Ten Ranked Universities

	Physics	Chemistry
Number of Female Ph.D.'s 1988-92	138	364
Female Percent of Pool	10.7	21.6
Assistant Professors (women/total number)	11/61	8/49
Percent Female	18.0	16.3

Figure 2:
Women Lag Behind Men in Receiving Doctorates

	Physics	Chemistry
At Universities Ranked 1-10:		
Female Ph.D. Yield	79.2 %	68.7 %
Male Ph.D. Yield	88.0 %	78.1 %
Parity Index	0.90	0.88
At Universities Ranked 11-25:		
Female Ph.D. Yield	60.9 %	54.9 %
Male Ph.D. Yield	64.1 %	67.8 %
Parity Index	0.95	0.81

Addendum:**“Yields” and “Parity Indices” for Top Astronomical Institutions***By Meg Urry and Valerie Kuck*

HOW DOES astronomy compare to physics and chemistry in the advancement of women? In the accompanying article Kuck finds that top physics departments graduate a smaller fraction of women than are in the graduate student pool, yet hire a slightly higher fraction than in the relevant Ph.D. pool. In contrast, top chemistry departments graduate relatively more women yet hire far fewer women than the percentage in the Ph.D. pool. Statistics for astronomy (Urry, STATUS, January 2001) suggest that the top ranked astronomy departments are as likely, and possibly more likely, to hire a significant percentage of female astronomers (relative yields of graduate schools were not investigated in that work), but an astronomy study comparable to Kuck’s analysis of chemistry and physics has not previously been done.

Here we look at the top astronomy departments and evaluate the same statistics as in Kuck’s article, namely Ph.D. completion rates of male and female graduate students in a 5-year period, 1993-1997; the corresponding number of first-year graduate students (1988-1992); and the number of women recently hired as assistant professors at the top astronomical institutions¹.

We caution that the results have large statistical uncertainties, there being far fewer astronomers in the U.S. than either chemists or physicists. Furthermore, the simplistic analysis attempted here is distorted by the influx of graduates from physics (and elsewhere), and by the incredible growth of astronomy in the 1990s. (As just one example of this growth, there were

more Ph.D.s in 1994-1998 than graduate students in 1988-1992.) Still, a few straightforward conclusions are possible.

The yield of Ph.D.s relative to entering graduate students varies tremendously for individual top-10 departments, ranging from 43% to 200% for women and 47% to 210% for men². (Yields greater than 100% occur if people transfer into the program after the first year or take less than 5 years to finish.) The overall yield for women is lower than for men (81% compared to 101%). The parity index overall is 0.80, considerably below the true-parity index of 1. Twenty-four percent of graduate students 1988-1992 were women while only 20% of the Ph.D.s 1994-1998 went to women. As found in previous studies, the attrition of women astronomy graduate students appears to be greater than that of men.

Several institutions have graduated a relatively large fraction of women: 9 of 33 Ph.D.s (not shown in table) at the University of Texas at Austin in 1988-1992 (and 6 of 35 in 1994-1998), and 10 of 27 Ph.D.s at the University of California at Santa Cruz 1994-1998. A few others are at the other end of the distribution, such as the University of Chicago (5 women of 37 Ph.D.s, 1994-1998) or Cornell University (4 women of 29 Ph.D.s, 1994-1998) — perhaps surprisingly, as both had admitted 1988-1992 graduate school classes that were 1/3 female.

Women are hired as assistant professors by the top 25 astronomy departments at roughly their presence in the Ph.D. candidate pool: they are ~20% of possible candidates and ~20% of recently hired assistant professors, with large statistical errors. In this respect, astronomy compares favorably to chemistry and similarly to physics in terms of producing new women assistant professors.

It appears that the situation in top astronomy departments, while perhaps not ideal, is at least better than in our sister fields of chemistry [...] and physics....

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It appears that the situation in top astronomy departments, while perhaps not ideal, is at least better than in our sister fields of chemistry (where too few women

assistant professors are being hired) and physics (where a smaller percentage of women are getting Ph.D.s). The number of women astronomers is growing, and provided we are not complacent about it, should continue to do so. ❖

Table 1:**Doctorate Yields and Parity Indices for Top Ranked Schools in Astronomy**

	Graduate Students sum 88-92			Doctorates sum 94-98			Yield % (Female)	Yield % (Male)	Parity Index
	Total	Female	Male	Total	Female	Male			
Total³	325	77	248	313	62	251	80.5	101.2	0.795
CalTech	32	8	24	44	10	34	125.0	141.7	0.882
Princeton	59	10	49	29	6	23	60.0	46.9	1.278
UC Berkeley	29	6	23	48	7	41	116.7	178.3	0.654
Harvard	28	3	25	27	5	22	166.7	88.0	1.894
U Chicago	31	10	21	37	5	32	50.0	152.4	0.328
UC Santa Cruz	38	10	28	27	10	17	100.0	60.7	1.647
U Arizona	57	21	36	37	9	28	42.9	77.8	0.551
MIT	*	*	*	25	6	19	*	*	*
Cornell	18	6	12	29	4	25	66.7	208.3	0.320
U Texas at Austin	33	3	30	35	6	29	200.0	96.7	2.069

Correction: Numbers in the dotted lines were inadvertently transposed in the original printed version and have been corrected here.

Footnotes:

¹ Numbers of doctorates earned are from NSF Doctoral Records File 1966-1999 (Survey of Earned Doctorates), WebCaspar, National Science Foundation. The student enrollments are from the NSF Graduate Student Survey, Fall 1972-1999 (Survey of Graduate Students and Postdoctorates in Science and Engineering), WebCaspar, National Science Foundation. The ranking are from NSF Research Doctoral Programs based on scholarly quality of faculty ranking. These rankings were compared with the U.S. News and World Report results which list the same top ten programs as the NSF ranking.

² Yield is number of Ph.D.s received 1994-1998/number of graduate students 1988-1992 for each department. (Four of the top 25 schools were excluded due to missing data.) Parity index is the ratio of the yield of women to the yield of men.

³ Numbers do not include "MIT" statistics, due to incomplete data.

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- AIP (1999). *Graduate Programs in Physics, Astronomy, and Related Fields*. New York: American Institute of Physics, 1999.
- NSF Doctoral Records Files . WebCaspar, National Science Foundation, 1966-1999.
- NSF Graduate Student Survey, (Survey of Graduate Students and Postdoctorates in Science and Engineering). WebCaspar, National Science Foundation, Fall 1972-1999.

Wendy M. Williams is an associate professor of human development at Cornell University. Her books include Escaping the Advice Trap, written with Stephen J. Ceci (Andrews McMeel, 1998).

Women in Academe, and the Men Who Derail Them

By Wendy M. Williams

EACH SPRING, graduate students who are about to receive their Ph.D.'s hunt far and wide for tenure-track jobs. Last year, one student in the program I teach in applied for 86 positions. Competition for assistant professorships in psychology and human development is so fierce that often several hundred applicants vie for a single position. The process weeds out anyone but the most committed.

Unfortunately, male and female graduate students respond differently to the demands of the academic job market. Although 70 percent of the students in my graduate program are female, it is the men who compete most aggressively for jobs – the student who sent out 86 applications last year was male. My informal tally reveals that 90 percent of the men apply for virtually every job that remotely matches their qualifications, while only about half of the women do so. When women apply for jobs, they do quite well – but they are far more likely than men not to compete for positions. That pattern is confirmed anecdotally by my colleagues at other institutions. Many intelligent and talented women substantially reduce their chances for career success, prestige, and financial security by being unwilling to participate in a national job search, usually because the men in their lives don't want to move. We rarely see male graduate students severely limiting their job searches because of their partners' desires.

When brilliant women allow their careers to be derailed, everybody loses: the women, the scholars who might have been their colleagues, and society at large. Why, in this era of greater equity for women, are we experiencing such a sorry state of affairs?

Consider one example (with identifying details changed): A brilliant female student, on a trajectory toward a remarkable career, began a love affair with an attorney late in her graduate training. She had built a terrific vita, filled with impressive publications; she was a great teacher who gave wonderful talks on important and interesting research. Her chances of landing a prestigious job were high. But to get the kind of position that she had prepared for throughout graduate school, she would have to participate in a national search and be willing to relocate.

All fall, her advisers sent her dozens of job announcements, encouraging her to apply for each position. Yet she requested only five letters of recommendation, all for jobs within commuting

distance of the city where her partner worked. He certainly could have found an equivalent job in any major city, but he made it clear that he wanted to remain where he was. Besides, he noted, his city contained lots of colleges – why should they have to move?

The student was convinced by his arguments. She wound up with a one-year appointment at a mediocre college; the job had low pay and a heavy workload. After a couple of years in that position, she will have destroyed her chances of ever achieving the career for which she spent many grueling years preparing.

Readers may wonder why the student could not make do with a bad job for a few years, or even take a few years off, rejoining the career track later. Unfortunately, each research-oriented, tenure-track academic job attracts so many top-notch applicants who have logged one impressive accomplishment after another that most search committees rule out candidates who have done less well for even one year. Committees often look first at the quality and number of an applicant's publications. Graduates whose temporary jobs require them to teach eight or more courses a year and don't give them adequate institutional resources to conduct high-level research cannot pass that first hurdle. (Of course, some graduates want teaching-oriented positions. But the students I am describing had prepared themselves for research jobs in academe.)

How do the female graduate students who narrowly limit their job searches explain their behavior? They describe in detail how impossible it would be for their men to move. They state, usually erroneously, that they may still get prestigious, tenure-track jobs, and that even if they do not succeed at first, they can try again later. After spending five, six, or more years preparing themselves to conduct research as well as teach, the women end up losing the chance to reach their goals when their partners insist on staying put.

Most of the partners do not realize that they are permanently derailing the women's careers; they think that they are asking the women to make reasonable compromises, or just to postpone searching for the perfect jobs. The women are crippled by a lack of accurate information about the academic job market, which prevents them from rebutting their partners' arguments that a move shouldn't be necessary.

It is one thing if a woman decides to focus her life on her family, perhaps choosing to work part time or to relocate if that would be good

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for her partner's career. But the women I am concerned about declared their career intentions when they applied to graduate school. Their enrollments kept other promising candidates out of programs with limited numbers of slots. The women accepted thousands of dollars each year in stipends from their universities, as well as forgiveness of tuition charges. And at the last minute, they abandon the careers for which they have trained so long – typically without even realizing how much they are sacrificing.

How can we help female graduate students stay on the path they have chosen? The key is to make sure that from the start, when they apply to graduate programs, the women have adequate information about academic careers.

Each graduate program should distribute to all applicants written descriptions of the steps involved in getting a job as an assistant professor, and information about the resources the program offers to help with a job search. Some examples of meaningful help are advice about choosing a research topic likely to lead to jobs, assistance in developing a vita, opportunities to participate in national academic meetings, and coaching for interviews.

Professors must talk explicitly with graduate-school applicants trying to choose advisers about the steps involved in landing a job. Women (and men) who find academic careers unappealing once they realize what job searches involve may withdraw their applications, making room in the programs for applicants who are willing to relocate after they earn their Ph.D.'s.

For the most part, detailed information about getting a job becomes clear only after students have been in a program for five or six years, when mentors can no longer ignore the issue and when fellow students only a little more advanced in the program serve as examples of success or failure. At that point, male graduate students step naturally up to the plate. Our society expects men to compete for jobs, and men learn from childhood how to be assertive, to play to win but to cope with losing, to place personal success at least sometimes above the needs of friends and relatives.

On the other hand, many female graduate students are shocked to learn what they must do to get a good research position. Women need extra help from their academic mentors: more meetings dedicated to discussions of life after graduate school, and opportunities to talk about the implications of the job-search process for their personal lives and their feelings about competing.

I have led discussions in a professional-development seminar for first-year graduate students about how to land an academic job. Topics included the specific steps and sacrifices involved in getting a research position, the types of careers available and the constraints of each, how to choose a faculty mentor, how to choose a research topic designed to win a job, and how to present yourself to professors as a good potential colleague.

More attention to research careers in such seminars, in informal meetings, and during classes would prepare women to communicate more effectively with their partners. For example, female graduate students should make clear early in their romantic relationships that they may have to move. If their partners are not flexible and supportive, the women can attempt to educate them – or find new partners. Professors should explain the choices and compromises they've made in their own lives, whether or not they've managed to combine careers and families.

Professors know what an academic career entails, but many of them are simply too busy discussing research to talk about real-world issues. Others believe that such practical matters are not their responsibility. In a society that does not implicitly prepare women to compete aggressively for jobs, we must explicitly pick up the slack with our female students. The process of landing a job should not be a secret, nor should the consequences of failing to participate in the search. Women must be told bluntly what they need to do to succeed in the careers they have chosen, and we must teach them to expect of themselves a level of commitment that we take for granted in men. ♦

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Maria Mitchell: A Life in Journals and Letters, edited by Henry Albers, College Avenue Press, Clinton Corners, NY, 2001

Book Review by Vera C. Rubin, Department of Terrestrial Magnetism, Carnegie Institution of Washington

WHEN VASSAR Female College opened in 1865, one of its few buildings was an observatory, and its first professor of astronomy was Maria Mitchell (MM). She, like other brilliant women of her generation, had an international reputation and an impressive list of achievements, but no college degree. These women had been taught their professions by a supportive father, brother, husband, or male friend; they would teach the first generation of U.S. women who obtained college degrees in science. In turn, these college-educated women would become science professors at colleges for women. Their students would break open the doors of American universities, and obtain the first science Ph.D. degrees for women in the United States.

Mitchell was born in 1818 on Nantucket Island, where women played a significant role in the intellectual and fiscal life while the men were at sea. From her father, a banker and amateur astronomer, she learned astronomy with a telescope on the roof of their home. After graduation from school at age 16, she organized a school for girls, each of whom paid a penny a day to attend. This may have been the first racially integrated school in the U.S.

At age 18, she accepted a position as the first librarian at the Atheneum, the intellectual center of the island. Her very special talents must have been apparent, even as a teenager. As librarian, she had access to books from which she educated herself in subjects as diverse as literature, calculus, and statistical computational astronomy. Through lectures on Nantucket and visits to Boston, she made friends with Emerson,

Whittier, Alcott, and Peabody. October 1, 1847, while her parents were entertaining guests at dinner, MM was using the telescope as she did most nights, sweeping the sky in search of comets. But this night she discovered one. Ultimately, she received a gold medal from the King of Denmark, offered for the discovery of a telescopic comet.

Henry Albers, for 32 years a professor of astronomy at Vassar College, has combed her diaries, journals, and letters from all over the world and compiled a wonderfully informative and entertaining story of the intellectual growth of this wise and witty woman. Thus it is mostly in Mitchell's words that we follow the life of a brilliant woman who was offered opportunities never before offered to an American woman scientist. In return, her horizons broadened, and she grew to play a major role in the founding years of Vassar College, in the lives of her

students, in the larger domain of education for women, and ultimately in the political arena of women's rights. Always, she was searching for truth.

The discovery of the comet changed Mitchell's life. She became in the U.S. a symbol of the emergence of women into the public world of science; worldwide, the community of male scientists and literary figures opened to her. She was elected into the American Academy of Arts and Science (AAAS) in 1848, one of its first woman members, and she was an active member of the AAAS. She accepted a job offered by the Nautical Almanac Office when it opened in 1849; her responsibility was computing the positions of the planet Venus. Mornings she calculated orbits, afternoons she was the librarian in the Atheneum, and evenings were spent sweeping the sky for comets. As the only unmarried child in a family of 10 children, her days and months were sometimes filled with caring for sick relatives. At those times, she carried her calculations into the sick room. Her financial independence and her accomplishments,



Courtesy of the Nantucket Maria Mitchell Association

Hermione Dassell portrait of Maria Mitchell at the telescope.

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rare for a woman at that time, offered her unique opportunities to travel.

Living at a time when a trip from New York City to Nantucket was an ocean voyage, her travels for her own education and for science inspire awe. Apparently wanting more in her life than computations and books, in 1857 she quit her job as librarian and journeyed alone to the West. As the escort of a young woman from Chicago, she traveled down the Mississippi River and up the east coast of the U.S. She carried letters of introduction to important and interesting people; her comments are always insightful. From a slave market in New Orleans, she wrote, "I could hold my tongue and look around without much outward show of disgust, but to talk pleasantly to the trader I could not consent." From Mammoth Cave, where they ascended and descended ladders, and crossed rough bridges over gaping abysses, "if two ladies travel alone, they must have the courage of men."

Her travels continued for one year more, to England, France, Italy, and Austria. There was hardly an important observatory she did not visit, nor an important scientist she did not meet. Sir George Airy and Sir John Herschel and their families became her friends. To Airy she presented a photograph of the stars taken by the Bonds at Harvard. The English astronomers had then only photographed the moon. Herschel presented her with a sheet from Caroline Herschel's (his aunt) notebooks in which she had recorded William Herschel's observations. Mitchell describes her social interactions with astronomers Leverrier, Enke, von Humboldt, Secchi, Mary Somerville, and father Wilhelm and son Karl Struve. Much of the travel in France and Italy was with Nathaniel Hawthorne and his family. During this time, she was also making calculations for the Almanac Office, for they had refused her request to retain her position but do no work during her travels.

Mitchell's comments concern many whose names we recognize today. At a reception in London: "Several gentlemen spoke to me without a special introduction... Dr. Toynbee is a young man not over thirty, full of enthusiasm and

progress, like an American. He really seemed to me all alive, and is either a genius or crazy - the shade between is so delicate that I can't always tell to which a person belongs." On observatories: "All the early observatories of Europe seem to have been built as temples to Urania, and not of working chambers of science." After discussing their individual failings (including pillars that hide stars) she concludes, "Well might Struve say... 'an observatory should be simply a box to hold instruments.'" On travel: "Nothing can be more dreary than the (14 hour) day passed between Civita Vecchia and Rome, in a vettura. Had (Mr. Hawthorne) spoken between the two towns, I did not hear him... there came on a drizzling rain, we had no food and were all quite devoid of enthusiasm when we entered Rome in the darkness of midnight." On customs: "Manners and customs differ in every place... You buy apples by the pound, and hooks and eyes by the ounce. Not having a very definite idea of weight, I bo't a pound of one and was surprised by the small amount, an ounce of the other and found I had hooks and eyes enough for the rest of my life."

Her return voyage started from London, where she heard Charles Dickens read "The Cricket on the Hearth." MM asked the ship's captain if he would put her ashore at Nantucket, as they passed within 30 miles of the Island. His reply, "... that I ought not to live there, if I can't go the long way around to New York," concludes her engrossing and detailed travelogue.

It was in her role as an educator of women that MM revealed her greatness. Vassar College opened in 1865 with eight professors, two of them women, and ten teachers, eight of them women. From the start, she believed that the

students should be doing meaningful scientific work. "We are students learning together." She refused to lecture to the students what they could find in textbooks.

The students published a column in *Science Monthly* (shortly to become *Scientific American*) which contained their calculations of the rising and the setting of the planets and other celestial phenomena. They calculated orbits, determined local times with a transit telescope, and counted meteors, including those of the great meteor

**"We especially need
imagination
in science.
It is not all
mathematics,
nor all logic,
but it is
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—MM

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shower of 1866. "Are there 17 students in Harvard College who take Mathematical Astronomy do you think?" (1865). "I asked (Prof. Pierce of Harvard, after MM had attended one of his classes) if a young lady presented herself at the door if he could keep her out and he said 'No and I shouldn't'. I told him I would send some of my girls" (1866). "It is better to be peering in the spectrograph than on the pattern of a dress... it is better to spend an hour in watching the habits of an insect than in trying to put up their hair fantastically" (1872).

She traveled in 1869 with current and previous students to observe an eclipse in Iowa, and again in 1878 to an eclipse in Colorado. Each student had a task: to count half seconds from the chronometer in order to time each contact, to observe and sketch the corona, to observe planets and stars. MM's account of the Iowa eclipse in *Hours at Home* included, "My assistants, a party of young students, would not have turned from the narrow line of observation assigned to them if the earth had quaked beneath them... Was it because they were women?" She taught, "We especially need imagination in science. It is not all mathematics, nor all logic, but it is somewhat beauty and poetry." She taught, "The step, however small, which is in advance of the world, shows the greatness of the person, whether that step be taken with brain, with heart, or with hands." Her students reported that they "went out of her class room alive with energy and purpose." By 1873, when she traveled to Russia with her nephew, her visit to the Pulkova Observatory was secondary to her visits relating to education for women.

At an 1873 meeting of the Woman's Club of Boston, Prof. Pierce admitted that Marie Agnesi, the Italian mathematician, was the single original woman in science. In her diary, MM commented, "It seems to me if, in 1800 years with every advantage some 12 men have been original in science, and with every disadvantage one woman has been, the woman's mind must be truly wonderful." Yet MM herself was surprisingly modest. Following the award of an honorary Ph.D. from Rutgers in 1870, she wrote the Vassar president, "I submitted to my title twenty four whole hours, after which I announced that the joke was old, and have resumed the brief one of MM" She did not mention in her diary the LL.D degree conferred on her by Hanover College in 1882. And the diploma awarding her a Doctor of Laws degree in April 1887 (sent to her by Columbia College in October, 1887) was followed by a letter in November asking if

she had received it. Would she have preferred a Doctor of Science diploma?

During the last decades of her life, disappointed that women professionals were still second-class citizens, MM reached out to a wider audience. She and Dr. Avery, the only woman professors at Vassar, were paid less than one-half the salary of the male professors. Their continual salary disputes with the college were never resolved. MM became President of the Association for the Advancement of Women (AAW) in 1874, an organization she helped to found. Julia Ward Howe was an executive of the Association. In 1876, at the Fourth Congress of the AAW, MM presented a paper on *The Need of Women in Science*. From it, Albers has included a hauntingly poetic paragraph.

"Does anyone suppose that any woman in all the ages has had a fair chance to show what she could do in science?... The laws of nature are not discovered by accidents; theories do not come by chance, even to the greatest minds; they are not born of the hurry and worry of daily toil; they are diligently sought, they are patiently waited for, they are received with cautious reserve, they are accepted with reverence and awe. And until able women have given their lives to investigation, it is idle to discuss the question of their capacity for original work." Maria Mitchell left Vassar in 1888 due to ill health, and never returned; she died the following year.

Those of us who now attempt to open science to more women have never faced the questions that MM was asked, and the questions that were then debated at scientific societies: Can women's brains and bodies survive doing science? Are women capable to doing science? Henry Albers has produced a remarkable book that follows the intellectual growth of a young Nantucket girl, passionate about astronomy, who developed into a brilliant woman devoted to educating younger women to become scientists. As an astronomy student at Vassar College, I could not understand why her astronomical interests led ultimately to her extensive activities on behalf of women. After reading Alber's book about this extraordinary woman, I understand. ❖

Autographed copies of the book, *Maria Mitchell: A Life in Journals and Letters*, may be obtained by sending \$25 directly to:

Dr. Henry Albers,
8810 Leabrook Street,
Fairhope, AL 36532.

Joan T. Schmelz is an Associate Professor of Physics at the University of Memphis. She received her Ph.D. from Penn State University in Astronomy in 1987. Her research involves the investigation of properties and dynamics of the solar corona, using spectroscopic and imaging data in the X-rays and EUV. Her most recent work provides observational constraints for the coronal heating problem.

Rosalind Franklin and the Double Helix

By Joan Schmelz

IN THE SPRING OF 1953, Rosalind Franklin of King's College, London was perilously close to unraveling the mystery of DNA structure – the famous double helix. But before her analysis was complete, she was beat-



Joan Schmelz

en to the punch by James Watson and Francis Crick of Cambridge, who later won the Nobel Prize for their efforts. We all know the story, right? Watson himself wrote his colorful recollections in the book entitled *The Double Helix*, and some of us may have even read this book as part of an advanced biology

course back in our high school days.

Watson writes extensively about Franklin in *The Double Helix*. More precisely, he introduces us to a fictional character he calls “Rosy”, a lab assistant to Maurice Wilkins (who shared the Nobel Prize with Watson and Crick), with a disagreeable, cantankerous personality and a frumpy unladylike way of dressing. Watson obsesses about Rosy’s appearance, musing what she might look like if she did something with her hair and took off her glasses. According to Anne Sayre, the author of *Rosalind Franklin and DNA*, Rosy was not recognizable as Rosalind Franklin. In fact, Franklin worked on an equal footing with Wilkins, her hair was elegantly styled, and she never wore glasses! What’s Watson up to? we find ourselves wondering.

Rosalind Franklin was born on July 25, 1920 in London to a happy family with a long history of socialist rather than scientific accomplishments. She was educated at Cambridge and worked for British Coal during the war. Her early research papers on the microstructures of coal are still referenced today. Peter Hirsch of Oxford University called her work “remarkable. She brought order to a field that had previously been in chaos,” and she did it all between the ages of 22 – 26.

In 1947, Franklin went to France (she spoke excellent French) to begin working as a

chercheur at the Laboratoire Central des Services Chimiques de l’Etat. Anne Sayre suggests that it was probably the happiest time of her life – she was young, she was living in post-war Paris, and she was learning the techniques of X-ray diffraction from Jacque Méring. Méring was an acknowledged expert in crystallography with an interest in the structure of graphite, an amorphous substance that challenged the state-of-the-art techniques in everything from sample preparation and handling to data acquisition and interpretation. Franklin’s apprenticeship with Méring soon turned into a collaboration. The experience prepared her for the scientific challenges of unraveling the structure of DNA, but nothing could have prepared her for the personal antagonism she was about to encounter at King’s College.

Franklin returned to England in 1951 to take up a position in the laboratory of Professor John Randall at King’s College, London. Her job was to use her newly acquired skills in crystallography to organize, supervise, and carry out X-ray diffraction work on DNA. Here, she was on an equal footing with Maurice Wilkins who specialized in the biochemical and biophysical aspects of DNA. The DNA work did not belong to Wilkins, as Watson misinforms us; if it belonged anywhere (in the English research tradition that has no American equivalent), it belonged at Randall’s Lab. Franklin and Wilkins clashed almost from the beginning. We may never know the reasons, but we do know the implications: Franklin worked essentially in isolation (with graduate student, Raymond Gosling), while Wilkins developed a friendship with Watson and Crick that led to the Nobel Prize.

What did Franklin have to do with the successful Watson-Crick-Wilkins collaboration? Watson all but admits in *The Double Helix* that he nursed his friendship with Wilkins in order to get his hands on Franklin’s proprietary data. It seems that whenever he was in need of inspiration, he was off again on the train to London to have lunch with Wilkins and gossip about Franklin’s



Rosalind Franklin in France circa 1950. Photographed by Vittorio Luzzati. © CWP and Regents of the University of California <http://www.physics.ucla.edu/~cwp>

Watson and Crick announced the double helix structure of DNA. The race was over.

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latest results. (If this sound unbelievable, read the books and draw your own conclusions.)

Franklin's progress is well documented in her own laboratory notes as well as in the reports she submitted to Randall. She spent the greater part of her first eight months at King's College assembling the equipment necessary for cutting-edge X-ray diffraction work. By the autumn of 1951, she had succeeded in isolating and imaging a new form of DNA. At that point, Franklin knew that the DNA molecule was a large helix with multiple chains, that the phosphate backbones were on the outside of the structure, and that there were phosphate bonds available to link to proteins. She had also measured some of the key angles of the helical structure.

What she did not know was that she was in a race with Watson and Crick who were using her results to build a model of the DNA structure. She continued with her careful detailed analysis, unaware that the team from Cambridge was missing just one crucial piece of data. In early 1953, Watson and Wilkins were

again discussing Franklin's results, but this time, Wilkins went one step further. When Watson asked his friend what Franklin's new form of DNA looked like, Wilkins showed him the picture! He did this not only without Franklin's permission, but also without her knowledge. Watson raced back to Cambridge to share this with Crick. There was a month or two of frenzied activity, and, in April 1953, Watson and Crick announced the double helix structure of DNA. The race was over.

Franklin took up a position at Birkbeck Lab soon after the announcement. She spent the rest of her few remaining years working on the structure of viruses and left a legacy of over a dozen journal publications. She died of cancer on April 16, 1958, without ever knowing of the enormous contributions she made to the discovery of the structure on DNA.

In 1962, Watson, Crick and Wilkins won the Nobel Prize for Medicine and Physiology. ❖

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Illustration by Ann Feld, STSci

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Ms. Mentor's Impeccable Advice for Women in Academia, by Emily Toth

Book Review by Ann Wehrle

THIS BOOK IS FUNNY, thought-provoking, practical, and wise in the ways of the academic world. Most women who have borrowed my copy read it through in a single gleeful sitting. Professor Emily Toth, disguised as "Ms. Mentor," writes an advice column (available on-line at The Chronicle for Higher Education's website, <http://www.chronicle.com>).

The format is question-and-answer, drawn from six years of enquiries, and backed up with twenty-five years of experience in academia. Topics include graduate school, job hunting, conferences, first year of teaching, the struggle for tenure, and post-tenure, among others. Examples include how to negotiate startup funding, how to find out what to ask for, and getting agreements in writing from the Dean or department chair. Graduate students often eagerly anticipate giving their first paper at a conference, but are baffled by how few senior people attend the oral sessions. Ms. Mentor clues them in, "... the major purpose of academic conferences is to network, gossip and conspire with one's peers." She solves academic dilemmas, such as how and why a panel chair must alert speakers near the end of their allotted times and when to cut them off. The hilarious conference scene illustrating "peacocking" will be recognizable to many astronomers.



Ann Wehrle

A perennial issue raised in women's job books is how to dress professionally. Ms. Mentor recommends elegant rather than earthy or ethnic, and excoriates miniskirts, gray banker suits, and "little-girl dresses." "Dress like the highest ranking female member of your institution" (not your department!) is her pragmatic advice. And then there's handling the illegal questions asked by job interviewers – are you married and do you have children? Advice: the interviewers hold all the winning cards; if you do want the job, answer the questions calmly.

Why buy this book? As a grad student, to learn what really goes on in the academic world. As a job-hunter, to read her pithy advice on presenting yourself and negotiating a good deal. As a tenure track faculty member, to figure out where to put your energy (hint: do not serve on seven committees simultaneously). As a professor, to learn Machiavellian techniques such as orchestrating a meeting. Ms. Mentor reminds us that men learn how to self-promote, compete and win as part of their socialization as boys. The question-and-answer format allows Ms. Mentor to show by example how women can learn the game and play to win. ❖

University of Pennsylvania Press: Philadelphia, 1997,

\$15.95 paperback,
available via amazon.com
and in university bookstores

"Once upon a time, the statement "I am an astronomer" defined my very being. Everything else was secondary. This seemed to me to be the minimum acceptable level of devotion in astronomy. In the "real world", a place where people have families, mortgages, hobbies, and free time, this would be considered a form of mental illness."

Anne Turner, AAS Newsletter 107, 7 (2001)

Dr. Rebecca Elson, a native of Quebec, was a graduate of Smith College and the University of Cambridge, England. She did extensive and landmark work on the globular clusters of the Larger Magellanic Cloud, and on the cluster systems of other, more distant galaxies. As well as being a successful astronomer she was a published poet, a soccer player and a keen organic gardener. She died in Cambridge in 1999, aged 39.



Photograph by Richard Sword

Rebecca Elson
1960-1999

Dr. Alison Campbell is on staff at the Department of Physics and Astronomy at the University of St Andrews, Scotland. She was a close friend of Becky Elson from graduate school until Elson's death in 1999.

Announcing the Poetry Collection "A Responsibility to Awe"

By Alison Campbell

REBECCA ELSON'S POETRY collection, "A Responsibility to Awe", was launched in October 2001 in Cambridge, England. Nearly 50 people were present, including her husband, friends and colleagues. Gerry Gilmore, Craig Mackay and Poshak Gandhi each read one of her poems, while others were spoken by friends and by staff of the publishers, Oxford Poetry.

The book is receiving rave reviews in the UK; a typical comment is "This is the most important poetry collection of the last ten years." Some are calling it unique, because many of Becky's poems bridge the gap, so seldom spanned, between science and emotion.

If only Becky could hear these wonderful comments! She was always so reticent about the "other side" of her life. I (and I am sure others) tried many times to persuade her to publish "Aberration," her 1990 poem about the HST PSF, but she worried that her colleagues would no longer take her seriously.

Part of the reason publication of a major collection of Becky's poetry has come so soon is that, tragically, her work is complete. But had she lived, I believe recognition was only a matter of time, for among these poems are many that illuminate the deep connections between our rational and our primal understanding of the universe. Other, equally stunning pieces on more personal themes use powerful imagery to evoke emotions ranging from loneliness through tenderness to passion. ❖

➤ **ABERRATION** ◀

*The Hubble Space Telescope
before repair.*

The way they tell it
All the stars have wings
The sky so full of wings
There is no sky
And just for a moment
You forget
The error and the crimped
Paths of light
And you see it
The immense migration
And you hear the rush
The beating

*From "A Responsibility to Awe," this work
"Aberration" by Becky Elson is reprinted with
permission from the publisher.*

**Elson's poetry collection,
A Responsibility to Awe,
is available from Carcanet Press, Manchester, UK.**

Cost: £ 6.95, ISBN: 1-903039-54-1.

Web: <http://www.carcanet.co.uk>.

Phone: +44-161-834-8730 ext.21;

email: pnr@carcanet.u-net.com.

Making Slow Progress *continued from page 7*

An unexpected but significant finding from this study of graduate school performance was the wide variation in female Ph.D. yields. In physics, the doctoral yield at the top 25 universities for women varied from 108% to 13.3% (see Appendix 1), while in chemistry the yield ranged from 85.3 to 28.7%. (The greater than 100% yield can be attributed to the transfer of small number of women into a physics department after the first year, or to women completing their doctoral studies in less than five years.)

The wide range in yields within a discipline

suggests that institutional environments play a significant role in women's decisions to complete a Ph.D. Coupled with the parity index analysis, it suggests that women receive varying degrees of support and/or encouragement in obtaining a doctorate. It would be interesting to see whether there are initiatives that can affect the yield, such as the American Physical Society site visit program administered by the Committee on the Status of Women in Physics. There is no such program in chemistry.

All of the above data reiterates the point that gender discrimination continues to persist in academic physics and chemistry. It is past the time to eliminate such unfair treatment. ❖

Appendix 1:
Doctorate Yields and Parity Index of Top Twenty-five Ranked Schools in Physics

	Male Grad. Stdts 88-92	Female Grad. Stdts 88-92	Female Ph.D. 94-98	Male Ph.D. 94-98	Female Yield (%)	Male Yield (%)	Parity Index
Harvard University	101	20	18	105	90.0	104.0	0.866
Princeton University	110	17	7	123	41.2	111.8	0.368
Massachusetts Institute of Technology	234	33	21	214	63.6	91.5	0.696
University of California-Berkeley	174	16	15	145	93.8	83.3	1.125
California Institute of Technology	113	26	21	108	80.8	95.6	0.845
Cornell University	135	32	27	117	84.4	86.7	0.974
University of Chicago	109	18	17	91	94.4	83.5	1.131
Univ. of Illinois at Urbana-Champaign	215	18	18	170	100.0	79.1	1.265
Stanford University*	80	14	14	127	100.0	—	—
University of California-Santa Barbara	110	12	8	70	66.7	63.6	1.048
University of Texas at Austin	287	25	14	159	56.0	55.4	1.011
Columbia University	79	10	10	81	100.0	.02.5	0.975
Yale University	80	8	7	74	87.5	.92.5	0.946
University of Washington	107	14	9	75	64.3	70.1	0.917
University of California-Los Angeles	138	15	10	109	66.7	79.0	0.844
University of California-San Diego	112	25	12	74	48.0	66.1	0.726
University of Pennsylvania	144	15	2	78	13.3	54.2	0.246
University of Maryland at College Park	261	37	17	134	45.9	51.3	0.895
University of Michigan at Ann Arbor	114	24	26	94	108.3	82.5	1.314
Rutgers	73	9	6	61	66.7	83.6	0.798
University of Wisconsin-Madison	173	18	16	132	88.9	76.3	1.165
SUNY at Stony Brook	161	21	15	116	71.4	72.0	0.991
University of Minnesota - Twin Cities	159	31	21	78	67.7	49.1	1.381
Ohio State University	173	21	11	104	52.4	60.1	0.871
University of Rochester	252	54	23	117	42.6	46.4	0.917

*Not considered in calculations of top ten schools because of ~50% rise in male doctorates

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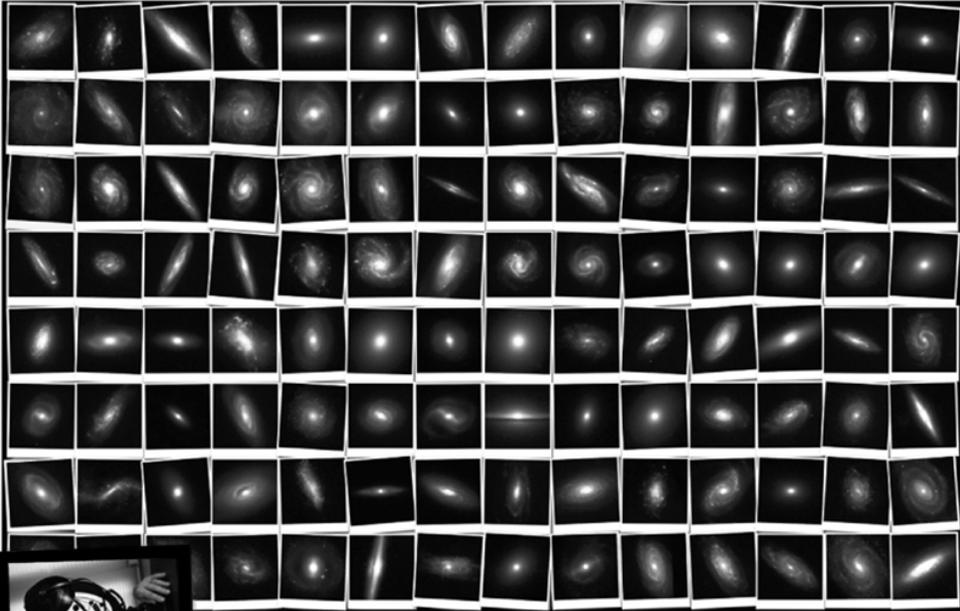


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Vera Rubin Symposium

Following the January AAS meeting, a two-day symposium will be held at the Washington, DC headquarters of The Carnegie Institution in honor of Dr. Vera C. Rubin's many contributions to astronomy. A public lecture by Dr. Allan Sandage of the Carnegie Observatories will be held at 4:00 pm on Thursday, January 10, 2002. All are welcome to attend.

For more information, visit: www.carnegieinstitution.org/rubinsymposium.html.

