June 2000

STATUS

A REPORT ON WOMEN IN ASTRONOMY

CONTENTS

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

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Meg Urry heads the Science Program Selection Office at STScI, and does research on active galaxies, notably multiwavelength studies of blazars. She was the chief organizer of the 1992 STScI conference on Women in Astronomy which led to the Baltimore Charter, is currently a member of the Committees on the Status of Women in Astronomy (AAS) and in Physics (of the American Physical Society), and has been co-editor of STATUS since 1998.

The Status of Women in Astronomy

By Meg Urry

Surveying the Playing Field

ASTRONOMY is a highly competitive profession, and to succeed requires brains, dedication, energy, imagination, and luck. It is hard for almost everyone to get a faculty job, to get tenure, to rise to leadership roles in the profession. Is it harder for women? Or easier? The answer lies not in anecdotes — which abound to support either view — but in an objective assessment of the data. If women are being given an unfair advantage, we should see that they are being hired in greater numbers than their percentage in the talent pool. If vice-versa, perhaps greater measures are needed to ensure their fair access to the profession.

Accordingly, we looked at how many astronomers are women, and how this changes with professional level. Because astronomy is a relatively small profession, it is usually combined with physics (which is 10 times bigger) for statistical purposes. The only available statistics for astronomy alone, spanning graduate school through the full professor level, come from the following three surveys: the 1992 and 1999

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Regina Jorgenson

Vladimir Strelnitski

Cultural Impact on the Percentage of Women in Astronomy

By Regina Jorgenson and Vladimir Strelnitski

IT HAS LONG BEEN KNOWN that there are large fluctuations in the percentages of women astronomers in different countries, with trends perhaps related to their political, religious, or other cultural traditions. There are some examples that may be easy to explain, such as the remarkably low percentage of women astronomers in Muslim countries, where the role of women in strongly limited. However, there are also less apparent, and therefore more intriguing trends. For example, it has been repeatedly remarked that countries such as Germany or England tend to have a lower percentage of women astronomers relative to countries such as France or Italy. The attempts to give a simple explanation to this dichotomy are not convincing — after all, shopping hours in Germany and Italy are not so very different (see the article by Steve Beckwith in the January 1999 issue of STATUS). In pursuit of a more comprehensive explanation, we undertook an analysis of the known quantitative data on the subject.

Using the statistics from the IAU Information Bulletin 82 (June 1998), we compared the percentages of women IAU members in countries grouped according to three cultural characteristics: (1) linguistic roots — Germanic versus Romanic, (2) predominant religion — Protestant versus Catholic (only for Western Europe, Australia and the USA), and (3) political alignment prior to the

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STScI surveys of four observatories and 32 universities with astronomy graduate programs (100% response, ~1,300 Ph.D. astronomers), and the 1999 AAS survey of ~300 institutions (~60% response, ~1,600 Ph.D. astronomers). The STScI surveys were done by Ethan Schreier in 1992 (published in the *Proceedings of the Conference on Women in Astronomy*, online at www.stsci.edu/stsci/meetings/WiA/) and by this author last year. The AAS survey was initiated in early 1999 by consensus of the Chairs of the Committees on Employment, Education, Women, and Minorities, and was carried out by Kevin Marvel and AAS Executive Office staff; Brett Blacker (STScI) and I analyzed the results (BAAS 31, 1552, #121.01).

Evaluating the Survey Data

The raw data are shown as bar graphs in Figures 1-3. The picture that emerges from these surveys is a consistent one: roughly 1/4 of graduate students are women, ~1/6 of the post docs, assistant, and associate professors, and only ~5% of the full professors are women. Most men in astronomy are full professors (65%), compared to only 1/3 of the women (the largest group of women are postdocs). Interestingly, the percentages of women are slightly higher in the STScI sample, which includes the four observatories not in the AAS data base (STScI, CfA, NOAO, NRAO) and institutions that are generally the largest and most prominent.

The AAS survey will be repeated regularly, so there will be new data to show how these numbers evolve. Ideally, the bulge of women at the young end of the profession will propagate smoothly up the hierarchy. That is, 25% of the Ph.D.s will go to women, 25% of the new postdoc hires (now) will be women, 25% of assistant professors hired (in a few years) will be women, and so on. This would indicate a gender neutral system. In the meantime, we can use the present, somewhat limited, data to assess the current situation.

In fact, there are disturbing signs that the advancement of women lags behind that of men. The clearest disparity occurs at the entry level — the transition from graduate school to postdoc. Statistically, 43% (+/– 2%) of the men in graduate school can expect to obtain postdocs, while only 26% (+/– 3%) of the women will. (This discrepancy is significant at the >5 sigma level.) These percentages follow from a comparison of the numbers of men and women in graduate school and postdoc positions at the surveyed institutions, under the assumption that the gender compositions of those groups change little over the time scale for transition from one to the next.

At later transitions, the statistics are too poor to distinguish between the advancement rates for women and men astronomers; the raw numbers for women are still lower but only at the ~1 sigma level. (This is a "Catch-22" situation: there are few enough women astronomers that the error bars are large, thus it is hard to establish with high statistical significance that women are falling behind.) For combined physics and astronomy, where the statistics are more robust, the progress of women lags behind at all levels. Women are less likely to be hired, are less likely to be given tenure, and spend longer at lower levels (e.g., as associate professors) than their male colleagues. (See articles by Gerhard Sonnert

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Edited by
Meg Urry and Lisa Frattare
Space Telescope Science Institute
cmu@stsci.edu frattare@stsci.edu

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http://www.aas.org/~cswa/status

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and Virginia Valian, STATUS, January 1999, and references therein.)

It is noteworthy that this lesser progress for women occurs during a veritable explosion in national astronomy faculty. Between the two STScI surveys, in 1992 and 1999, the number of professional astronomers increased by 1/3, assistant professor positions increased by more than 50%, associate professor positions by nearly as much (43%), full professors by 1/4, and postdocs by 1/5. It is still a tough job market for new Ph.D.s, certainly, but it is much better than it would be in a steady-state situation. If women fall behind even now, when and how can we expect to attain the gender neutral state?

The Statistics of Invited Speakers: Rough Parity?

Several other statistics are important, if more specific, indicators of the status of women in astronomy. The percentage of women invited to speak at meetings is one measure of the gender neutrality of the field. If women are invited in the proportion appropriate to the particular sub-field (at a seniority level comparable to the male invited speakers), then one would conclude no gender bias is present, at least on average. The speaker-invitation process also has an important feedback effect: evaluation of astronomers for hiring, promotion, tenure, or prizes usually includes an assessment of the frequency with which the candidate is invited to give talks at major meetings. Thus underrepresentation would not only indicate unfairness, it could help perpetuate it.

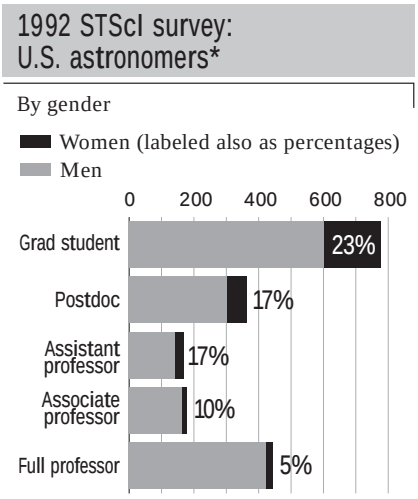
A random survey of about 25 topical astronomy meetings (submitted to this author, roughly equally, by people outraged at the exclusion of women and by others demonstrating how effectively women are included) shows that 9% (+/–2%) of invited talks were given by women, 87% (+/–7%) by men, and 4% by people from whose names gender could not be determined. This is roughly consistent with the percentage of women Ph.D.s over all astronomy, and so is gender-neutral, at least in an average sense. That meeting rosters so often anger women and make them feel excluded may simply be because the numbers are very low — there are still very few women in astronomy.

However, there may be more to the story: this author noted a number of rosters that lacked any women, despite many who have contributed extensively to the particular sub-field. Obviously other rosters must have over-represented women, for the average to end up close to the national average. We would have to evaluate the second moment of the overall distribution to quantify whether this perceived bifurcation is actually non-Gaussian. In the meantime we can conclude that, if meeting organizers make a conscious effort, they should be able to achieve the appropriate 10% representation of women (up to 25% if there are many young speakers).

Inequality in Honors and Prizes

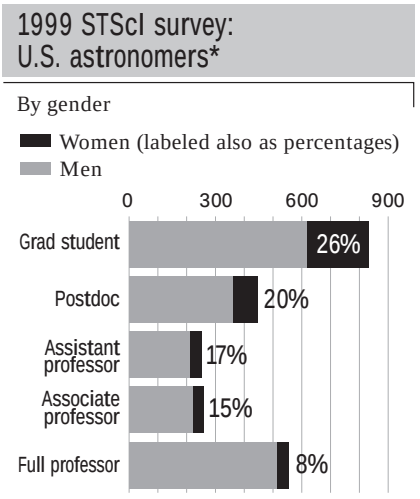
Another statistic is the percentage of women given prizes or high honors. One example is the percentage of women elected to the National Academy of Sciences. In the physical sciences, about 5% of the new members elected over the last 15 years are women, and this is also the percentage in astronomy at present (4 women of 78 astronomy members). This is comparable to the percentage of women full professors across all of astronomy but lower than the percentage of women full professors at the dominant astronomical institutions (8%).

Figure 1



We can also ask what percentage of AAS prizes in the last decade went to women (see table, page 4). Of 96 science prizes, seven went to women (or 7% +/– 2%). The Warner, Pierce, and Urey prizes, by design, go to young astronomers; of the 29 recipients, five were women, less than, but comparable to, the percentage of women postdocs averaged over the past decade. Excluding the planetary award, however, only two of 19 (11% +/– 8%) were given to women, while 17-20% of the postdocs over this period were women. For the more senior science prizes over the past decade (including division prizes), two of 67 were given to women, whereas, based on the percentage of women full professors at top universities and observatories, five to six would be expected. Perhaps most striking, none of the 16 intermediate-age prize winners (Heinemann and Tinsley) have been women; given the ~10-14% women in associate professor positions, the average expectation is about two

Figure 2



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*The 1992 and 1999 STScI surveys looked at four U.S. observatories and 32 U.S. universities with astronomy graduate programs (receiving a 100% response rate, ~1,300 Ph.D. astronomers) while the 1999 AAS study surveyed ~300 U.S. institutions (with a ~60% response rate, ~1,600 Ph.D. astronomers).

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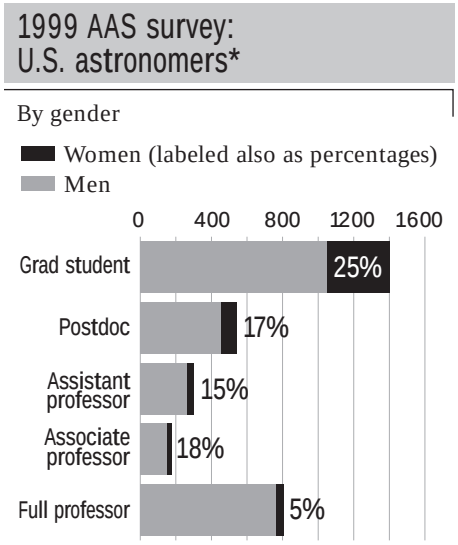
(13% probability that the absence of women would happen by chance).

The expectation is that roughly 12 of the 96 science awards "should" have gone to women if there were no dependence on gender. This comes from assuming 20% of the young winners (5.8), 12% of the intermediate-age winners (1.9), and 8% of the senior winners (4.1) should be women if drawn randomly (with respect to gender) from the appropriate age pool in the past decade. The probability of seven women winning awards when the expectation is 11.8 is only 4%. For service and education or public outreach, the percentage going to women (11% +/–7%) is slightly higher than for science and still below the gender-free expectation (though with large uncertainty, and here the probability of this happening by chance, independent of gender, is 27%).

Figure 3



In summary, women have been winning AAS prizes at a rate significantly below their percentage in the pool of candidates. Certainly women are not winning a disproportionately high share of awards — as is sometimes the claim — with the possible exception of young planetary astronomers (a 20% random probability to have gotten three, rather than two, of the 10 awards).

A decade of prizes and medals of the American Astronomical Society and divisions (1991–2000 inclusive)

Prize	Age	Type	Women	Men	% Women	Notes
AAS						
Warner prize	young	science	2	7	22	no 1994
Pierce	young	science	0	10	0	
Tinsley	(inter**)	science	0	6	0	1990-2000
Heinemann	inter**	science	0	10	0	
Russell	senior	science	1	9	10	
van Biesbrock		service	1	9	10	
Annenberg		ed/outreach	1	4	20	1992-1996
SPD						
George Ellery Hale			0	6	0	1990-2000
DDA						
Dirk Brouwer		science	0	10	0	
DPS						
Kuiper	senior	science	0	10	0	
Urey	young	science	3	7	30	
Masursky		service	1	9	10	
Carl Sagan Medal		public comm	0	3	0	1998-2000
HEAD						
Bruno Rossi winners each year		science	1	14	7	multiple

**Intermediate age classification

Conclusions

The bottom line is that there are still very few women in astronomy, particularly at the senior levels of the hierarchy. The data show clearly that the relatively large numbers of women astronomers at entry levels are not achieving the same success as their male peers. Although at least 10% of the Ph.D.s in astronomy have been awarded to women for more than 100 years — and for the last 20 years, the number has been closer to 20% — the number of women full professors of astronomy is still well below 10%. Women astronomers are not making it to the full professor level at the same rate as their male peers, nor to the National Academy, nor are they receiving a fair share of AAS prizes. And this lack of equal progress is happening right now.

This article describes the objective situation of women in astronomy. It does not speak to individual cases — to the hiring of this or that person, to the awarding of a particular prize in a particular year, to invitations to speak at particular conferences — usually the statistics are too limited in any one instance (e.g., 1 +/–1!) and there are always rational reasons for whatever actions occur. But overall, the data show women doing less well than men in astronomy, most obviously at the first-postdoc stage. At higher levels, the statistics in astronomy alone are too sparse to say, but in astronomy plus physics, the differential attrition continues. We can at least dispel the myth that women astronomers are being hired and promoted and rewarded in preference to men — it simply is not happening. Or rather, if it is, there has to be a "cosmic conspiracy" such that as many women are being discriminated against as are being given preferences.

This unequal situation persists despite the fact that most institutions have affirmative action plans, the intent of which is to identify qualified women and minorities in hiring situations and to make sure they are considered fully. Some universities that feel particularly behind the curve have targeted searches for women and/or minorities, often competing them across several departments. Some view this as reverse discrimination, making it harder for a young man to succeed than a young women. However, the data clearly falsify this perception, at least in a global sense.

Some may ask, what is the reason for this gender difference? (Sometimes the implication of

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John Foley

John E. Foley, Ph.D. worked at Los Alamos National Lab for 25 years, where he held positions as a research scientist, technical manager and Director of Human Resources. He is currently an independent consultant, writer, teacher and scholar in ethics, with an emphasis on workforce diversity.

You All Treat Me Like the Junior Scientist

By John Foley

The Hidden Dimensions of Merit

ALL EMPLOYEES believe that merit should lead to success and reward. This belief is one of the most fundamental and important tenets of the work-place and is referred to as "colorblind meritocratic fundamentalism." Under this tenet, research and development organizations "strive to maximize the production of valuable knowledge and also to reward and empower individual merit." In addition, the "race, sex, class, and indeed all the other personal attributes of the [employee] are irrelevant." (Kennedy, pp. 709-710).

Most white male managers and employees (the "dominant cultural") strongly believe in this fundamental tenet and feel there are few, if any, barriers to success because of race, sex, class, or age. They believe success is earned through individual effort and hard work, and they're concerned that efforts to increase diversity in the workplace through mandated affirmative action programs undermine this fundamental tenet of merit and lower standards. Examples of dominant group beliefs and attitudes are shown in the model of Fig. 1.

Women and people of color (the "subordinate culture") also believe that success should result from merit and hard work, but many feel (1) there are institutionalized barriers that limit their success because of race, sex, and class and (2) their white male colleagues enjoy unearned and unmerited privileges, i.e., they feel the fundamentalist model is too simplistic, incomplete, and unfair. Their more complex views and beliefs are shown in the model of Fig. 2 (page 10), which includes the barriers and privileges that are generally invisible or hidden to members of the dominant culture.

The institutionalized barriers that women and people of color experience in the workplace — and the effects of these barriers — are well documented. For example, the Federal Glass Ceiling Commission reports:

"The body of research … reveals that in the private sector equally qualified and similarly situated citizens are being denied equal access to advancement into senior-level management on the basis of gender, race or ethnicity. At the highest levels of corporations the promise of reward for preparation and pursuit of excellence is not equally available to members of all groups."

But the institutionalized privileges that white men enjoy are rarely discussed or documented. Fortunately, a small and growing body of literature exists (see Delgado and Stefancic).

As long as institutionalized, or systemic, barriers and privileges exist, merit does not necessarily lead to success — and success does not always result from individual merit; i.e., merit is to some extent an illusion.

Institutionalized Cycles of Oppression and Privilege

In America today, privilege is institutionalized. I've developed a model (Fig. 3, page 10) based on the works of Roybal Rose (1996), Chester (1976) and Wildman (1995, 1996) that includes both a "cycle of oppression" and a "cycle of privilege."

The oppression cycle, which is the lower half of Fig. 3, begins with the dominant group believing the subordinate groups are inferior, i.e., less smart, less talented, less worthy. This belief is then institutionalized through discriminatory mechanisms that result in unfair barriers and dis-advantages to the subordinate groups. These mechanisms — i.e., laws, rules, policies, norms, resource allocations, customs — are reinforced by the institutions of society, such as governments, churches, schools, organizations, and families, and lead to economic, political, and social deficits for the subordinate groups.

Figure 1

Typical dominant cultural view of merit and success in the workplace

Merit → Success and rewards

- Strong belief that individual merit leads to success and there are few, if any, barriers or privileges.
- Standards have been lowered for women and people of color; quality is down.
- "I worked hard to get where I am, why can't they? I didn't need help."
- Affirmative action is reverse discrimination. Solutions must be "colorblind." They must be fair to white males.

The privilege cycle, the upper half of Fig. 3, begins with the dominant group believing it is superior (e.g., smarter, more talented, more worthy) to the subordinate groups (the flip side of believing that the subordinate groups are inferior). This belief is then institutionalized through power structures that provide unearned and unmerited privileges and advantages to the dominant group. The results are economic, political, and social rewards and benefits for the dominant group.

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Figure 1

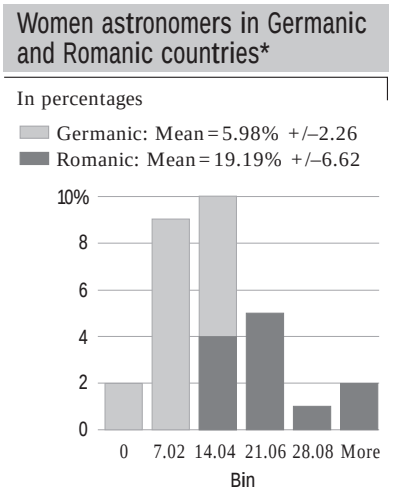


Figure 2

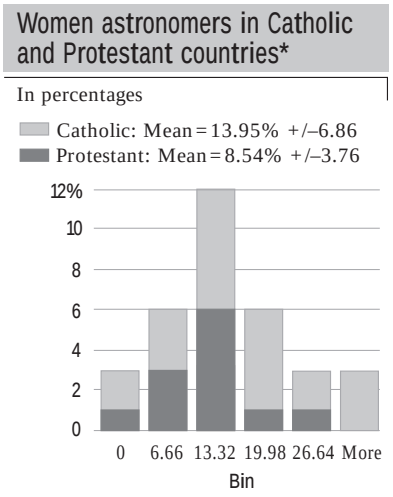
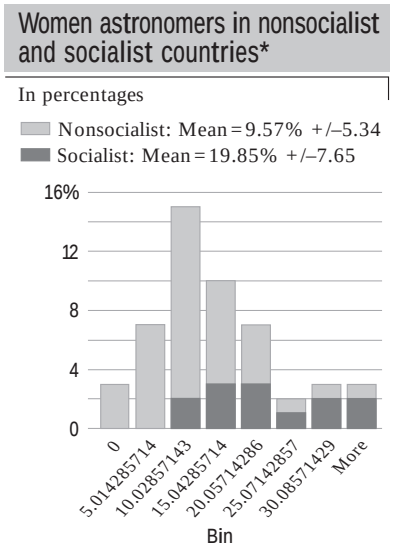


Figure 3



Jorgenson and Strelnitski

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break-up of the socialist bloc — socialist versus nonsocialist.

Our results are plotted in histogram form in figures 1, 2, and 3. They show unambiguously that the mean percentage of well-established women astronomers in Romanic speaking countries (19 ± 7%) is much higher than in Germanic speaking countries (6 ± 2%), and that this percentage is noticeably higher in socialist countries (20 ± 8%) than in nonsocialist countries (10 ± 5%). Perhaps surprisingly, religious traditions seem less important than linguistic roots among nonsocialist countries: the percentages of women astronomers in Catholic (14%) and Protestant (9%) countries is not as different.

What is the deeper cultural tradition, correlating with the linguistic roots of a country, that has created the Romanic versus Germanic dichotomy? What is the key feature of "post-1917 socialism" that so remarkably raised the percentage of women with well-established careers in astronomy?

In order to stimulate a discussion, we propose the following tentative explanations: In Germanic (predominantly Northern European) countries the division of gender roles in the family could have been traditionally deeper than in Romanic (predominantly Southern European) countries, the intensity of division being determined by the severity of the climate. Such traditions are strong enough to persevere despite the dynamism of the modern world.

As for the "socialist versus nonsocialist" effect, it is hard to find an explanation other than the residual of the principles of equality of genders proclaimed by socialist revolutions. It is one of few examples in which the humane theoretical principles of socialism were not completely crushed by reactionary political regimes.

*The following countries were included in graphs:

Germanic countries: U.S.A., U.K., Germany, India, Canada, Australia, The Netherlands, Sweden, Czech Republic, Switzerland, Denmark, South Africa, Ireland, Austria, New Zealand, Norway, Iceland

Romanic countries: France, Italy, Spain, Brazil, Argentina, Belgium, Mexico, Chile, Rumania, Portugal, Venezuela, Uruguay

Catholic countries: France, Italy, Spain, Canada, Poland, Brazil, Argentina, Belgium, Mexico, Switzerland, Chile, South Africa, Hungary, Austria, Slovak Republic, Portugal, Croatia, Lithuania, Venezuela, Uruguay, Vatican City State

Protestant countries: U.S.A., U.K., Germany, Australia, Sweden, Denmark, Estonia, Norway, Latvia, Iceland

Socialist countries: Russia, Ukraine, Poland, Bulgaria, Hungary, Rumania, Armenia, Slovak Republic, Estonia, Georgia, Croatia, Lithuania, Latvia

Nonsocialist countries: U.S.A., U.K., Germany, Japan, Italy, China (Nanjing), India, Spain, Canada, Australia, The Netherlands, Brazil, Sweden, Argentina, Greece, Belgium, Mexico, Czech Republic, Switzerland, Turkey, Denmark, Korea RP, Chile, South Africa, Israel, Egypt, Finland, Ireland, Austria, New Zealand, China (Taipei), Norway, Portugal, Indonesia, Venezuela, Uruguay, Iceland ❖

Authors' biographies:

Regina Jorgenson received her B.S. degree in physics in 1998 from the University of Puget Sound. Shortly after graduating, she received a Watson Foundation fellowship to travel abroad to study the situation of women astronomers in five countries. (See also "A Personal Journey …" by Regina Jorgenson, next page.) She is currently the Assistant Director of the Maria Mitchell Observatory.

Vladimir Strelnitski received his Ph.D. in astrophysics from Moscow State University in 1973. He worked for many years at the Institute of Astronomy of the Russian Academy of Sciences. For the last eight years he has been working in the U.S., first at the Smithsonian Air and Space Museum and New Mexico Tech, and currently as the director of the Maria Mitchell Observatory.

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In 1998 Regina Jorgenson received a Thomas J. Watson Foundation fellowship to study Women in Astronomy and the Effects of Culture on Science. She spent a year traveling in Europe, India, Australia, Japan and Russia, interviewing women astronomers. The following article, an anecdotal look at the trip, is the first in a two-part series. The second, which will be published in the January 2001 issue of STATUS, will contain a more rigorous analysis of interviews and questionnaires.

A Personal Journey of Exploration through the World of Women Astronomers

By Regina Jorgenson

MY FIRST GLIMPSE was of high heels. Followed by a tight, black mini-skirt, leopard-skin print top, coral lips and a crowning head of beautifully curled hair. Surely, this woman descending the stairs before me must be the secretary. I gulped as she introduced herself and only hoped that I was not as red on the outside as I felt I should be. She was indeed the woman I was to meet, a tenured astronomer at a prestigious institute, yet I had never before encountered a scientist who looked or dressed as she did. Her manner and style were typical of the sensual, sexy, Latin-European country from which she came, but were never seen in any scientific institutes or academies I had frequented. I found it difficult to hide my shock as parity emerged between this physical identity and the competent, accomplished astronomer I was to interview. But my greatest shock was the realization that I had judged her on such a superficial level. Me — a politically correct crusader of women's rights, a feminist.

I would soon learn that this embarrassing, humbling experience was only the first in a series of events that challenged not only my unconsciously held biases but also my openly acknowledged moral beliefs. India and Russia, respectively the homes of two value systems I had been taught to disdain — arranged marriage and socialism — were also rumored to harbor strangely female-friendly scientific environments. And Australia, despite its similarity to the U.S., would reveal a unique piece of evidence in an oft-debated question of education. From socialism and arranged marriage to single-sex schools and mini-skirts, my worldview changed as I slowly gathered evidence of how greatly culture can affect the situation of women in astronomy.

I began this year as a crusade, seeking answers to the question of why there are so few women in astronomy — a seemingly worldwide trend. I supposed that by looking at cultures with varied tradi-

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this question is that, if we cannot identify the cause, it is not a real effect, or at least, nothing can be done about it.) Some may conclude that women are less able, although there is certainly no objective evidence supporting this notion. Indeed, many women (and men) perceive just the opposite, that women need to be better to succeed. Another possibility is that (as an NSF program director once suggested to me) women choose preferentially not to advance in the profession. Or there may be subtle barriers, the so-called "micro-disadvantages" that Virginia Valian talks about (STATUS June 1999). We can see that overt discrimination has almost vanished. Faculty search committees today rarely discuss gender explicitly, and never to exclude women candidates. Few of us consider ourselves prejudiced, and few would advocate the promotion of men above women simply because of gender.

There are probably many reasons for the dependence of success on gender, different ones applying in different places and at different times. To "fix" the situation may require diverse small actions, many of which will improve the situation for all astronomers, not just women. But make no mistake: we do not now have a perfect system, we are failing to capitalize on the talents of women who have demonstrated strong interest in our field by pursuing advanced degrees, and we are not attracting and retaining and fostering success among the best minds in astronomy. ❖

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tions regarding the roles and treatment of women I could gain deeper insight into the source of the problem.

In India, I was intrigued to discover how such a traditional society could foster a relatively high percentage of women astronomers. As my interviews progressed, I realized that nearly every woman I talked with was married and had children. It was explained to me that marriage holds such an important social and practical role in the society that all people are expected to marry, usually through a system of arranged marriage. "After all," I was told, "if you don't marry and have children, who will take care of you when you grow old?" This is a viable concern in a state that has no system of social security. Unlike women in the west who often feel that they must choose between family and a highly competitive and demanding job in astronomy, working women in India are not only allowed but expected to take time off for family. Thus, it is not thought unusual or bad that a woman has a family and a career in astronomy simultaneously. In addition, the large, extended structure of most Indian families provides built-in childcare, with grandparents or other relatives available to care for children when both parents are at work. The social expectation that family is most important, coupled with the extended family structure, allows Indian women much more freedom in choosing to pursue a career in astronomy.

Percentage-wise, Russian women astronomers are twice as numerous as their female counterparts in most western countries. This surprisingly high percentage of women in astronomy has a long history in Russia and is commonly explained as an effect of the socialist revolution. Under socialism all people were expected to be educated, to work and to contribute to society equally. Women were therefore commonly found in all areas of the work force and were supported rather than hindered by the social system and cultural beliefs. Extended families and extensive daycare support often helped to alleviate childcare concerns. Sadly, the current situation in Russia for all fundamental sciences such as astronomy is poor and deteriorating. Since the break-up of the government, virtually no money has been spent on scientific research. Yet somehow, many astronomers have managed to hang on. In the words of one woman, "We [Russians] are working on enthusiasm alone right now." Ironically, in this situation, the percentage of women has increased in the field. Men, the traditional breadwinners of the family, have been forced to find other work, leaving opportunities for women who have financial support through traditional family structures.

In Australia, I was surprised to discover that pre-university, single-sex schools are still quite popular. Growing up in the U.S., I had always thought of these schools as antiquated and I knew it was commonly feared that women from these schools would not be able to function, once released into the "real world" (i.e., of male competition). In fact, nearly half of the Australian women astronomers I spoke with were a product of these schools — a fact that seems to support the belief that single-sex schools foster an environment that allows girls to gain confidence in science and math without the burden or pressure of competition with male peers. The significant percentage of women from these schools shows that single-sex education does not hinder potential to succeed in science.

To me, these examples do not advocate socialism, single-sex schools, or arranged marriages per se, but they certainly make clear the need to address the issue of cultural bias when discussing the global lack of women in astronomy. Only through my immersion in these cultures did I realize how complex this problem is. After all, despite the aforementioned positive impacts of culture on women astronomers, there are still many more negative cultural influences. For example, it is well known that girls in India do statistically and consistently much better than boys in school, yet are more likely to fail once they go to university. This trend was explained to me as the result of culturally instilled, gender-specific character traits. Grade school teaches and tests the skills of rote memorization, whereas college requires independent thinking, questioning and problem solving. Thus, in college, men are finally given the chance to apply the skills that were nurtured in them since they were boys — independent thinking and questioning — while women fall behind, usually lacking these skills that were traditionally suppressed by society.

In the past six months, since completing my year of travel, I have received several disheartening e-mails from women I had met, informing me that they have since left the field of astronomy. Hearing this news from women with whom I had so recently spoken left me saddened and acutely aware of how volatile and precarious the apparent success of women astronomers might be. Although it is commonly thought that the situation for women is improving, we must be careful to maintain international support for the encouragement of women in astronomy. Blatant discrimination against women in science is mostly a thing of the past. Now we must face the more difficult task of first recognizing and finally eliminating the subtle and culturally grounded obstacles that are keeping women from reaching the stars. ❖

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Laurie McNeil is a professor in the Department of Physics and Astronomy and the Curriculum in Applied and Materials Sciences at the University of North Carolina at Chapel Hill. In 1997 she was Chair of the APS Committee on the Status of Women in Physics. Both Laurie and her husband, Pat Wallace are condensed matter physicists.

Marc Sher is a professor of Physics at the College of William and Mary, specializing in particle theory. He is currently news editor and electronics communication editor of "Physics and Society," *and a member of the APS Panel on Public Affairs. His wife, Beverly Sher is a Visiting Assistant Professor/Health Careers Advisor at William and Mary.*

This article is an excerpt from the full report entitled *"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*.

The Two-Body Problem:

Seeking Employment for Dual-Science-Career Couples

By Laurie McNeil and Marc Sher

THE "TWO-BODY PROBLEM," as the difficulties faced by dual-science career couples is jocularly known, is an increasing problem in physics as well as in other areas of science. The increase in recent decades in the number of dual-career couples has meant that more professionals of all kinds are facing the problem of finding two suitable jobs in the same geographic area. The situation has a particularly acute effect on women in physics, because 79% of married women physicists have a physicist or other scientist as spouse (compared to 18% of married male physicists).

Another difficulty that physicists share with some other sciences is the small size of the field. With the exception of a few "meccas" such as the Bay area, the number of physics (or physics-related) jobs available in a particular place at a given time is likely to be very low. Further difficulties arise when the two members of a couple are not at the same point in their careers (receipt of Ph.D., end of post-doc, etc.) at the same time, meaning that the two are seeking positions at different levels or at different times. This difficulty increases as the couple's careers advance, because higher-level positions are scarcer than entry-level ones. If the geographic location of the job search is based on the opportunities available to the more senior partner, the junior partner may not be able to find a position appropriate to obtain the credentials necessary for advancement later. If the junior partner's opportunities are the determining factor, it is difficult for the senior partner to find a suitable position as entry-level positions are always more numerous than senior ones.

Dual-career couples

Laurie McNeil and Pat Wallace

Marc and Beverly Sher

In order to get a sense of the nature of the problems faced by dual-science-career couples, and the institutional responses (helpful and detrimental) that they invoked, we conducted a web-based survey under the auspices of the American Physical Society's Committee on the Status of Women in Physics. The survey was launched in January 1998, and eventually received 632 replies. A complete account of the survey responses, and the recommendations we developed from them, can be found at http://www.physics.wm.edu/dualcareer.html. Here we present a brief discussion of the kind of difficulties dual-science-career couples face, and a sampling of comments from the survey respondents. These include the kind of unhelpful responses that a distressingly large fraction of institutions have given when faced with such situations.

The ideal, of course, is to find two jobs at the same time, in the same (desirable) location, with each job well suited to the qualifications of its holder. Most couples find this ideal to be unobtainable at some point in their careers. They may choose to have one member of the couple play the role of "leading partner" and take the best job available, thereby determining the location in which they will settle. The "trailing partner" then tries to find a suitable job in that location. The choice of which partner will play which role can be influenced by professional seniority, research specialty (often the specialist

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These rewards and benefits then reinforce the original attitude of superiority.

It is important we understand and examine both of these cycles. If we look only at the oppression, or discrimination, cycle we will be left with the impression that the dominant culture is "normal" and the subordinate cultures are the "other." Also, by considering only oppression, we collude with the power structures that cause oppression by making invisible the unearned privileges and benefits of the dominant group.

Mahoney (p. 331) points out that privilege is hidden, or invisible, to members of the dominant culture:

"The privilege that facilitates mobility and comfort in ordinary life is particularly difficult for whites to see … White privilege therefore includes the ability to not-see whiteness and its privileges."

McIntosh (p. 294) suggests that white privilege is "an elusive and fugitive subject" and the "pressure to avoid it is great, for in facing it I must give up the myth of meritocracy." West (pp. 139-143) notes that in academic institutions hiring, promotion, and tenure are "based, in part, on merit, but also on race, gender, class, and a variety of mis-cellaneous attributes not related to academic qualifications."

Figure 2

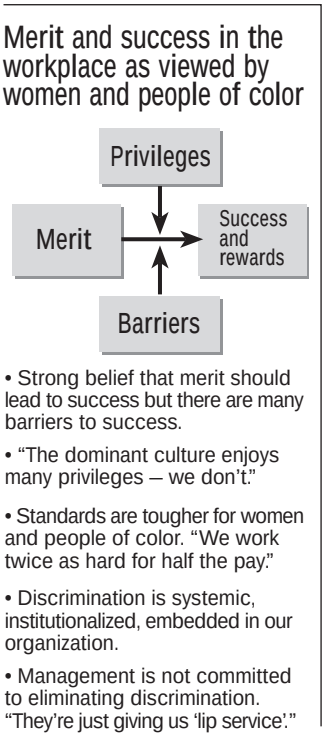
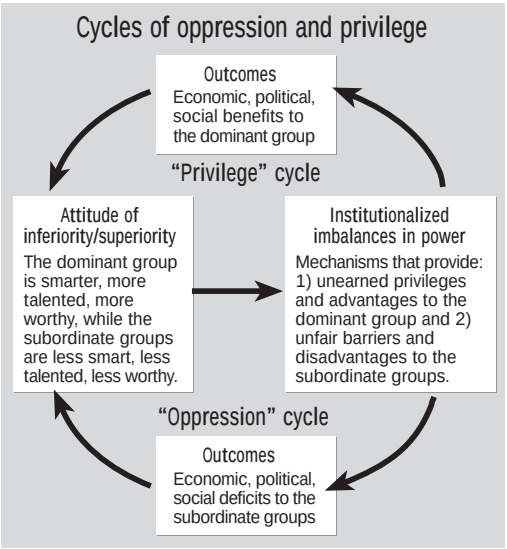


Figure 3



"You All Treat Me Like the Junior Scientist"

In the early 1980s, I became the leader of a nuclear research group at the Los Alamos National Laboratory with about 25 scientists, most of whom, like myself, were white, male, 35-45 years old, and held Ph.D.s in nuclear engineering or physics. My involvement in diversity issues at the time was primarily legal — we had affirmative action and equal opportunity programs because we were required to have them.

Soon after I became the leader of this group, a young (white) woman scientist (I'll call her "Jane") complained to me, "You all treat me like the junior scientist." She felt "junior" because she was treated differently; for example, she was never included in planning meetings that the other scientists attended, she was never invited to make presentations whenever our research program was reviewed, and she never participated in field exercises when we tested the nuclear measurement instruments we designed and built. Also, she felt her work as a computer scientist was viewed as a support role, rather than as research. In short, she felt she was being treated unfairly because she was excluded from important group activities. This exclusion was occurring because she was different from the other scientists in the group, i.e., she was young, a woman, had "only" a master's degree, was not a physicist, and was doing support rather than research. Jane's situation is shown in Fig. 4 (page 11).

Jane presented convincing arguments about her unfair treatment and after several discussions with her I began to understand that I'd been oblivious to the unfairness in our group. Eventually, Jane and I came to an understanding that I would make affirmative efforts to include her fully in our group's activities and opportunities.

It turned out that Jane had tremendous talents that I hadn't known about and during the next few years she made significant original contributions to our research efforts — contributions that were on a par with those of other scientists in the group.

I wasn't the only one that saw Jane as "junior," we all saw her that way. The barriers — involving sex, class, and age — were deeply embedded in the attitudes and beliefs of most members of the group and were institutionalized through norms of what a research scientist looks like. These norms not only resulted in barriers for Jane, but they also afforded privileges to those who were white, male, not too young or too old, physicist, and Ph. D. Both the barriers and the privileges were largely invisible or hidden to the dominant members of the group. I was unaware of these barriers until Jane pointed

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them out. Unfortunately, it is easy and convenient to remain unaware or oblivious of them through mechanisms of denial or blame.

If these barriers had been due only to my personal prejudice against Jane, then this story would be one of non-institutionalized oppression, rather than institutionalized oppression based on sex, class, and age. But since the beliefs were deeply embedded in the thinking of the members of the group, Jane's "junior" status resulted from institutionalized discriminatory mechanisms that caused her to be treated differently from everyone else and to be excluded from activities and opportunities. This was not an individual act against another individual, but the result of institutionalized beliefs that had been codified in discriminatory mechanisms of exclusion and marginalization.

Because of my positive experience with diversity — Jane's story being one example — I was convinced there was truth in the familiar argument that a diverse workforce is a better and more creative workforce. I was able to move quickly beyond denial and blaming and became a believer in the utility of diversity in the workplace. And as the opportunities occurred, I would lend a hand to help women and people of color.

"What Have You Done For Us Lately?"

In 1986 I became the first Director of Human Resources (DHR) at Los Alamos, and I was responsible for the human needs of nearly 8000 employees. In this position, I was able — with the help of many people of good will and good intentions — to champion the push for a more diverse workforce.

But by 1989, three years after becoming the DHR, our diversity initiatives were not going well. I felt I was under siege from women, people of color, and my white male colleagues. For example:

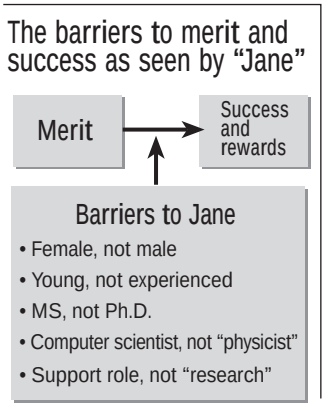
• Women and minority groups: These groups seemed to demand we do more and more for them. Every time we did something to help them, they came back with additional demands. Our help never seemed to satisfy. It was as if they were asking, "What have you done for us lately?" And our answers were always lacking.

• My white male colleagues: Most white male managers and employees resented our diversity initiatives. Some didn't believe women and people of color experienced barriers or unfairness. Others felt that if women and people of color experienced problems, it was their own fault. Frequently I was told, "I came to Los Alamos to do good science, not social engineering." Many white male managers felt our affirmative action efforts were lowering the quality of the scientific staff. In addition, they argued that affirmative action was reverse discrimination.

• My bosses: They wanted quick fixes to our diversity problems and concerns; i.e., "What's taking you so long?" And they wanted the tensions involving race, sex, class, age, etc. to just go away.

I didn't like the criticism I was getting for trying to help women and people of color, and I was sick and tired of being viewed as the bad guy by everyone. I didn't have a clue as to why our efforts to establish a more diverse workforce were floundering. And I didn't understand that by trying to help women and people of color, we were doing diversity wrong.

Figure 4



"We Don't Want Help We Want Justice"

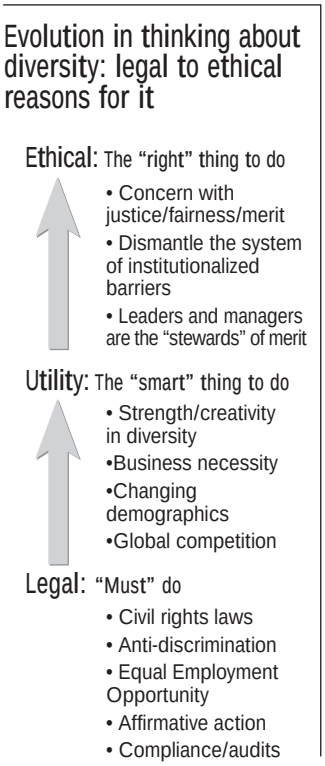
In 1990, I attended a workshop on cross-cultural communications led by Lillian Roybal Rose. After the workshop, I had an opportunity to discuss with her my frustrations in trying to help women and people of color. She said (Roybal Rose, 1990),

"John, don't ever do anything 'to help' me. If you do, I'll eventually hate you for it because your actions will be condescending and patronizing — and I don't want to hate you."

Her comments startled me because I thought I'd been hearing women and people of color say, "What have you done for us lately?" But from Roybal Rose, I heard something different.

She explained that dominance is inherent in the phrase, "to help," and it's certainly a large factor in why our attempts to help women and people of color are floundering. And because helping that comes from dominance is patronizing and demeaning, then "there is no trust, no respect, no real liking, on either side" (Roybal Rose, 1996, p. 28). By "helping" we are continuing the subtle dominance (subtle to white males, but not to women and people of color!) of men over women, whites over people of color, scientists

Figure 5



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over non-scientists, etc., which has been going on at Los Alamos for 50 years.

"We don't want 'help,'" Roybal Rose said, "we want justice."

She argued that we both must work for justice. My role, as a white male with power over her in the oppressions of racism and sexism, is "to act justly and not dominate," and for her part, "I say to white people that I will always see their humanness even if they never understand about racism" (Roybal Rose, 1996, p. 42). Neither of us can shrink from our commitment to justice, no matter how tough the struggle becomes.

Jane's Story — Revisited

Before I'd met Roybal Rose, I'd always thought of Jane's story as a story about me helping Jane become a better scientist. But with new insights, I realized that Jane's story is not about "helping" — it is about justice.

When Jane first came to talk to me, she was concerned about how we were treating her, i.e., about the unfairness of being excluded from participation. She wasn't suggesting that her talents weren't being used (although we were to discover they weren't), she was concerned with fairness, with justice.

And by removing the barriers to fairness and including her more in our group's activities, we became a more productive group. Jane didn't need my help because she lacked talent, or because she wanted special treatment. What she needed from me was help in removing the unjust barriers. And as the leader of our group, I was in a position of power to do this, i.e., I was in position to challenge — in a small way — the prejudiced attitudes and discriminatory mechanisms of the institutionalized oppressions (Fig. 3) that were embedded in our group and throughout Los Alamos.

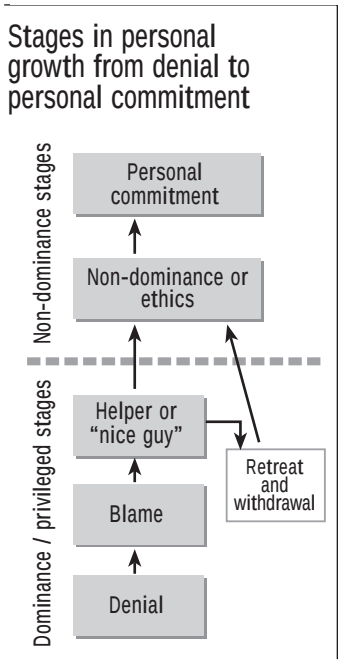
And now when I discuss Jane's story in terms of "justice" rather than "helping," it goes like this:

Jane didn't need my "help," she needed justice. And by working for justice, we became more productive. We also became more diverse.

This leads me to the following conclusion about how we should think about both merit and diversity in the workplace:

Justice is a prerequisite for merit. It's also a prerequisite for diversity.

Figure 6



Justice is the most powerful argument for diversity because it requires that the institutionalized system of unfair barriers and unmerited privileges (i.e., Fig. 2, Fig. 3) be dismantled.

The evolution in my thinking about diversity is summarized in Fig. 5 (page 11). Initially I was involved in diversity issues because I was legally required to do so, based on civil rights laws. I think of such involvement as "must" do — I had no choice. Then I learned there were practical or utility reasons for diversity — it made good business sense, i.e., it was the "smart" thing to do. Finally, my understanding moved to ethical reasons, such as justice — the "right" thing to do. It is only by dismantling the institutionalized system of unfair barriers and unmerited privileges that we can arrive at a truly meritorious workplace.

Towards Justice, Merit, and Diversity

The simplistic view of merit and success, as shown in Fig. 1, commonly held by many white male managers, involves (1) denial of the institutionalized barriers and privileges and (2) blaming of women and people of color for their marginal success in the workplace. These dominant views are shown as the two lowest stages of the model in Fig. 6, which is a model of personal growth and commitment to justice. In the lower stages of this model, managers are found in three stages of (mis)understanding of race and gender issues in the workplace or in one stage of retreat and withdrawal. These stages are:

Denial: The manager is oblivious to the barriers and privileges, or he simply chooses to remain unaware (only members of the dominant culture have the luxury of such ignorance); i.e., "Discrimination is a thing of the past. We live in a colorblind society. I don't even see color. I've always been judged by merit, and I only judge merit."

Blame: The manager believes that the gender and race problems in the workplace are caused by women and people of color; i.e., "They should just quit being victims and quit complaining. I've made it by my own efforts — why can't they? They're getting more favorable treatment. It's reverse discrimination."

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Helper or "Nice Guy:" The manager understands that some barriers exist for women and people of color, and he sincerely wants to help "them;" i.e., "Even though I've never discriminated against anyone, I feel a little guilty about the way they have been treated in the past by others, so I'll help out."

Retreat and Withdrawal: The manager becomes frustrated with his efforts to help. He is criticized by women and people of color for not doing enough, and, at the same time, he is criticized by his white male colleagues for doing too much. Consequently, his feelings get hurt because he isn't appreciated, and he fears losing the respect of other white males. Therefore, he becomes defensive — he begins to pull back from helping, becomes captive to political correctness, and numbs out. This is the stage I discussed earlier concerning my frustrations about our floundering diversity efforts at Los Alamos in 1989.

Roybal Rose (1966, p. 42) points out that these defensive behaviors of white people, such as political correctness, lack of spontaneity, and pulling away, are difficult for women and people of color to deal with:

"For People of Color, an encounter with a white person who knows what is right but has not processed it emotionally can be frustrating and exhausting. Every word, every signal breeds confusion. Whites busily guarding a politically correct posture are impossible to reach on a human level, because they have an image to protect."

From Dominance to Diversity

Even though this pattern of denial, blame, helping, and retreat is com-mon among white males, it is not inevitable. We can choose to break the pattern and move into the two highest stages of Fig. 6. We can move from dominance to diversity.

Non-dominance or Ethics: The manager understands that if we want diversity in the workplace, we must first achieve justice. And to achieve justice, the manager must become a just person.

He knows that real merit cannot be achieved until: (1) the unfair barriers that women and people of color experience in the workplace are eliminated and (2) the privileges that white males enjoy are available to every-one.

This manager understands that in order to begin to dismantle the institutionalized system, both personal and collective efforts are necessary. The struggle to end racism (hooks, p. 195) "… is a struggle to change a system, a structure. … For our efforts … to be truly effective, individual struggle to change consciousness must be fundamentally linked to collective effort to transform those structures that reinforce and perpetuate white supremacy."

The collective effort must be directed at all three components of the institutionalized cycles of privilege and oppression (Fig. 3), i.e., at prejudiced attitudes, at imbalances of power, and at inequitable outcomes.

The process that one needs to go through in personal effort to unlearn sexism and racism is both emotional and cognitive. Roybal Rose encouraged me "not to shrink from the emotional content of this process." She explained (Roybal Rose, 1996, p. 42):

> When the process is emotional as well as cognitive, the state of being an ally [to women and people of color] becomes a matter of reclaiming one's own humanity. Then there is no fear, because there is no image to tear down, no posture to correct. The movement to a global, ethnic point of view requires tremendous grieving.

"Justice is a prerequisite for merit. It's also a prerequisite for diversity."

The journey from dominance to diversity begins with listening. The white male manager:

- Learns to really listen to others, i.e., to pay attention without intention.
- Develops a new sense of personal honesty and humility about racism, sexism, and other oppressions, and about the privileges that he enjoys in the workplace and in society. He understands "that race makes a difference in people's lives and that racism makes a difference in U.S. society" (Frankenberg, p. 159). He learns that facing up to one's own biases, prejudices, and privileges is the beginning of liberation.
- Adopts a deliberate skepticism about his own ability to make racial and gender neutral decisions. Involves others — women and people of color, as well as other white men — in decision making to uncover institutionalized barriers and privileges.
- Engages in open and honest discussions about racism, sexism, and other oppressions and about privileges with white men, women and people of color.

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John E. Foley
P.O. Box 15163
Rio Rancho, NM
87174
JefEthics@aol.com

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- Reads and studies the works of others who have struggled with unlearning racism and sexism.
- Seeks out examples of institutionalized oppressions and privileges in the workplace and actively works with allies — other white men, women, and people of color who are committed to justice — to eliminate them by changing policies, procedures, beliefs, and attitudes.
- Discovers white male pride and connects with the universality of human experience.

And the journey leads first to justice, then to both merit and diversity.

Personal Commitment: Working with allies, the manager uses — but not misuses — his position of power and privilege in non-dominant ways to work for justice, merit, and diversity in the workplace. He does this because he understands the loss to himself and to others caused by the subtle and not-so-subtle injustices and privileges in the workplace.

The ethical challenge for white males, and others in dominant positions, is this: We must use our positions of power to tear down the unfair institutionalized systems that gave us the power in the first place. This is what we must do if we believe in merit, justice, and diversity in the workplace. And we will be better off if we do it. We should not shrink from this challenge, no matter how tough or uncomfortable the struggles becomes.

This is a difficult stage for the white male because he is under tremendous pressure from his colleagues who are still in the lower stages of Fig. 6 to return to his earlier dominant attitudes and be-haviors. He must resists these pressures by remem-bering that in the long run the (1) dismantling of the existing system of institutionalized barriers and privileges and (2) achievement of merit, justice and diversity are in both his organization's and his own best interest. ❖

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Professor William C. Keel was educated at Vanderbilt and UCSC and held postdoc positions at KPNO and Leiden. He has been at the University of Alabama, Tuscaloosa since 1987. Since 1992 he has mentored five "Research Experience for Undergraduates" students, three of whom are women (with his first being STATUS co-editor, Lisa Frattare). The meeting of NSF REU mentors he refers to below occurred at the AAS meeting in January 1994; it included a more or less serious discussion of the propriety of faculty and students of opposite sexes observing together at remote sites.

Reflections on Status and STATUS

By William C. Keel

A RECENT E-MAIL message from Lisa Frattare finally pulled me into typing up some thoughts I'd had since seeing the last issue of STATUS, and some of which I'd talked about with her. They may not be quite suitable for publication, but may contain some grains useful for thought. The timing was interesting — she sent some copies of STATUS along with a bunch of pictures I plan to give away at an HST 10th-anniversary shindig, and I read it the same day that our faculty fellowship group had a speaker from the communications department who addressed feminism and Christianity (and her message was indeed more than "go read Deborah Tannen and then come back"). But I digress. In astronomy, a view from a different direction can be very enlightening, so perhaps the same thing applies here.

Howard Georgi's article (from the June 1999 issue of STATUS) was both interesting and tantalizing. Several times he seemed on the verge of enunciating a crucial insight and then backed away. Maybe that means there's all that much more to do simply in formulating the issues clearly enough. Or maybe I'm so far out of it that I missed them in a perfectly adequate expression.

In a fascinating example of interdisciplinary luck, I found much to learn in the article on soccer coaching (from the January 2000 issue of STATUS). In hindsight, I can see just these issues of men and women responding differently to various teaching/coaching styles explaining some hitherto puzzling things I've seen in small lab classes. Typically, I see students form groups of three, with one doing 3/4 of the activity, a second doing 1/4, and the third — all too often the only woman in the group — apparently disconnected and just writing it all down. Maybe I'm starting to get the tools to mix things up a bit.

Indeed, most academic departments don't seem all that friendly to family issues, period. A previous department chairman here got pretty ticked that I didn't want to serve on a tenure committee that would meet intensely for a 3-week period that included the due date for one of our children, finally asking "Look, is she having the baby, or are you?" The same guy was also snitty about my not wanting an 8 a.m. class because of the timing with regard to getting kids to school (7:55 starting bell), when we both knew that there were faculty with no such constraints, who refuse such classes simply because they don't like getting out of bed that early. We have a new chairman now, who has an 8th-grader, and somehow he seems to remember what it's like much better.

Ah, haven't we all had it professionally and personally with those grunts who have no life outside their work? That was, of course, the proper behavior that most grad schools tried to socialize us to, probably because only with such monomania could most of us stick with it to finish a degree and get a first job. Truth in advertising compels me to admit that I probably didn't acquire a life until well into my first postdoc. There's no denying that it's a professionally fruitful way to work. We cannot compete with folks who put 16-hour days in for decades. It's just frustrating when they insist that everyone else should do so as well. At least, since there's widespread anecdotal evidence that female grad students and postdocs are more likely to have genuine lives, a little more diversity in the field could be good for everybody. Well, all right, everybody except (names deleted on advice of counsel).

I was initially taken aback that the NSF REU program dealt with the issue of who should go observing with whom, but maybe on second thought I shouldn't have been. I know men who make a point of honoring their marriage commitment by never being alone with another woman in any possibly compromising or tempting situation. If one's professional situation allows it, this is to my mind a perfectly defensible view. However, in the case of an observer who mentors fledgling observers, doing so would result in a *de facto* disadvantage to some.

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in the more arcane area will have more limited choices of location), preference in employment type (academic, industrial, national lab), or personal dynamics. The traditional pattern is for the man to lead and the woman to trail, but this is not the case for all couples, especially younger couples and those in which both members are at roughly the same stage in their careers. Regardless of which member leads, the trailing partner is often hard-pressed to find suitable employment. If no job commensurate with the trailing partner's qualifications can be found, s/he may end up underemployed or unemployed. This situation has led many people, and especially many women, to leave physics altogether.

While to a degree these problems are personal ones that individual physicists must solve for themselves, it is within the power of institutions to help ease the situation or to make it worse. In the responses to our survey, we have collected many examples of the ways in which potential employers can contribute to, or at least fail to cope with, the problems of dual-career couples. In this section, we will discuss the different ways in which institutions can make the problems worse. Here we discuss the different ways in which institutions can make the problems worse. The happier story of how some institutions have solved the problem in particular cases, and the description of effective strategies for both job seekers and institutions, can be found in the final report on the Web.

Reduced consideration for members of dual-career couples

One form of problematic response is to give reduced consideration to candidates who are in a dual-career situation, perhaps with the justification that a candidate free of such encumbrances would be more likely to accept a potential offer. If the candidate does not volunteer the information that she or he has a spouse who is a scientist, obtaining that information requires asking questions which are forbidden by Equal Employment Opportunity laws and guidelines. This may render such a response legally actionable. According to the experience of our respondents, during the screening and interview process, potential employers often ask questions that are not permitted under EEO laws. Members of academic search committees, in particular, are often unaware of the rules governing personal inquiries, or may be aware of them but choose to ignore them.

> "The department chair called me at home and asked me several questions about my marital status. He said that he knew these were illegal questions but that he was going to ask them anyway and I could decline to answer them if I wanted. When he found out I was married to a physicist, he said there would be no opportunities for him to be employed in the area. He also said they now screen all candidates because they have offered jobs many times only to be turned down in the end because a spouse could not find a job. A week later I called and found out I was totally off the list. I reported this to the dean and the search was cancelled."

> "Though the potential employer is not supposed to ask personal questions pertaining to [pregnancy], I found in my experience that questions of this sort do come up, and the interviewee is forced to state her position."

Once a potential employer finds a candidate to be desirable and contemplates making an offer to one member of a dual-career couple, often the employer makes assumptions about what the candidate's response will be rather than allowing the couple to make their own decision. In particular, potential employers often assume that a woman (far more often than a man) will refuse an offer if a suitable position is not available for the partner.

> "I was told that they had already decided not to pursue my application because they 'knew' that I wouldn't be interested in moving since my husband wasn't moving to a position in the area."

> "Interview was cut short when it was discovered that the spouse was also a scientist."

> "I was asked where my husband would be working. It was made clear to me that if my husband did not have a job nearby, I would not be considered for the job."

Nepotism and resistance to hiring the spouse

In many cases, particularly in geographic areas where there are few employers of scientists, the potential employer may be asked if a position for the candidate's partner could be found in the same institution. Such a position may be difficult to produce, depending on the partner's field and qualifications, and on the availability of openings at the institution. However, additional barriers may be raised even when such a position is potentially available. Members of the institution may feel such hires are inappropriate in principle, regardless of the partner's qualifications.

"I remember in particular one senior male faculty member telling me how hard it is to get new professors, because so many of them had

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spouses who were scientists. This faculty member said he was not about to 'burn' a tenure slot just for somebody's spouse."

Or, the institution may generalize inappropriately from a single experience (or even rumor) involving the hiring of both members of a couple.

> "At my institution a manager stated that he would not consider dual career couples in his section because it 'always leads to trouble"

Or, nepotism rules may be invoked to reject such a possibility. This may occur even if the institution does not have such rules any longer, or if they are simply matters of administrative policy (which could potentially be changed) rather than legal restrictions. Whether or not they exist, nepotism rules are invoked far more frequently to forbid the hiring of the woman rather than the man.

> "One cited anti-nepotism rules as making it impossible to consider both of us (the rules hadn't existed for years, but apparently the department chair was unaware of this fact.)"

Particularly when the trailing partner is female, potential employers may assume that she is less qualified, or that her ambitions are limited enough that she will accept a position that is beneath her qualifications (or no position at all).

> "Most of them assumed that since I am a woman, I should be satisfied with a lesser job. They almost did not take his concerns too seriously. (We both have Ph.D.s from the same university with very comparable credentials.) One of them was interviewing him for a Asst. Prof. position and tried to set up a Post-Doc position for me."

> "'They suggested that I might consider giving up my career."

> "One department chair said that trying to find two jobs was a bad strategy and that things worked best if one partner took the best job available and the other stopped working."

> "We both made the short lists for several faculty searches. In every case, we told the committee about our situation before we agreed to visit. In two cases, with respect to the male being the candidate, the search committee seemed to indicate that the two-body problem was too complicated for them to solve. In two cases, with respect to the female being the candidate, the search committee said that they were interested in solving the issue, if needed."

Captive spouses and insulting offers

If an institution chooses to offer positions to both members of a couple, often one offer may be for a permanent position and the other for a part-time or "soft money" position. Our survey results and APS statistics indicate that the lower-level offer goes more commonly to the female member of the couple. A promise may be made that a full-time or tenure-track position will become available later, but many times the woman is not given full consideration for the subsequent position because she is perceived to be "captive."

> "Two extremely talented scientists. The husband, a little ahead chronologically in his career, has tenure at a large university. The wife is teaching and doing research at the same university on soft money. Despite her glowing teaching and publication record, she has been constantly passed over on recent job searches. Documents secretly released to her seem to indicate the search committee hopes she will just stay, on her soft money: 'after all, her husband has tenure. Why waste a real job on her?'"

Or, she may simply be taken advantage of:

> "They gave her a desk, and ultimately a title, though no salary (although the university takes overhead on her grants). She is forbidden to use the department secretaries for grant preparation, however."

> "She has been an instructor for 15 years now, with low pay and a heavy teaching load, and despite this she has been successful at attracting grants and publishing papers. She recently led a successful fight at our university to win the right to submit grant proposals under her own name rather than having the chair of her department as P.I."

> "My institution has a long history of hiring the wives of professors into soft-money positions with no possibility of independent research or of consideration for hiring as tenure track faculty. Every woman who has tenure here has either sued or threatened to sue the institution."

Even if offers of permanent positions are made to both members of a couple, the salary or start-up funds that are offered may be colored by the perception that the couple is in a weak bargaining position due to the dual-career situation. While this perception may be accurate, taking advantage of it is not a way to produce a happy and productive pair of employees.

> "Employer made an insulting and degrading offer to my partner, which she was

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In honor of the 250th anniversary of the birth of Caroline Herschel (March 16, 1750), Kristy Dyer, a Ph.D. candidate in the Physics Department at North Carolina State University and previous contributor to STATUS, has composed a short biography of this notable woman astronomer. We thank Professor Fran Bagenal of the University of Colorado for contributing material for this biography.

In Memory of Caroline Herschel

By Kristy Dyer

Portrait of Caroline Herschel by Georg Busse, Hanover, Germany, 1847. Courtesy of Adler Planetarium & Astronomy Museum, Chicago, Ill. (P-144)

ALTHOUGH Caroline Herschel was born into a musical family, her mother felt that her only role was as a domestic servant and blocked all attempts at her attending school. At age 22 her favorite brother William "bought" her freedom by offering to pay for a maid to take her place. She then moved to England and started crash courses in English, deportment, singing and dancing, in addition to taking over the household duties. Her goal was to be self-supporting and, indeed, within a year she was in demand to sing solo oratorios. At the same time, astronomy was taking up more and more of her brother's spare time. In 1782 William was appointed Royal Astronomer, and this ended Caroline's singing career: "I have been throughout annoyed and hindered in my endeavour at perfecting myself in any branch of knowledge by which I could hope to gain a creditable livelihood."

William started a series of "Little Lessons for Lina:" algebra, geometry and spherical trigonometry. Since he belittled her memory abilities as "sand in which everything could be inscribed with ease, but as easily effaced," she took constant and detailed notes, later made detailed recordings of his observations, and applied extraordinary perseverance and high standards of accuracy to the catalogues she compiled. With a small telescope she found 14 new nebulae for the catalog and discovered five comets in 10 years, although she noted that she could really only observe when William was out of town since she was at his constant beck and call when he was working!

In 1787 she was appointed assistant to her brother with a salary of 50 pounds a year: "… the first money I ever in all my lifetime thought myself to be at liberty to spend to my own liking." At William's request she spent 20 months revising the Flamsteed catalog of 2,935 stars. "I found the indispensable necessity of having this index recur so forcibly," William Herschel said, "that I recommend it to my sister to undertake the arduous task." Caroline corrected errors and added 561 previously unobserved stars to the catalog, which was then published by the Royal Astronomical Society in 1798.

William died in 1822 and Caroline, not expecting to long survive her brother, moved back to Hanover. She turned her room into an office with a writing desk and bookshelf and there she made a complete catalog of all of William Herschel's nebulae and clusters, and in 1825 mailed it to her nephew, John Herschel. "I learned fully to appreciate the skill, diligence and accuracy which that indefatigable lady brought to bear on a task which only the most boundless devotion could have induced her to undertake, and enabled her to accomplish," John noted. He used it extensively in his work but delayed publishing any of it until 1864, in order to include his own catalog.

Caroline Herschel's comets are listed at http://www.ozemail.com.au/~asnsw/articles/comether.htm

Caroline Herschel's deep sky objects are listed at http://www.seds.org/messier/xtra/similar/cher.html ❖

Lisa Frattare

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Lisa Frattare is an Outreach Specialist at the Space Telescope Science Institute. She has been the main image processor on the Hubble Heritage Project team for nearly 3 years and has co-edited STATUS since 1998. Her daughter was due in early May 2000 (actual birth date unknown at press time).

Pregnancy and the Workplace — A Personal Perspective

By Lisa Frattare

I KNOW THAT not all STATUS readers are interested in every topic involving female astronomers, particularly when it is not one directly relevant to their own lives — hence the need for descriptive headlines. Sometimes it can be useful, however, to get a glimpse from another perspective. For example, I have never had to consider dual-career couple-hood myself (I purposely chose a non-astronomer as a mate!) but I do know lots of dual-career astronomy couples, so reading such articles helps me to understand their situation a bit more.

The same goes for the issue of pregnancy and the workplace. It may not appeal to everyone, but for those of you who were intrigued enough by the title to read on, I thought I would share some of the previous nine months' experience of being pregnant and how this played a role in my everyday work in astronomy.

Job-related Flexibility

I can start by saying that the outlook is very good in my current job. I have tons of "flexibility." (You will hear me say that a lot.) If you know me personally you have heard me moan about how my husband thinks my job is, "just, oh, so flexible." I have flexibility in the time of day I can come and go, flexibility in my sick time and vacation hours if I need to knock off early to attend a doctor appointment or a birth class.

I will have flexibility once the child is here in that I can take her to the doctor. I can telecommute, I can reschedule long projects for after my leave and pull rabbits out of hats and do all sorts of things that most people who are confined to a 9–5 job cannot do. I can even work precisely 8 hours per day unlike some folks who get paid for 9–5 but really work 7–7. (See reference to inflexible husband, above. Oops, maybe I should have married an astronomer!)

So on the job front, life appears stable. I feel no overwhelming concerns about how in the world I will manage being pregnant, having a child, taking time off, starting in with daycare, etc. That stuff will work itself out extremely well. I was even surprised to learn that, because of Short Term Disability, for approximately six weeks during my leave I actually cannot work regardless of how I feel! At first I said to my Human Resource representative, "What do you mean I am forbidden to work! Can you do that?" She explained it was actually to protect me, to ensure I keep my job, and suggested I must have some projects of my own if I have time on my hands. (I have "flexibly" rescheduled some science papers for this time and might even get started on the next issue of STATUS well before the deadline!).

Support and The Need to Regain Control

I also have had tons of support from managers and supervisors. One supervisor said, upon hearing I was pregnant and when I was expecting, "Lisa, this is great news, I am so happy for you! I will be having a nervous breakdown later in the day, however." I took this to mean I am vital, important, and not expendable nor easily replaced in the work I do. What a fantastic response! (Perhaps managers are trained to say things like that?) Someone else might think my manager is implying that things will fall apart with me gone and thus to hurry back, but I do not feel any implied pressure to return too early, or to have to check e-mail everyday while on leave, or to comment on e-mail that I do end up reading.

Other folks I work closely with on a day-to-day basis inquired about short-term replacements for me and repeatedly asked, "Shouldn't you begin training others in your remaining time, so as to make it less of a disruption for those of us who are left?" I found this a rather uncomfortable intrusion into my life, implying a decision that was really between my manager and me. I just wasn't ready to have other people help make large decisions like that for me. Maybe their intentions were good but their timing was bad — this message made me feel expendable. To make things worse, when I tried to discuss this "lack of control" feeling with other co-workers, they would comment, "You probably don't want to hear this, but you might be over-reacting, because you *are* pregnant and emotions do run high during this time ..."

There is very little control when one is pregnant. People react differently than when you are planning an extended science leave, say, or a several-month vacation. Establishing that I wanted to keep control of my work life was a an important step for me. My level of discomfort was such that I finally put my foot down and asked co-workers to rely on my and my manager's judgment.

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Amazing Comments from Co-Workers

Another striking thing is what people at work wish to discuss with me about my pregnancy. They come up with the most amazing comments! Professionalism goes on holiday and people say anything, sharing their thoughts, doubts, biases and knowledge of pregnancy, childbirth and child-rearing. Ironically, many of these comments came from childless people. Some questions and statements required no return comment on my part, others invoked my chuckling or venting later with my husband. (I did ask if he was getting similar comments from his co-workers. Of course he said no.) A few examples:

• "So, are you or your husband planning on quitting your job?"

• "Daycare is the root of all that is evil in society today."

• "You really should pay attention to how you are getting in and out of the car, I read somewhere that it is extremely detrimental to the baby to get in and out the wrong way."

• "I read that drinking any alcohol in the third trimester kills the baby's brain cells and is bad for mental development."

• "Why AREN'T you taking three months off? You really should."

• "Well, you ARE disabled, you might as well get a temporary parking sticker."

• "What do you mean you are writing a journal to the baby and talking to it before it is born? This kid is spoiled already!"

Many of the more in-depth conversations about my well-being and long-term plans were a little less direct, but still quite opinionated:

• "You may want to be Super Mom and continue doing your job, but nobody can really do both, so some things will have to give..."

• "You may think you can work from home, but it will probably be impossible when you are dealing with a child under six months of age..."

• "You really should consider the worst possible scenario — what if the baby has colic or something else goes wrong?"

I jokingly "announced" my pregnancy at work during "T-shirt" day with a custom-made shirt that said: "Astronomers make the best New Moms — We don't mind being kept up all night!" It gets difficult at times to have to apologize for being optimistic about upcoming issues in my life. I don't remember getting so much negative advice when I was about to get married. No one said, "Well, you should think about the worst case scenario: your in-laws might be a pain, or your husband might stay out late and not call for hours... And heaven forbid how this might affect your work performance. You should probably seek a replacement for the first few years of your marriage …" Of course this is not something you hear people say to newlyweds.

I do appreciate the not-so-pessimistic kind of colleague, usually a new parent, who is tired and perhaps has had a colicky baby, who says, "I love it, and wouldn't trade this feeling for the world! You'll love it too. It is hard work, but it is *so* worth it."

Did We Both Just Use the Word "Vaginal"?!

Other surprising conversations, at least in the workplace, were in-depth physiologically explicit discussions. These occurred nearly exclusively with men who were active in the birth of their child, about issues that they and their wives went through during actual childbirth or in dealing with a newborn. I was the on the receiving end of countless (unsolicited) discussions about breastfeeding, vaginal births, and C-sections, in the halls, on the way to meetings, and at company parties. In no way were these discussions threatening or uncomfortable to me personally, but they seemed rather off-beat for the workplace. However, after a half dozen such conversations with various casual male co-workers, I began to see a pattern: they needed to reveal what they knew and how much they had experienced with the birth of their own children. Much of it was positive and factual, like describing a car crash, and they rarely got into the emotional aspect of their experience except to say how incredible they thought the event was. And how incredible they thought their wives were for having gone through the experience.

In Closing

One thing is clear: expecting a child while working has really brought people out of the woodwork! I guess it is a major life event that one really can't hide (for the last few months for the mothers anyway). I can't recall a life event where so many people were so interested in discussing quite personal issues. I am learning from childbirth classes that childrearing is similar to religion and politics: it is open to graphic discussion and usually leads to philosophical debates in which there is really no one right opinion.

It is quite interesting to acknowledge other people's views. (Perhaps, after having gone through this experience, I too will find myself offering advice of the kind I have been so surprised to hear.) I hope to instill in my daughter the values of being honest and open yet respecting another's feelings. Perhaps 30 years from now she will have children, by which time society will (I hope!) have acquired a more optimistic view of "super moms" and what it is like to be in our shoes.

Most of all, throughout all these social interactions I have learned a great deal more about myself, my beliefs and what is important to me. It has been an excellent character-building event. Even though I may roll my eyes now and then, I will have great stories to tell my child as she grows up and asks what it was like when I was pregnant with her. ❖

From another (anonymous) mother, a "pregnant in the workplace" story from the not-too-distant past:

Pregnancy "Note From a Life:"
By a reader contributor

WHEN I INFORMED my department chairman that I was pregnant, the first thing he asked me with a big smile, was if I was going resign. When I said I wasn't he then asked, still smiling, if I was going to go half time. When I said no, he then expressed considerable puzzlement and asked, "Well, what are you going to DO?" I answered childcare. He didn't say anything and walked out. (His wife specialized in pre-school education.)

See more **"Notes From a Life,"** *page 23*

My child was due near the end of the academic term (good timing), which probably meant that there would be about two weeks when I would not be able to fulfill my teaching obligation. The same department chairman told me that I could not expect any of my colleagues to cover my teaching and I would have to double teach if I wanted any time off, which I did. I was surprised by this lack of generosity from my department because my colleagues had always covered for each other for sickness and travel. When a senior person had a heart attack everyone pitched in to cover his course.About three years later my university finally enacted a policy of maternity/paternity leave.

When I asked this same department chairman about my salary and the low raises I had been receiving despite my strong record, he said I could not expect a good raise because I was married and there were two salaries. Of course the situation existed for several of my male colleagues, but according to him that was different.

All of this happened not so very long ago at a large research university. I believe that the atmosphere and standards have dramatically changed, however I sometimes suspect that some of my colleagues still harbor these opinions even if they no longer express them so openly. ❖

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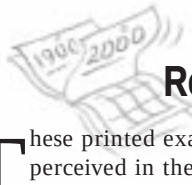
(Hmm, I do note that one of the editors of STATUS was one of only two female student I've ever had the occasion to take observing … Coincidence? You tell me.) There's obviously a lot of spoken and unspoken culture here. At some institutions, male faculty members have a fear (factually justified or not) of even the indirect accusation of impropriety, feeling that the mere innuendo could be career-limiting. And it's been common advice for longer than I've been in the business that male faculty should never be behind closed doors with female students for the same reason. (So why did I get the slam-the-door-and-undergo-life-crisis example? OK, that was just one, and the only difference in gender is that male students seem to be more likely to come to my house instead of my office to do this).

There's a related issue that we see constantly in faculty meetings — just what is graduate training in the sciences for? We have some faculty committed to the idea that there are a Few Chosen, and our job is to identify them and weed out the rest. The notion that there are students who would become quite successful in technical careers (yea, even Physics itself) with some deliberate nurturing at this stage found fertile soil in some minds, but fell on stony ground in others. Perhaps the purely pragmatic observation that the state commission on higher education is breathing down our necks about graduating enough students to remain academically viable (i.e., we have an immediate need not to be shut down) will be an unwitting force for change here.

Just some musings from a middle-aged southern white male. ❖

Back issues of
the STATUS newsletter are
available online at:

http://www.aas.org/~cswa/



Remember When ...

These printed examples show a typical view of how women were perceived in the workplace and what was considered reasonable, eye-catching and suitable material in department halls and in newsletters in times past. Each item in itself was permitted thinking for that time period. You gotta admit, times have changed!

1943: Efficiency of women employees

The following partial excerpt is from the July 1943 issue of the trade magazine Mass Transportation. *It was written for male supervisors of women in the work force during World War II. (*STATUS *was unable to print the entire article but it is available on several search engines on the web by using keywords from the title. The full citation is: "Efficiency of women employees; eleven helpful tips." L.H. Sanders.* Mass Transportation, *v. 39, p.244+, July 1943).*

There's no longer any question whether transit companies should hire women for jobs formerly held by men. The draft and manpower shortage has settled that point. The important things now are to select the most efficient women available and how to use them to the best advantage.

• Pick young married women. They usually have more of a sense of responsibility than their unmarried sisters, they're less likely to be flirtatious. They need the work or they wouldn't be doing it.

• General experience indicates that "husky" girls — those who are just a little on the heavy side — are more even-tempered and efficient than their underweight sisters.

• Give every girl an adequate number of rest periods during the day. You have to make some allowances for feminine psychology. A girl has more confidence and is more efficient if she can keep her hair tidied, apply fresh lipstick and wash her hands several times a day.

• Give the female employee a definite day-long schedule of duties so that they'll keep busy without bothering the management for instructions every few minutes ... women make excellent workers when they have their jobs cut out for them, but that they lack initiative in finding work themselves. ❖

1970: Goddard Beauty Queens

One of our far-flung correspondents recently sent us an old issue of the Goddard News, a publication of GSFC, from 1970 to be exact. We thought STATUS readers would enjoy this photograph (edited slightly), one of the only pictures in the issue showing any women. These particular women are the candidates for "Goddard Queen," each representing a different Directorate at Goddard. The winner was to be selected at the Annual Queen Dance, which included "a cash bar, music..., and, of course, pretty girls." ❖

1992: Department orientation flier

This flier was used by a Physics and Astronomy Department student group in 1992 to announce an orientation meeting. Although both female and male officers of the group had approved the flier, the response from some students and faculty ranged from tepid to strongly negative. The flier was eventually removed but caused longer-term ill feelings among many of the individuals involved. ❖

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 follow more "Notes" sent to us by our readers. We continue to welcome submissions of Notes for publication in future issues of STATUS.

When I was in graduate school in the early 1990's a male physicist from China came to my research university to give a department colloquium. He was extremely famous and highly respected in his field. As was customary before the talk, several members of the department hosted the speaker at lunch on campus which I attended. I sat near the speaker at lunch and noticed that he would not speak directly to me. The same situation was true when he was asked a scientific question by a senior female astronomer whose work closely paralleled his. He eventually turned to a male colleague at the table and explained that according to the cultural standards of his country, he could not speak to women.

♀ I am one of only three women of the 20 students in my physics class. One day I stayed after class to ask the professor about a homework problem. We went to the blackboard and had a lively discussion with both of us drawing on the board working together. A male student was also waiting to ask a question. As our discussion became more involved, the professor asked if he could let the other student interrupt, hoping that his question would be brief. The other student had a question regarding the same problem, and said that he was benefiting from our conversation.

The professor then returned to the board, but never made eye contact with me again from that moment on, only with the male student! I had all but disappeared from the room! This was made more painfully obvious by the difficulty the professor had in facing the sitting male student who was several yards away, while I was still at the board next to the professor. I got so angry that I lost the train of the discussion and when I could finally focus again I had to ask some questions to catch up. This reminded the professor that I was still there. When I noticed the impact that my questions had on his behavior, I just kept asking questions as a way to remind him of my presence. After this episode was over I felt humiliated. Not only did I feel invisible, but the only means I had to regain his attention in the presence of a male student probably made me appear dumber in his eyes. This professor probably didn't even realize how his behavior affected me and I never felt comfortable telling him about the incident.

♀ As a grad student I attended a meeting of the Astronomische Gesellschaft in Australia some years ago. Due to the submission of several fake posters, the local organizing committee decided to put up a "joke" poster, which contained, among other things, a picture of a topless woman. I failed to see the humor in that picture, especially when considering that this poster was placed where passers-by could easily see and read it.

I suggested that the member assembly discuss this poster and whether it was an appropriate style to have included at the meeting. I earned a lot of laughs when I made this suggestion. During the next three days prior to the scheduled meeting, I got a lot of comments about my "lack of humor" and "prudishness." The most extreme comments came from a full professor who accused me of "censorship," and "being ostentatiously moral." The AG board finally decided that it would indeed be censorship to condemn the poster, but asked all members to try not to hurt other people's sensibilities when producing papers.

Send your "Notes" to cmu@stsci.edu or frattare@stsci.edu

♀ When my lab was being photographed recently for publicity purposes, a senior scientist (a very nice man who always treats me respectfully) decided to include one of our secretaries in a lab coat, in order to show how wonderful our company is because it has women in its labs. One of our lab techs who stopped by as they were finishing up asked the senior scientist why the secretary was with him. After hearing the story, he asked why the senior scientist didn't just get me since, "she's a woman and she actually *does* work in the lab." The senior scientist apparently replied that he forgot about me, as well as another woman who also works in the lab, and he was very apologetic about it. As this was someone who obviously means well and does want to promote the presence of female scientists in a publicity photo, it is ironic that the image of a woman was forefront in his mind rather than the literal presence and acknowledgement of a woman scientist on his staff. ❖

"…Say cheese!" *Illustration by Ann Feild*

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forced to take eventually because there were no other options."

"It is a very bad idea to raise this issue BEFORE an offer is made, since all negotiating leverage for salary and benefits would be lost. At [three prominent universities], jobs offered to us both as a 'package deal' had miserable salaries as a result of their knowing we wanted to stay together."

"I was offered a lower position that I am qualified mainly because they know that it is difficult for a couple to get tenured positions at other universities. In the same manner, I believe that my salary is arbitrarily held low because they know I won't accept other job offers."

Egregious remarks

The picture of institutional response to the dual-career situation would not be complete without including some of egregiously inappropriate exchanges reported by the survey's respondents. Even more astonishing is the recent vintage of these remarks, which one might have thought belonged to an earlier era in our society.

"One professor suggested to my husband at his interview that one way to solve the two-body problem was to divorce me — not a very sensitive suggestion."

"[Potential employer] told the candidate's spouse that they shouldn't be working anyway."

"One suggested that I should be available to do 'volunteer' scientific work, because it was my partner's role to support the family."

"I was told that I should be able to find a lab to work in, as long as I was willing to change fields and didn't expect to be paid; if I 'needed to be paid' I might be able to teach introductory calculus."

"Her last request for a raise was met with the response that she didn't need a raise because her partner was well-paid as a full professor."

Conclusions

We have given dozens of specific quotes from our survey respondents. A reader of these comments might imagine that they occurred decades ago, and are not likely to be repeated today. However, we have analyzed the ages of these respondents, and found that virtually all of them are in their 30's or early 40's — these quotes are current, and represent current institutional practices.

How can one respond to these attitudes and practices? To some degree, one is dealing with societal prejudices, which will not easily be changed. However, there were a number of positive responses and suggestions discussed by survey respondents, and they give some hope. As the number of women in physics grows, these prejudices should fade. We argue in our full report on the survey that it is in the best interests of institutions to change these attitudes and practices in order to attract and retain the best scientists. The report offers a number of suggestions of how institutions and individuals can respond to the situation in a positive way. Transformations of this kind are necessary if the number of women in physical science fields is to increase in this century. ❖

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