

# STATUS

A REPORT ON WOMEN IN ASTRONOMY



JANUARY 2009

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Fran Bagenal, Editor

## The Ongoing Demographic Shift in the AAS

*Kevin Marvel is the Executive Officer of the American Astronomical Society. Below is a transcript of his presentation to the 2003 Women in Astronomy conference that has been updated with 2008 statistics and an addendum.*



AAS membership statistics indicate that a demographic shift is underway in our field. This demographic shift—if it continues—will result in gender parity in astronomy sometime in the next 30 years, likely sooner than later.

In 1973, the AAS undertook an initial survey of its membership. This survey was first called for by the Working Group on the Status of Women in Astronomy, which was founded in August of 1972. The survey had a sample size of 2,800 members and attained a 27 percent response rate. This

was not a fantastic response, but looking at the survey, which was quite long, it is amazing we got this high of a response. It also appears that enough people responded that the survey does represent a statistically meaningful sample of the membership at that time.

Overall, the female membership was only 8 percent and there was some evidence for an increasing fraction of women in our youngest members. Furthermore, there were some disparities in women prizewinners and the number of women who served in the AAS leadership. Fewer women were being elected than what you might expect based on their membership fraction.

*continued on next page*

## Note from Editor

*Fran Bagenal (Professor of Astrophysical & Planetary Sciences, University of Colorado, Boulder)*

Change is in the air, and STATUS is moving with the times. First, you will notice the change in layout. After many years of layout support from STScI, (thank you Krista Wildt), the new STATUS is coming from the AAS office. Second, there is discussion on CSWA about moving from hard copy into the modern era of blogs and chat rooms. Online postings allow rapid response to issues, debate on hot topics as well as postings/links to material as it appears. Watch AASWOMEN (<http://www.aas.org/cswa/AASWOMEN.html>) for news. In the meantime, past issues of STATUS (always available at <http://www.aas.org/cswa/STATUS.html>) are being re-organized online so that you can search for articles on specific topics, people, etc; – lots of good stuff there on issues that seem to recur. A net result is that hard copy of STATUS will probably be issued only once per year – unless of course we are flooded with good material. Recognizing that even the indomitable Meg Urry does not have the spare time to edit the proceedings of the Women In Astronomy conference that was held in June, 2003 at Caltech, Pasadena, STATUS will be publishing transcripts from the conference over the next few issues. Articles by Charlotte Fishman and Denise Denton have already been published (January 2007) and in this issue Kevin Marvel presents his study of the AAS demographics, with a 2008 update. The recommendations from the Pasadena WIA conference have been circulated and astronomy institutions have been encouraged to endorse them. We are including a brochure of the Pasadena recommendations as a centerfold – easy for removing, copying and distributing. Finally, one of the reasons this issue is so late in appearing is that we have been anticipating an important report from National Research Council on Gender Differences in Careers of Science, Engineering, and Mathematics Faculty. Look out for a full discussion and interview of the Chair, astronomer Claude Canizares in the next issue. As always, your contributions to STATUS are heartily welcome.

# STATUS

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Published by the  
American Astronomical Society  
2000 Florida Avenue, NW, Suite 400  
Washington, DC 20009  
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The STATUS newsletter is distributed to AAS members at the January and June meetings and sent to home institutions of subscribers during the week of the meeting. Contributed articles are encouraged. Deadlines for submission are October 1 and March 1, respectively.

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## The Ongoing Demographic Shift in the AAS *continued*

I have taken the statistics from this 1973 survey of our membership (which includes full, associate and junior members) as they were presented, and Figure 1A shows the men and the women. It shows five-year age bins horizontally and the percentage in that age band of the membership vertically. Note that the bin label represents the lowest age included in the bin. So you can see that we had quite a high percentage of senior women members and that the percentage of women was more or less flat across the whole society.

In Figure 2A, I show the percentage of the given gender at that age bin. There is certainly a youth peak. At any given age that you might pick, the women actually sometimes represented a higher percentage in that age bracket. For example, at age 33 there were about 30 percent women, so there was a marginal youth peak. The women members were young.

There is another complete survey that was done in 1990, and it was expensive, even in 1990 dollars (in Washington, D.C., we always scale our dollars). It cost about \$25,000 to do this survey. The response rate was very good - about 42 percent. The overall female membership had increased percentage-wise to about 12.6 percent just between 1973 and 1990, perhaps because of the active work of the Committee on the Status of Women in Astronomy. There were more young female members than male, and the peak of the age distribution for women was about 30 and about 45 for men (see Figure 1B).

The total number of members at this time was roughly 4,000 to 4,400. Looking at this figure, you can see that in the youngest age bracket in 1990, roughly 30 percent of our membership in the society was women.

You can also see that for our middle-aged members, the flat percentage of women members is simply propagating forward. We do not gain many middle-aged or older members (this is true for both genders). What this indicates is that our membership is increasingly female, as a society we're changing.

Figure 2B shows the percentage of the gender at a given age from the 1990 survey, and you can see for the younger age ranges that a larger fraction of women, are younger versus older. Most of our women members are younger.

There was another survey done in 1995. It was actually not a full membership survey but a partial membership survey. About 1,000 members were polled. This was done basically to save money in doing these sorts of surveys (they are expensive!) and to get good results.

Again, the overall percentage of women members had increased to about 16.5 percent (Figure 1C). And there was some evidence for episodic growth. I didn't think the evidence was so strong, but it was mentioned in the report summary. At that time, Peter Boyce, who worked hard on surveys of this type, thought that it would be worthwhile to investigate the potential causes of what caused this episodic growth.

The percentage in the youngest age bracket had grown to about 40 percent and again, the earlier age bracket with 30 percent women, had moved forward in the age chart (we all get older!).

One comparison that I didn't make, because the samples were done in different ways and cross-survey comparisons done incorrectly will lead to misleading conclusions, is to compare what's happened to this cohort as it propagates through - has it grown or shrunk? That's a difficult question and would require a different kind of survey to determine.

Looking at the percentage of the gender at a given age (Figure 2C) shows again an age peak in the youngest age brackets. At some level, this figure (and the others like it) are convolutions of a whole bunch of issues that affect astronomers, both men and women, as they enter astronomy as a profession and continue the aging process, some coming, some going, some, unfortunately, passing away' also it is important to remember that figures like this represent many different things, not just the issue we are trying to understand, how women fare in our profession.

The Ongoing Demographic Shift in the AAS *continued*

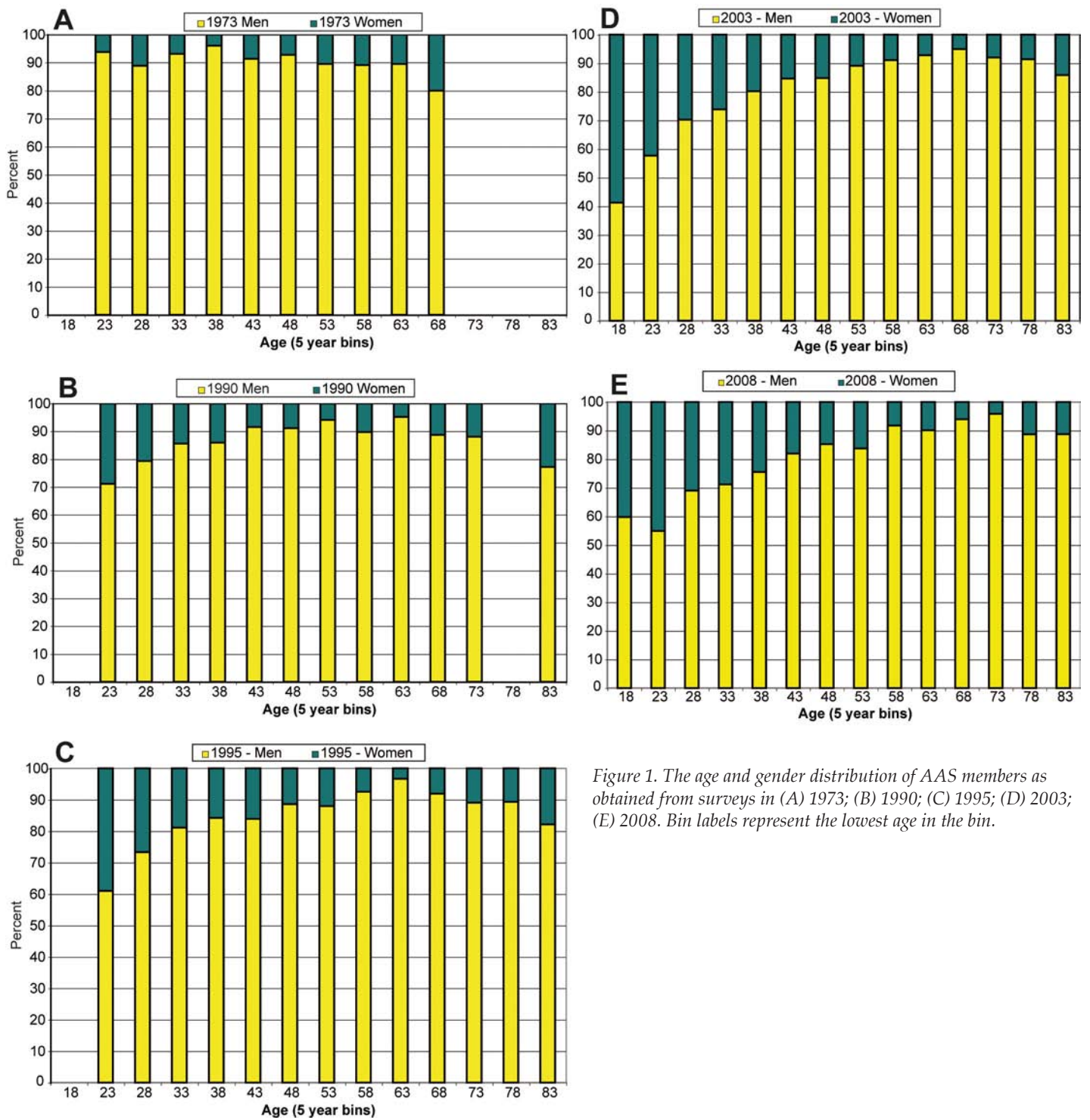


Figure 1. The age and gender distribution of AAS members as obtained from surveys in (A) 1973; (B) 1990; (C) 1995; (D) 2003; (E) 2008. Bin labels represent the lowest age in the bin.



## The Ongoing Demographic Shift in the AAS *continued from page 3*

Figure 3 is an interesting plot. This is a cumulative age band sample, so for everyone under 30, what fraction are women in the AAS? In 1995, it was about 30 percent. For those 40 or younger, it was about 24 percent, and so on. So, the number for the left-most bin more or less represents the fraction of women in the society as a whole. This is a little bit of a cheat, because it is a cumulative statistic, but, in fact, this parabola just gets deeper, if you actually did it for just those age bands. This figure conclusively shows that our Society has changed demographically in a very substantial way in the last 20 plus years.

On June 23, 2003 I took a snapshot of the AAS membership database and did a summation similar to the 1973, 1990 and 1995 data. I included every single membership type except publisher affiliates. That includes the very few lifetime members we have, the emeritus members, the full, associate and junior members, all of our divisions and all of our division affiliates. I lumped them all together. For a few years we have been collecting the birth date as an optional piece of information - a very helpful piece of information for producing plots of this type - and I would like to thank all of you, who have included your birth date in our database. It's very worthwhile to do that, and it helps us produce graphs like the one I am going to show you. The birth date is optional, but I have a total of about 5,900 members that gave us that information out of 6,480 in total. Gender is also optional. We basically only require an individual to provide us with enough information to send them their membership materials. However, we strongly encourage everyone to provide us with as much information as possible. In a year or so, we will begin online updating of our membership database and each member can update or complete their records. We will have a big campaign to encourage this when the online tools become available.

Figure 1D shows the current situation. Fully 59.6 percent of our members from 18 to 23 year olds are women [at this point applause broke out in the lecture hall]. You can see in the next bin up that the fraction has also improved. We have more women from age 23 to 28 than in the previous 1995 data.

One thing to keep in mind is that there are only a few hundred people in the lowest age bracket, but, in my opinion, these represent people who will likely continue in astronomy as they have committed to our Society so early. Of course, they could just be joining to take advantage of our very favorable

*Rachel Ivie (Statistical Research Center of the American Institute of Physics) reports on the status of a new jointly-sponsored project by the AAS and AIP, A Longitudinal Study of Astronomy Graduate Students:*

Data collection was recently completed for the first phase of the AAS/AIP longitudinal survey of astronomy graduate students. The project, which began in early 2007, was the result of recommendations made at the 2003 Women in Astronomy Conference. Eventually, the study will track astronomy graduate students over the course of several years. The study has several purposes: to collect data on people who obtain graduate degrees in astronomy, to compare attrition rates for men and women, to collect data on people who leave the field of astronomy, and to collect data on astronomers who work outside the traditional employment sectors of academe and the observatories.

With support from AAS, the Statistical Research Center (SRC) of AIP is collecting the data. A working group composed of AAS members and an SRC staff member developed the questionnaire. Then, a list of current astronomy graduate students was compiled from various sources, including AAS junior members and lists provided by astronomy and physics departments to the SRC. The graduate students were contacted over a period of several months by e-mail and by postal mail. The SRC received about 1500 responses, and more than 800 of these volunteered to participate in future data collection efforts. Once preliminary results are available, the working group will seek additional support for the next round of data collection, which should begin in 2009 or 2010.

The Statistical Research Center of the AIP posts statistics and reports relating to physics and astronomy education, as well as of the profession at <http://www.aip.org/statistics/>

junior membership rate and the delight of their own electronic journal subscription. I'll let my readers be the judge.

Figure 2D shows the percentage of the given gender at a given age, so of all the women in the society, something like 18 to 20 percent, are younger than 25. I should have mentioned it earlier, but the reason for the odd numbers for the bins is that the youngest age bin is meant to represent undergraduate students, the next graduate students, the next postdocs or early faculty and so on.

Another fact to keep in mind is that the various cohorts match up fairly well, meaning that as a cohort ages, the same fraction is retained later on, barring the small fluctuations from varying sample sizes. It is hard to use our membership data to gauge how many women might have left the field, mainly due to the varying samples. A full longitudinal study would have generated this data. I am happy to report that the AAS Council has funded just such a survey, which is being carried out by the AIP with input and help from our CSWA, CSMA and Employment Committee.

Figure 3 shows the same cumulative distribution plot as 1995 with the 2003 data included. The parabola seen in the earlier figure just gets bigger. So overall, as a society, we're running just slightly under 20 percent women. As you go down in age, you can see that for members under the age of 35 there were about 35 percent women. This is a nice figure to remember.

The past AAS surveys have in large part come about based on membership needs and members stepping forward to help the society; both to organize it and to actually carry it forward.

The Ongoing Demographic Shift in the AAS *continued*

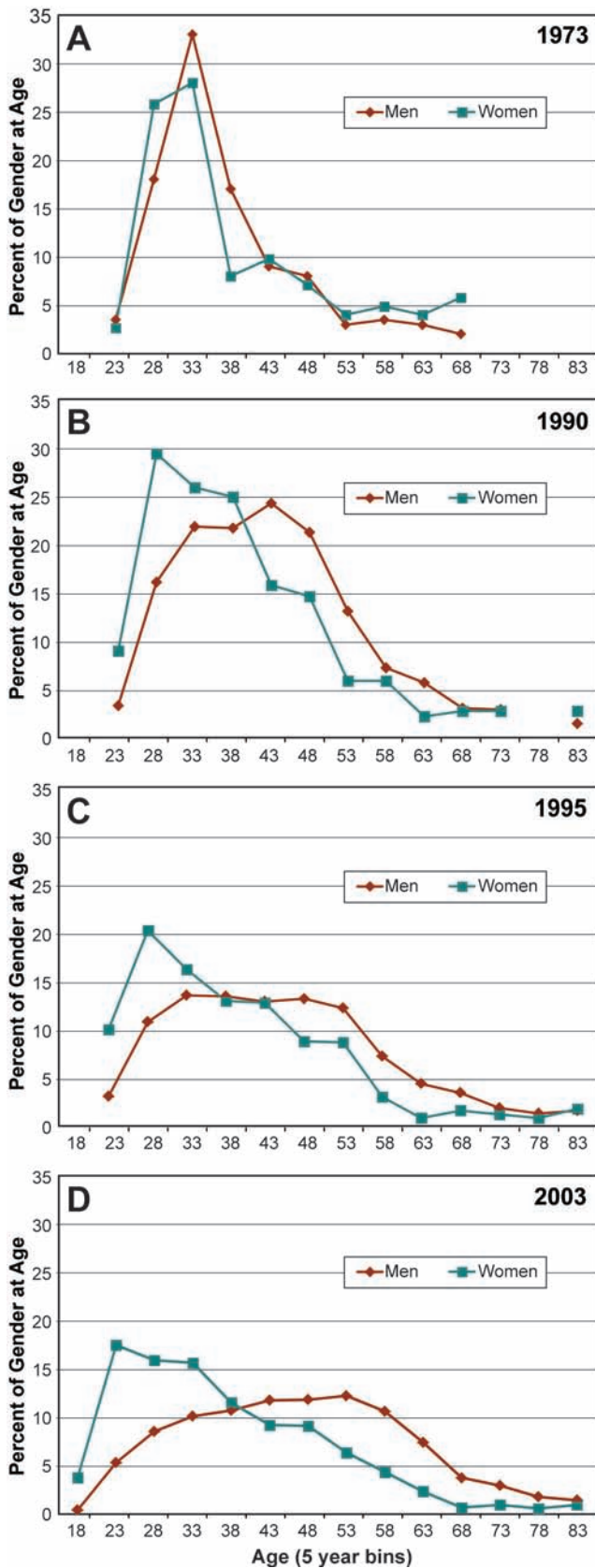


Figure 2. The percentage of a given gender as a function of age as obtained in the (A)1973; (B) 1990; (C) 1995; (D) 2003. Bin labels represent the lowest age in the bin.

Rachel mentioned her group at AIP has 12 staff. The AAS staff has 16 people in total to handle all the meetings and everything else we do, so in actuality we have only a fraction of a given individual to do any surveys at any given time (and that individual happens to be me). So, if anyone has an idea of doing a survey, we're quite happy to listen to you and encourage you, but we would like to try and get help when we do these things.

So, I want to just take a little bit of a break here and share with you some comments we received from the individuals actually taking the 1990 survey to let you see the varied nature and attitudes of our membership.

These are the positive comments (about 50% of responses were similar in nature to these):

- "Please make it happen every five years."
- "I'm happy that my dues are being used in such a concrete way."
- "This questionnaire is the best I've seen."
- "I usually hate questionnaires - this one is sensible."
- "Reading this questionnaire has raised my level of awareness."

The other 50 percent look like this:

- "How much did this questionnaire cost?"
- "Disappointed in this questionnaire, which seems to ignore all critical issues in astronomy."
- "It's a waste of time and money."
- "Whose dues are paying for this questionnaire?"
- "Don't waste funds on surveys."
- "Ego expense is not a proper use of AAS funds."

So, what has the AAS done in response to both the needs of the community and also in response to requests from the Committee on the Status of Women and so on? We've tried to implement at some level the report recommendations, which involve the creation of a list of women astronomers that could be used for prize committees, to find people who would be qualified to win prizes or to be nominated to various places. This service is in place and functioning, thanks to a volunteer effort and encouragement of women at the undergraduate and graduate levels. The Women In Astronomy meeting, for example, is along that level; employment concerns and report dissemination was basically aimed at trying to make sure that women had a chance in jobs that they deserved and also to try and spread this report widely so that more people knew about the recommendations. The CSWA was formed in 1979 and moved out of a working group status; the AAS endorsed the Baltimore Charter in '94;

*continued on next page*

### The Ongoing Demographic Shift in the AAS *continued*

| Prize   | Men        |            | Women      |            |
|---------|------------|------------|------------|------------|
|         | As of 1990 | Since 1991 | As of 1990 | Since 1991 |
| Russell | 41         | 11         | 2          | 2          |
| Warner  | 38         | 17         | 1          | 1          |
| Pierce  | 15         | 12         | 3          | 4          |
| Tinsley | 3          | 11         | 1          | 0          |
| Heinman | 10         | 19         | 1          | 0          |

Table 1: Prizes of the AAS through 2008

we've done demographic surveys; and we continue to support CSWA activities. We're also a sponsor of the WIA meeting.

I will now shift to speak about prize and leadership trends, basically to point out that the Baltimore Charter had a huge impact in some areas. Table 1 shows (as of 1990) the number of prize winners for our main prizes - the Russell, Warner and Pierce, Tinsley and Heinman prizes' (not the division prizes) and these are just the raw numbers of men and women winning that prize previous to 1990. Since 1990, we have had two Russell winners who were women versus 17 men and so on. Obviously not all prizes have begun to reflect our changing demographics.

The AAS leadership trends are also interesting to review. As of 1990, and considering all the years previous, the AAS had had only one female president. Between 1990 and 2003, four women and four men served as president. For the vice-president positions, as of 1990, only about 9 percent of women served as members of the executive committee in aggregate - that means including treasurer and secretary (but those are somewhat special positions of the executive committee, because they serve for a longer period of time). Between 1990 and 2003, the AAS has had three female vice-presidents for an aggregate executive committee percentage of about 28 percent. Since 2003, we had 3 presidents, all male. There have been 5 vice presidents, 4 male, 1 female. For Secretary and Treasurer there has been little change, except that we added one male to each position. The bottom line on leadership of the AAS is that, we need more women nominees for these important positions.

This change has come about because of participation in the process. Change has come from within. It is imperative that women, and minorities more generally, continue to participate in the system as it stands as they work to change it for the longer term. Only through participation can change come about and I think these statistics speak directly to this inherent property of a democratic society and the AAS in particular.

My conclusions are that AAS membership demographics are changing and changing rapidly in my opinion. In 2003, having 60 percent women among our youngest members and 35% among our members under age 35 is very nice to see.

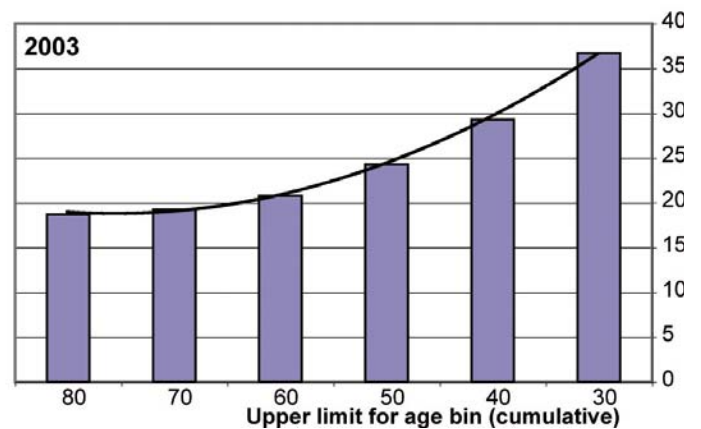
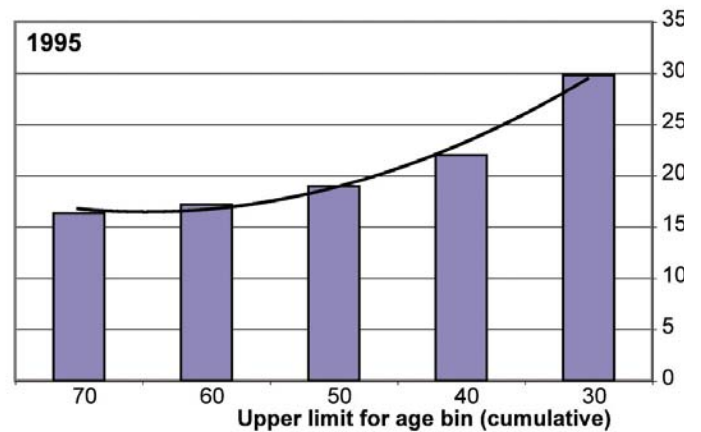


Figure 3. The cumulative distribution of the fraction of women AAS members as a function of age as of 1995 and 2003. The fraction is increasing at an accelerating rate amongst the youngest members.

The Baltimore Charter had a large impact on the number of women serving in society leadership positions. I think we still have more room to go on the prize situation. Everyone should remember that nomination committees don't work in a vacuum. They need nominations in order to select winners. If a small number of women are nominated, a small number of women will be selected as winners. If a large fraction of women are nominated, then a larger fraction of our winners will be women. Arlo Landolt and John Graham, our two most recent Society Secretaries, have made this point many times and very directly and I make it again here. The information on how to submit it is included with the form, so you all should consider making nominations if you can think of deserving individuals.

Addendum – material added since WIA meeting for publication in STATUS:

I have performed a similar demographic analysis of our membership for 2008 and the results show a continuing trend, with some fluctuation. The demographic ramp of women entering our Society is continuing and each five-year cohort appears to be



## The Ongoing Demographic Shift in the AAS *continued*

marching forward over time into the next age bin. Shown as Figure 1E is the 2008 version of the standard demographic plot I described earlier. The lowest age bin now only has 40% women, but also only contains 111 people total, so the fluctuation we see is in line with expectations, but bears watching.

I continue to expect the demographics of the Society to continue changing over time, especially as the large fraction of

mid-career women progress further. The AAS-AIP longitudinal survey will help us understand better how their careers progress and what difficulties they are facing. The AAS stands ready to take action, if needed, to ensure that all of our members receive fair treatment as outlined in the Baltimore Charter.

## So, now you have a PhD...

A couple of years ago STATUS published a list of pieces of advice from the astronomy community (gathered via AASWOMEN) on graduate school\*. Here we repeated the process for the next rung of the ladder. Below is a compilation of recommendations for those who have recently completed a PhD and are wondering what's next.

- My partner, who has an Astro-PhD and now works in industry, found the book "Put Your Science to Work: The Take-Charge Career Guide for Scientists" by Peter Fiske to be the most useful advice book she found on making the academia-to-industry transition.

- Regarding what 'alternative' career paths are available, I'd recommend and promote the AAS's non-academic astronomy network, <http://members.aas.org/career/nonacademic/bycareer-type.cfm>. It's a great resource that needs to be better publicized & expanded.

- My best piece of advice for new PhDs setting out would be to read Miss Mentor's book (i.e. *Miss Mentor's Impeccable Advice for Women in Academia*). I've found 95% of what she says to be useful to me personally, even though I'm not nominally the target audience.

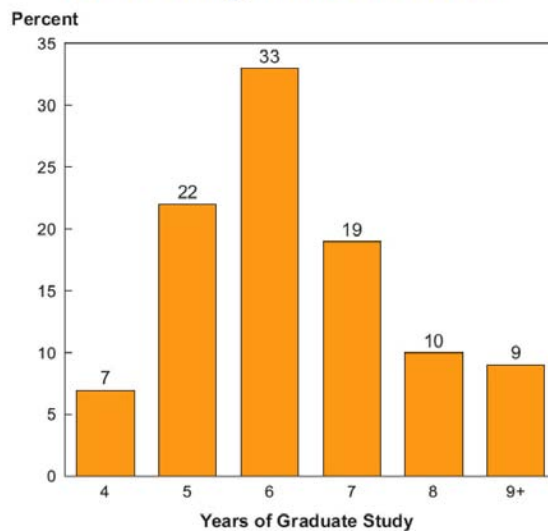
- Go somewhere new – it's invigorating! One year at one's PhD institution to finish/write up projects is fine but then you really need to move on and meet new people, hear new ideas, and develop intellectual independence from your advisor. If you have a huge attachment to you alma mater you can come back after proving yourself elsewhere

(though there is a tendency for people to always think of you as a grad student of Prof. So-and-so).

- The 2-body problem does make things tougher at this stage of life. Yeah, it is a real problem. But neither astronomy nor academia as a whole are alone with this problem. Most professionals face the same issues. A 2-hour separation is probably the worst (weekend commuting is a major burden to keep up). Luckily email, ichtat, skype, etc. make it easier to maintain relationships over distance. Take turns when it comes to the

next time to move. Yup, it will test your relationship. That which does not kill you makes you stronger.

## Physics PhD How Long Does it Take?



Statistics on how long people take to get PhDs - perhaps longer than many people usually think. This graph depicts the number of full-time equivalent years of physics graduate study completed by the PhD class of 2004 (US citizens only). From AIP's Statistical Research Division <http://www.aip.org/statistics>

- Postdocs are often eligible to be grant PIs. However, not only is having a granting record important during application for faculty positions, but also having one's own money gives one vital intellectual freedom at a critical point. Postdocs should seriously consider beginning to write grants, in collaboration or alone, about a year after starting their position early enough to be able to use the grant money to extend the postdoc if they so choose. They should also be aware of the ways that one can evade prohibitions on being a PI: zero-time appointments at friendly institutions, or Eureka Scientific.

- When applying for grants or resources (observing or computer time, for example), read the instructions carefully, and be sure to provide all the information explicitly requested. Don't count on your collaborators to do

it right, particularly senior ones, for whom getting it right is a lot less critical, and who are often distracted.

*continued on next page*

**So, now you have a PhD...** *continued*

- On a similar thread, within a year or two after the PhD, you should consider volunteering for a grant panel by emailing a program officer in your field and announcing your availability. Program officers are always searching for willing volunteers. Although it's a lot of work, that first panel provides an invaluable insight into the "other side" of how proposals are judged.

- Always begin your job search at least a year before you expect to complete your PhD or current postdoc. This is usually pretty evident to US students, less so, I find, to Europeans, who often plan on searching for a job only after finishing their thesis, only to get caught out by the US job cycle.

- If you want a faculty job, you have about 6-8 years. After that you probably have to wait until you have sufficient "star quality" to be brought in (with the large pot of money that you

will inevitably bring with you) as a special opportunity hire as senior faculty.

- Publish, publish, publish. Teaching experience really does not count for much when applying for jobs, even teaching jobs. Make sure you have some first-author papers. While some fields tend to go for sheer numbers of papers, others are more interested in a few that have impact. Find out about the currency in your field.

- Ultimately, you are on your own. You need to decide what it is you want to do and then dig in and do it. Industry, teaching, journalism, entertainment – even law – there's a big world of science out there beyond academia (about which your PhD adviser probably has no clue). Go explore and do good stuff!

\* Here is page with graduate school advice, stumbled across since the original article <http://www.cs.indiana.edu/how.2b/how.2b.html>

**In Praise of Daycare**

*Meg Urry is the Israel Munson Professor of Physics and Astronomy at Yale University. She is the current Chair of the Physics Department at Yale and Director of the Yale Center for Astronomy and Astrophysics. She is a former member and chair of the Committee on the Status of Women in Astronomy, and remains active in efforts to achieve gender parity in science. She wrote this article in an attempt to broaden the usual discussion. She and her physicist husband Andrew Szymkowiak adore their amazing daughters, Amelia (17, high school senior) and Sophia (14, high school sophomore).*

How many times have you heard "I don't want my child raised by a stranger?"

A recent study at Yale University finds that among undergraduates, women and men share the same

career aspirations. They also in equal numbers hope to have families. Where men and women differ is in their perception of how possible it will be to balance career and family. Few men appear to question their ability to do both; many women are very worried about it.

When was the last time you heard a man ask, "Gosh, I wonder if I can manage to have a family and a career?"

Women and men in an introductory physics class at Yale were asked about their future plans for having a

family. The five multiple choice responses (limited by the number of buttons on the electronic polling device) were:

Men and women were queried separately. The vast majority do plan to have a family. Of the 42 women planning to have



*Amelia and Sophia (Photo Credit: Meg Urry)*



**In Praise of Daycare** *continued*

children, only two said they intended to stay at home and be the primary caregiver, three said their partner would be, and more than half the women in the class (26) said they planned to share parenting responsibilities with their partner.

In marked contrast, fully one-third of the men (24 of 71) said their partner would be the primary caregiver, while only one-third (22) planned to share the responsibilities of being a parent.

Why is sharing parental responsibilities less expected for men than women? Why do women accept child-rearing as primarily their problem? Sure, biology is different, and pregnancy and nursing can have a physical effect. Barring rare complications, however, it isn't anything women can't handle, nor is it qualitatively different from, say, a man's bout with, a hernia repair.

Instead, women allow this inequity to happen. They accept their greater share of the responsibility the raising of kids. It is a mother's responsibility but it is the father's as well. Why do we give fathers a pass on this?

Why do women fear or suspect daycare? I was well-trained as a Ph.D. astrophysicist, not as an early learning specialist. What do I know about teaching the alphabet, toilet training, eye-hand coordination? Turns out daycare providers often know way more than we do. Every first-time parent knows he or she is a rank amateur. (And by the time parents figure things out, they're probably done raising the kids. Those who do it a second time around – usually guys – probably aren't any better off, since times change. Sigh.) But daycare providers are well trained, and they are self-selected to like kids and to enjoy the craziness of 20 toddlers rushing around.

|   | MEN (75) | WOMEN (45) |
|---|----------|------------|
| <b>A</b> I do not plan to have kids   | 5%       | 7%         |
| <b>B</b> Will have kids sometime, don't have detailed plans yet. [Kind of an understandable response for an 18-year old.] | 20%      | 24%        |
| <b>C</b> I plan to have a family and I will stay at home and be the primary caregiver.                                    | 11%      | 3%         |
| <b>D</b> I plan to have a family and my partner will stay at home and be the primary caregiver.                           | 32%      | 7%         |
| <b>E</b> I plan to work full time and share family responsibilities with my partner.                                      | 29%      | 58%        |

My kids went to daycare in someone's home from the time they were about 2 months old until they were 2 or so, at which point they attended a wonderful YMCA daycare. People used to say to me, How do you manage it, working full time and having a family? I thought to myself, My God, how would I manage taking care of a baby all day long? Now there is hard work. Being at

"work" was a breeze in comparison. (Although sometimes filled with its own version of childish behavior). Turns out, daycare providers are really good at this stuff, much better than amateur parents. After all, they've raised dozens of kids.

What about the "stranger" thing? Sure they were strangers at the beginning – and I defy any CEO to take their 6-week-old baby to someone else's house and not, within weeks, initiate an on-site daycare facility at their company – but in a very short time they become friends, second families – they add love. Some people think of it as a zero-sum game, as if the baby has only so much love to share, so it's going to be divided between mom and daycare provider. (Dad's rarely figure in this calculus, tellingly enough.) But the reality is, love adds. As a parent, you love your kid to death – you couldn't possibly love them more – and they love you back the same. And your daycare provider loves the kid, and gets loved back. There's just more love. It's a real plus.

People ask, Aren't you devastated when she calls the daycare provider "Mom"? Did that happen? Sure it did. Didn't really bother me at all. It felt like a natural mistake, like you might mistakenly call one daughter by the other's name. You know darned well who is who but you have a slip of the tongue. My kids were in full-time daycare from an early age but they always knew exactly who their mom was. (Nursing may have helped with this.) We each had a role, the roles were well identified, and we were their parents and the daycare providers were their daycare providers.

Some personal thoughts on timing (but of course everyone should make their own choices): Many young women have told me, I'm going to stay home for 6 months, then go back to work. (Or, for 6 months substitute 1 year or 2 years or whatever.)

What's the effect? Read your child psychology texts. I'm no expert, but kids are born not knowing what to expect, and they construct their world view based on experience. If their experience is that mom takes care of their every need for a period of N months or years, and then disappears for long stretches of the day – I imagine that can be disconcerting. Newborns sleep a lot. (So should their moms.) If they sleep at Miss Jane's house instead of with you, and you are off doing something you love, how can that harm a 2-month old? And your 6-month old might be happier with this routine than if it changes suddenly.

Some thoughts about Dads: Mothers who stay home take control of their sphere: the kids. Dads lose control of that sphere and take a larger piece of some other (finances, family decisions, home repair, whatever). Dads then become less involved as parents. Nowadays, some major institutional changes are coming about because dads are insisting that they want more involvement in their families.

Power. Money equals respect in our society. Women at home don't make money, so they lose power within the family and they are lumped together in an undifferentiated class. They

*continued on next page*

**In Praise of Daycare** *continued*

may themselves feel powerless. A friend – highly intelligent, accomplished, way brainier than her spouse – once explained to me that she had to ask her husband for permission to buy big things (more than household items) because “he makes the money.” He, of course, was free to run out and buy a new stereo, regardless of the state of the budget. Why did this woman acquiesce in such a patently ridiculous assignment of ownership? As an unpaid laborer she provided countless services to her husband: daycare, nursing, cooking, cleaning, etc. Her salary, as calculated by many different groups over the years, should have been enormous. (One husband of another friend laughed out loud when his wife quoted an article that put her salary at over \$100,000 per year. Right then she learned – or should have learned – what her value was to him.)

Back to daycare: Not everyone’s experience is the same, and bad events do happen, with daycare as with everything else. But disasters are rare, however overrepresented they may be in the newspaper. Few nannies shake babies to death, many more love them to bits, and teach them things, and make their lives joyful. The other children in group daycare become close friends. The social interactions, the motor skills, the learning that goes on – there is absolutely no doubt in my mind that my daughters were far better off in daycare than they would have been with me at home. And yet, they also loved to be at home with us (as they were most of the time, 15 hours a day on weekdays and 24 on the weekend).

To denigrate daycare is to buy into a stereotype that only a mother can raise a child well. Or that a mother, working alone and in some cases, bored and under-stimulated and under-utilized and over-tired, is somehow better for her children than a mix of loving-parent-who-is-happy-and-fulfilled-at-work and well-trained-daycare-provider-who-loves-to-do-projects-and-sing-and-play. Let’s get off this crazy kick. Let’s figure out how to make affordable, excellent, convenient daycare available to mothers. Let’s help mothers who do want to raise small children develop their own businesses, to reap from their talents the recognition and joy that other women get from physics or business or interior design. Let’s each do what we love, not judge others for choosing what they love. Daycare is a lovely thing. Thanks Miss Lisa, Miss Marsha, Miss Jen, the other Miss Jen, and Miss Betty – my kids are really great kids, and you did a lot to make them that way.

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*Addendum from Editor Fran Bagenal:* I noted this summer a debate brewing in the UK about maternity leave (up to 1 year) vs. parental leave (13 weeks). One result has been that employers are reluctant to hire women – any women – because they fear they might take off for a year. Such an asymmetry in leave also enforces the cultural expectation that women take on the main domestic role.

A better system is that of Sweden where, to quote Chris Cully (US father and post-doc living there) “The actual rules governing

the Swedish parental leave are way more complicated than those governing, say, a kinetic plasma system. But the basic gist of it is that each parent gets 240 days of leave (480 days total, ~16 months), which can be taken out at any time and in any number of days per week until the child is 8 years old. Up to 180 of these days can be transferred to the other parent. The employer usually has no right to refuse a request to take parental leave. Leave is paid at 80% of salary by the state, although many employers top this up (my fellowship tops my leave up to 90%). One catch, though, is that only one parent can be on leave at any one time. In practice, the mother usually takes about 10-12 months, then the father about 4-6 months (neither at the full 7 days/week), and then they spread the remainder of the time (usually several months) over the next 5-6 years.” Many US universities have instituted parental leave policies that offer fathers and mothers the same leave options and tenure-clock stoppage.

I also showed Meg’s article to a couple of women who got PhD’s from the University of Colorado ~15 years ago, both with children. A fierce argument some years back with Sarah (solar physicist at HAO/NCAR) had convinced me (who chose not to have children) that family issues are a critical professional issue. Leila, who took time off and then worked part-time (among other things, authoring of book *Minding the Heavens: The Story of Our Discovery of the Milky Way*) sent me her comments:

“I just wanted to let you know that I applaud Meg Urry’s article in praise of daycare. I did not use daycare for Alicia (now 7 ½), and I was quite prejudiced against it when she was very young. I do not know if I would use daycare if I had to do it all over again, but my prejudices have largely fallen away as I have gotten to know satisfied parents (mostly mothers, in my social circle) and very competent daycare providers. I think parents or prospective parents should take some time to research their local options, in particular by talking to parents of slightly older children who have been in day care or had nannies. Visiting a daycare center is not enough, probably—if you are on your first child, you really have to have the opinion of experienced parents. It can be hard to meet these experienced parents, by the way—I don’t think I knew very many when I was pregnant, never mind in grad school! Meg’s experiences are interesting and important reading material for men and women contemplating the work-family balancing act.

To use or not to use daycare is often a question of working or not working. Here again I have changed my mind a bit about the impact of staying home. I have worked since Alicia was born, but always part-time and from home, and outside the realm of academic research. (In the beginning I worked very, very few hours.) Many friends have commented on how lucky I am to have found interesting work that I can do from home, and I do enjoy the work and the flexible hours. But now I find myself pointing out that it is a big struggle to get paid decently for part-time work. I still do not earn enough to live on (though I’m beginning to contribute significantly to the family budget). I did not expect this whole issue to be so problematic. I figured I would go back to work (perhaps outside the home) when Alicia was 3 or 4, and

## In Praise of Daycare *continued*

certainly by the time she was old enough to go to school. I didn't know Kindergarden (at least where I live) is only 3 hours and 20 minutes, for one thing. I also didn't know how scarce part-time jobs are. Putting your child in day care means you can continue working, and that is huge, because it is so hard to "get back in again" once you are out.

The other thing I wanted to comment on is the survey of men and women undergraduates. Yes, it is disgraceful that so many young men expect their partner to stay home and be the primary caregiver, but I think (and hope) that 18 or 19 year old young men have just not given this question serious thought yet and will soon be educated on this issue. They are just picking the answer that seems most appealing on the basis of quality of life.

We all (including us women) wish we had someone to stay home and run the domestic side of things for us. I would be interested to see the results of this survey among older men and women who have had a taste of reality and grappled with the issues first-hand! I am not trying to say that the results of the survey are not important, however. It is probably difficult to get 18-20 year olds to delve into the nitty-gritty of work-life balancing, but it would certainly be valuable to do so."

This is clearly a major topic of our profession. I look forward to reading the response of STATUS readers on the CSWA discussion board.

## Teaching as Hypatia of Alexandria

"Fable should be taught as fable, myth as myth, and miracles as poetic fancies. To teach superstitions as truth is horrifying. The mind of a child accepts them and only through great pain, perhaps tragedy, can the child be relieved of them. Men will fight for superstition as quickly as for the living truth -- even more so, since a superstition is intangible, you can't get at it to refute it, but truth is a point of view, and so is changeable."

Hypatia of Alexandria (370-415 BC)



A 1908 Illustration of Hypatia.



Fran Bagenal is a Professor of Astrophysical & Planetary Sciences at the University of Colorado, Boulder. She usually wears a t-shirt and jeans.

As a junior professor in the late 1990s I felt pressure (not sure exactly where from) to add some diversity to the standard history of astronomy. I was also spending my time churning through the historical material in the textbook and wondering how I would remember the names, dates and who-did-what of the long list of "dead white men". Somehow I stumbled upon Hypatia of Alexandria. Boing! It hit me – I had to deliver my next lecture *as* Hypatia. After all, she had been a teacher of mathematics and astronomy, conveniently at the end of the ancient scientific era, and must have taught the very same concepts: the logical arguments for the Earth being round, the measurement of the size of the Earth, the relative sizes and distances between the Sun/Earth/Moon system, etc. It was true that I would have to greatly simplify the math (university students' skills of geometry having diminished over the past 1600 years). I would also have to leave her contemplating how the lack of measurement of any parallax motion (supporting Ptolemy's geocentric model of the

*continued on next page*



## Teaching as Hypatia of Alexandria *continued*

solar system) seemed logically inconsistent with Aristarchus' measurement of the Sun being much farther than the Moon and, as the largest object, the most logical center of the universe.

The moment of realization that I had to bite the theatrical bullet hit me while I was on a plane to visit collaborators at the University of Iowa. They encouraged me (easy for them!) as I described, with some trepidation, my plan to don a sheet and stand up in front of 200 students to deliver a lecture on Greek astronomy. Kindly, the wife of one of the colleagues gave me an old white petticoat to go underneath (I certainly did not possess such a garment). So, on Monday morning I told my TA to put all the paraphernalia of a modern classroom away and to announce that there was a surprise special guest lecture.

Feeling what I would have described in my English childhood as "a right pillock", I marched into the lecture theater smiling and trying to act what I hoped might pass as gracious. I had set out on a bench some items to help me demonstrate basic concepts: a plumb bob made from a piece of string with a pebble attached and a yard stick (to show that measuring lengths and using Pythagoras' theorem allowed the Greeks to label the location of stars in the sky); candles, a ball and a plate (to show building physical models allowed the Greeks to discriminate between hypotheses for what shape of the Moon would explain the phases); and balls of different sizes to act out the geometries of eclipses (to illustrate how the Greeks used observations of eclipses to work out all sorts of clever things, with a bit of geometry – sadly too complex for the average Intro Astro student). I reckoned that Hypatia had tablets to write on so chalk on the blackboard was probably not stretching the technology unreasonably. At the end, to my amazement, the students gave me an ovation.

Since my first encounter with Hypatia, I have learned all sorts of things about this remarkable woman – probably mostly wishful thinking and mythology that has developed over the millennia. But she really did know her math, she was a good teacher and she certainly stuck her neck out for rational thought.

"Reserve your right to think, for even to think wrongly is better than not to think at all."

Her contemporary, Socrates Scholasticus, describes her in his Ecclesiastical History:

*There was a woman at Alexandria named Hypatia, daughter of the philosopher Theon, who made such attainments in literature and science, as to far surpass all the philosophers of her own time. Having succeeded*

*to the school of Plato and Plotinus, she explained the principles of philosophy to her auditors, many of whom came from a distance to receive her instructions. On account of the self-possession and ease of manner, which she had acquired in consequence of the cultivation of her mind, she not infrequently appeared in public in presence of the magistrates. Neither did she feel abashed in going to an assembly of men. For all men on account of her extraordinary dignity and virtue admired her the more.*

Sadly, the history books tend to dwell on her social liaisons and grisly death. Her scientific achievements (mostly writings explaining earlier Greek works, though some give her credit for development of the astrolabe and the hydroscope) are described in various compilations of women scientists' biographies (see below). And my hero Carl Sagan paid homage to her in "Cosmos" (which I actually missed being TV-less at college). The 19th century

romantics just loved the drama of her life and she featured in novels and paintings. I think it would be cool if "Sex in The City" wrote her into the next film – she would fit right in.



*Many Americans were introduced to Hypatia by Judy Chicago (b. 1939) whose art piece (perhaps better described as a 5-year-long re-education of the nation on the contributions of women) of 1974-9, The Dinner Party included a Hypatia place setting. The installation can be seen at the Brooklyn Museum. Photograph by Jook Leung Photography*

## Teaching as Hypatia of Alexandria *continued*

But the best thing about modern Hypatia is how the internet has allowed young women around the world to pick her as a symbol, to make her their own and to develop lots of sites expounding women in science. Try a Google on Hypatia and you will see what I mean. I have listed some of my favorite URLs.

I repeated the Hypatia lecture many times, until I felt the performance was getting stale. My faculty colleagues seemed amused by my antics and might mention the act as an indication of dedication to teaching. But none of them bothered to turn up to see the lecture. Oh well, their loss. I also realized that 18-year olds tend not to care much for history. Having their professor dress up in a sheet made an entertaining change, but I think they probably learned more (about heat conduction) when I poured boiling water on my foot in a demonstration of how big potatoes (and planets) cool much more slowly than small ones. But don't let the cynicism of a jaded old professor put you off! I urge readers to be bold and seize any opportunity to teach creatively (just plan carefully and avoid boiling water). I have to admit that I had fun. Go for it!



Charles William Mitchell was an English Pre-Raphaelite painter from Newcastle, UK (1854-1903). His one famous piece was *Hypatia*, shown in 1885 and likely inspired by the Charles Kingsley serialized novel *Hypatia* or *New Foes with an Old Face*. This painting is currently in the Laing Art Gallery.

### Hypatia resources:

The three quotes from Hypatia are typeset in Thomas Phinney's new Hypatia Sans font (available via Adobe).

*Hypatia of Alexandria* – Maria Dzielska (Harvard University Press 1995) – perhaps the definitive biography – but also an eminently readable 100-page paperback.

*Hypatia's Heritage* by Margaret Alec (Beacon Press 1986) – Compilation of history of women in science

*Women in Mathematics* – Lunn M. Osen (MIT Press 1974) – ditto for women in mathematics.

*Women Scientists from Antiquity to the Present: An Index* – Caroline L. Herzenberg (Locust Hill Press 1986) – a nice discussion of Hypatia in the introduction.

*Hypatia* – Charles Kingsley (1819–1875) – Fictionalized account of her life, now available

On Wikipedia [http://en.wikipedia.org/wiki/Hypatia\\_of\\_Alexandria](http://en.wikipedia.org/wiki/Hypatia_of_Alexandria)

Howard Landman put together an extensive list of web resources – perhaps getting a little out of date - <http://www.polyamory.org/~howard/Hypatia/>

Carl Sagan quote from *Cosmos*  
<http://oregonstate.edu/instruct/phl201/modules/Philosophers/Hypatia/hypatia.html>

Impact crater on the Moon named after Hypatia  
<http://the-moon.wikispaces.com/Hypatia>

## THE HYPATIA INSTITUTE

A women in science and science education site  
<http://www.hypatiamaze.org/>

Fran Bagenal's Intro Astro online chapter on the history of astronomy <http://lasp.colorado.edu/~bagenal/1010/SESSIONS/5.ScienceAstronomy.html>

"All formal dogmatic religions are fallacious and must never be accepted by self-respecting persons as final."



## Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers, eds. Ronald J. Burke and Mary C. Mattis, 2007 (Northampton, MA: Edward Elgar Publishing, Inc.). Hardcover, \$170 at amazon.com.

*Jennifer L. Hoffman is an assistant professor of Physics and Astronomy at the University of Denver (DU). She studies the circumstellar material around hot stars and supernovae using a combination of spectropolarimetric observations and 3-D computational modeling. She is also developing a program to enhance science education among the non-traditional female students at DU's Women's College. She maintains a compilation of recent statistics on women in astronomy at <http://grammai.org/astrowomen/allstats.html>.*



In the wake of Lawrence Summers' controversial statements regarding the reasons for women's underrepresentation in science, the gender and racial makeup of the science, technology, engineering, and mathematics (STEM) workforce has been the subject of increased discussion. Though the blogosphere hosts no shortage of vocal supporters of Summers' hypothesis that "issues of intrinsic aptitude" (Summers 2005) are the largest contributing factor to the low

number of women in science and engineering, more pragmatic observers take note of the fact that the situation is changing, albeit glacially. This suggests that even if some difference in aptitude exists, its effects are still negligible compared with the social and environmental factors that discourage women and minorities from pursuing STEM careers.

However, those who believe the STEM community has an obligation to correct the inequities that prevent large numbers of talented potential scientists and engineers from joining its ranks are often discouraged by the seeming intractability of the problem. If there were a single dominant cause of the underrepresentation of women and minorities in STEM, one would expect that by now the myriad studies of the issue would have identified it and we would be well on our way to remedying its effects. Unfortunately, the situation is not that simple. The frequency of blatant sexism and racism in the STEM workplace has indeed decreased dramatically in recent years (as was frequently noted at the 2003 Women in Astronomy conference by those who had attended the 1993 inaugural meeting). Yet inequities persist, and those that remain are the more insidious for being numerous, widely distributed, and subtle. It may sometimes seem as though the problem will never be solved because we can never hope to address all the numerous ways women and minorities face small accumulating disadvantages (Valian 1999). On the other hand, one can take heart from the fact that precisely because the situation is so multifaceted, any small improvements are likely to make a difference for a few people – and in the case of very small populations, such as the number of female full professors in astronomy (50/406 in the "top 40" astronomy departments) or the number of minority professors in astronomy at any rank (55/594 in the "top 40"; Nelson et al. 2007), a few people can change the face of the profession.

For those looking for specific, tested strategies they can implement locally to help even the odds for women and minorities in STEM fields, *Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers* is a useful reference. Beyond laying out the scope and causes of the problem (both of which it does well), this book collects a number of articles that describe a broad variety of programs and initiatives aimed at all aspects of the representation problem, including public relations campaigns to change high-school girls' perceptions of engineering, summer bridge programs to ease college transitions for underrepresented minority students, curriculum reform and mentoring efforts to provide support during college years, and academic and industrial initiatives to "warm the climate" for women and minorities in the workplace. In some cases, detailed guidelines for establishing such programs are included; in others, recent research results outlined along with broad suggestions for how they might inspire future efforts. References are extensive throughout, providing many entry points for scientists and engineers to explore the literature in psychology, sociology, science education, and other related fields in which research has been done on underrepresented groups in STEM.

The book is divided into five sections. "Women and Minorities in STEM: The Big Picture" lays out the statistics and basic issues involved, including arguments for increasing diversity in technical and scientific fields, summaries of the obstacles that women and minorities face, and "action strategies" that can help mitigate these obstacles. "Experiences of Women and Minorities in STEM" presents studies describing the statistics and specific issues of five particular populations: female engineering students in the UK, female employees in US information-technology companies, African-American PhD candidates in the sciences, Israeli women in high-tech and scientific fields, and Asian Americans in science and engineering. The articles in this section vary widely in focus and style but offer a range of useful perspectives on different aspects of the representation issue. The latter three sections consider different segments of the career "pipeline." "Building Interest and Commitment to STEM" focuses on girls of high-school age and the factors that affect their decisions to enter and remain in STEM fields. "Enriching the Educational Experience" discusses changes in undergraduate education that can encourage participation by female and minority students in math, science, and engineering. Finally, "Improving the Professional Experience" outlines efforts to support women in academic STEM departments and the engineering industry.

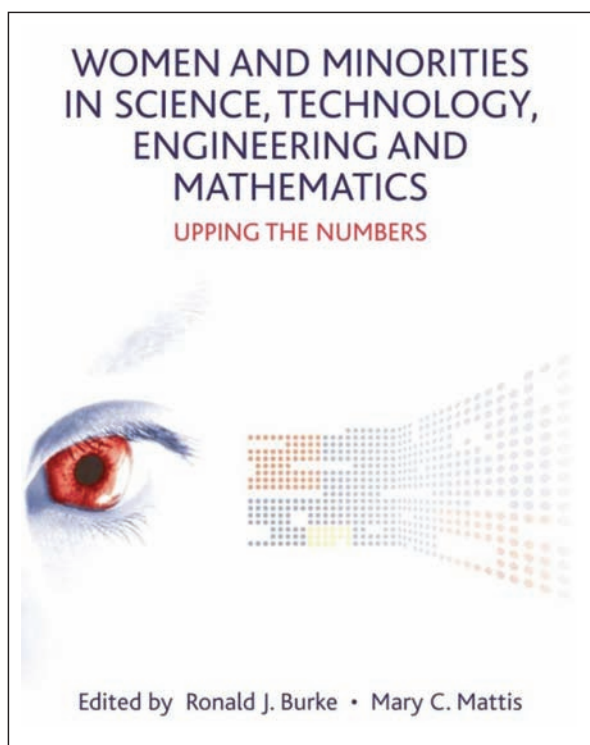
Each chapter has its own points of interest, but I found a few particularly engaging. The article on stereotype threat by Jennifer



## Women and Minorities *continued*

Steele and colleagues at York University provides a fascinating overview of a new and exciting area of research and its consequences for efforts to improve diversity in technical fields. (Stereotype threat describes a phenomenon in which members of a stereotyped group tend to fulfill that stereotype after being reminded of it. For example, women tend to perform more poorly than men on a math test when told beforehand that the test has revealed gender differences in the past, when exposed beforehand to gender-stereotypic television commercials, or even when most of the other test-takers are men.) The chapter on undergraduate student programs by Bevlee Watford at the National Science Foundation includes very detailed descriptions of successful initiatives such as “bridge” or transition programs for incoming students, formal mentoring groups, and residential learning communities. Watford lays out specific instructions and guidelines for anyone considering establishing such programs locally. I also found the discussion of Israeli women in STEM by Ronit Kark at Bar-Ilan University valuable for its insight into familiar issues in a cultural context quite different from that of the US. The emphasis placed on motherhood and familialism in Israeli culture results in similar disadvantages for women in technical fields as in the Western world, but Kark sees hope in the rise of a “new ideal” of Israeli femininity that celebrates the woman “struggling to juggle active family caring with a career... as the cultural heroine of the new economy in Israel.”

The individual chapters in *Upping the Numbers* vary widely in style, from dense and heavily referenced academic feminist prose to casual storytelling and advice. Reading several chapters in succession can make the collection seem disjointed. But in practice, most readers will be interested in one or two particular chapters at a time, so this unevenness is not a major drawback. Rather, each approach has its own benefits, so that anyone who persists and delves deeply into the book will collect along the way not only a long list of articles to look up and add to her personal bibliography, but also a rich assortment of ideas inspired by the descriptions found in the more anecdotal essays. What links the chapters and elevates the book above the level of much of the public discourse on the topic (which tends to be obsessed with pinpointing the causes of the skewed numbers) is the emphasis on specific actions; whatever facet of the problem one proposes to engage, this volume offers strategies for addressing the relevant issues and examples of programs that work.



Beyond these valuable concrete suggestions, the collection is quite strong in general. I appreciated the emphasis on the variety of experience of women and minorities in different fields and different cultures, as lessons learned from one population can be relevant for another. Another recurring theme has to do with the messages we send to young people, to job seekers, and to colleagues by our everyday actions and the way we represent ourselves and our work; this seems to me an underemphasized but powerful way of encouraging personal responsibility and involvement in making our communities welcoming for all members. On a purely practical level, *Upping the Numbers* is well structured: its preface provides a concise but detailed summary of each article that can be used to focus one's reading or to search for specific topics, and the index is

quite detailed and includes the surnames of all the first authors referenced in each article—a boon for anyone cross-referencing related material.

My complaints about the book are minor and mainly reflect the nature of an edited collection. There are several instances of overlap between chapters, and terminology tends to vary from author to author. Somewhat more troubling are occasional ambiguous sentences, unclear figures, and statistical assertions that fail to disclose the characteristics of the sample or account for obvious systematic effects. Finally, the hefty price tag (\$170 on amazon.com, hardback only) will prevent *Upping the Numbers* from reaching as wide an audience as it deserves. However, the book's strengths clearly outweigh these small failings, and I recommend it to anyone with an interest in the topic, especially if she can borrow it from her local or university library.

Summers, L. H. 2005, Remarks at NBER Conference on Diversifying the Science & Engineering Workforce (transcript available at <http://www.president.harvard.edu/speeches/2005/nber.html>)

Nelson, D., Brammer, C. N., & Rhoads, H. 2007, *A National Analysis of Minorities in Science and Engineering Faculties at Research Universities*, [http://cheminfo.chem.ou.edu/faculty/djn/diversity/Faculty\\_Tables\\_FY07/07Report.pdf](http://cheminfo.chem.ou.edu/faculty/djn/diversity/Faculty_Tables_FY07/07Report.pdf)

Valian, V. 1999, *Why So Slow? The Advancement of Women*, Cambridge, MA: The MIT Press

# SNIPPETS

NEWS BRIEFS AND HIGHLIGHTS

## To Recruit and Advance: Women Students and Faculty in U.S. Science and Engineering

Committee on the Guide to Recruiting and Advancing Women Scientists and Engineers in Academia, Committee on Women in Science and Engineering, National Research Council (ISBN: 0-309-54715-6, 145 pages, 2006)

*From the preface:*

This guide addresses three issues—recruitment, retention, and advancement—for three populations of women: students, faculty, and administrators in science and engineering. The intended audience includes anyone interested in improving the position of women in these three areas. Most of the individuals with a stake in progress on this front are toiling inside university walls, but external groups, such as federal agencies or professional societies, will also find this discussion of interest. Chapters 2-6 of the guide address in turn one of the issues combined with one population—for example, Chapter 2 explores the recruitment of students (although for administrators the three issues are combined into a single chapter). Each chapter is divided into three primary sections. A chapter begins with a brief discussion of the challenges facing women in the area (e.g., retention) addressed by the chapter. Much of this discussion is drawn from current literature. The rest of the chapter is then largely devoted to a description of the strategies pursued by the universities visited by the committee and others to meet these challenges. Each chapter concludes with a boxed summary that organizes the strategies by the faculty and administration levels most likely to implement them. Thus, for example, what can department chairs do to enhance the recruitment of female undergraduates? These substantive chapters are sandwiched by introductory Chapter 1, which briefly describes the challenges facing women students, faculty, and administrators and lays out the methodology used by the committee that produced this guide and the concluding Chapter 7, which summarizes the committee's findings and conclusions.

*Editor Fran Bagenal says:* I do not know how I missed this study. It was published a couple of years ago and seems to be chock full of useful advice to people and institutions at all levels of education and academia (and, yes, it is primarily about the “standard” academic track with little discussion of the “outside world”). The chapters follow up the academic ladder, each starting with a list of challenges

(such as the one below for graduate recruitment) and then discusses various successful strategies for addressing these challenges.

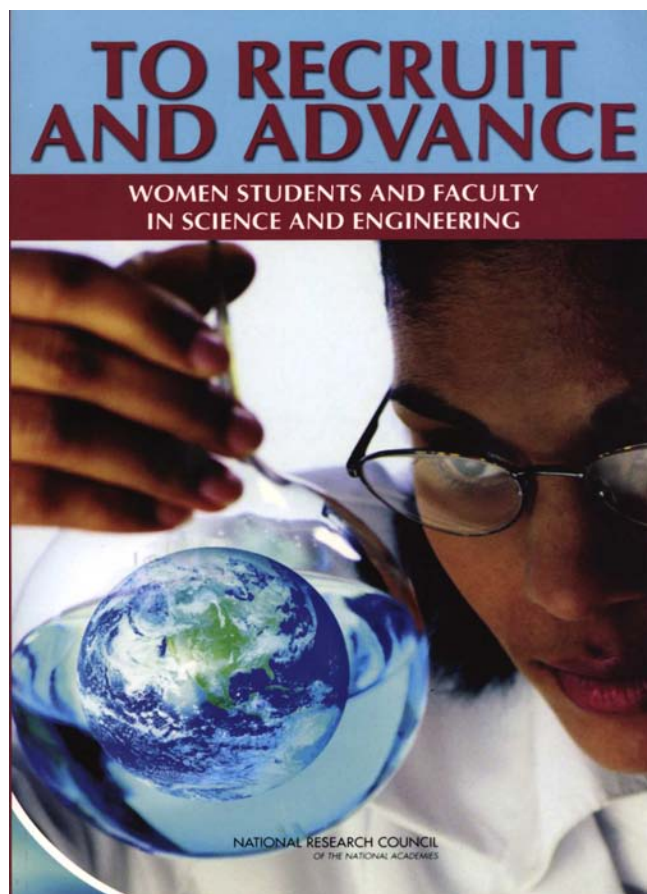
### Box 3-1 Summary of Challenges

Female students may be more likely to leave undergraduate and graduate S&E programs for the following reasons:

- The demographic characteristics of females make them more at risk for attrition.
- Women may have negative experiences, including marginalization, isolation, or harassment.
- For female undergraduates, the curricula may not be as engaging as for male undergraduates.
- The characteristics of graduate programs, including departmental culture, may favor male students.
- Women may face financial issues.
- Woman may more likely have negative, unsupportive, or missing relationships with advisors or mentors.

For example, here is a discussion of the role of the department chair in graduate student recruitment:

The role of the department chair in setting the tone of the department is also critical. A department chair can signal support in many ways, as was demonstrated at some of the institutions visited. The chair sets policy and procedure within the department and allocates resources to support various activities. The chair also has influence at various stages of the graduate program. Because graduate recruiting is conducted primarily at the department level, a chair can have a significant influence on how recruiting is conducted. For example, the chair can call for recruiting materials to be sent to a diverse group of universities and colleges. Likewise, the chair can encourage faculty to ask their colleagues at peer institutions to recommend diverse candidates for graduate study. During the degree program, the chair can decide what approach and tone will be adopted by the department when issues arise and provide support to activities aimed at helping women students. The

SNIPPETS *continued*

chair can support and reinforce institutional policies on sexual harassment, provide funds for refreshments at a lunchtime seminar series or journal club, or support a group that simply gets together to network and mentor one another.

At the end of each chapter there is a box listing strategies to address the challenges for each level of the institution. STATUS readers may have heard many of these things before but this report not only puts these “successful strategies” succinctly together but it has been put together by a team of experienced academics and administrators, carefully steered by the venerable Millie Dresselhaus (MIT), carrying the imprimatur of the National Academy of Sciences. A useful document to show your department chair, dean, or chancellor when arguing for institutional change. Get your department to buy a copy!

Both hardcopy and PDF are available from the National Academies Press at: <http://www.nap.edu/catalog/11624.html>

## Box 2-5

## Summary of Strategies for Recruiting Women Undergraduate, Graduate, and Postdoctoral Students

## What faculty can do:

- Advise and mentor prospective and current female undergraduate and graduate students and postdocs.
- Conduct outreach to K-12 institutions to help prepare women for college and to combat negative attitudes about the place of women in science and engineering.
- Network with faculty at community colleges and other four-year institutions to broaden the search for prospective recruits.
- Invite female students to participate in research opportunities.
- Participate in bridge programs, campus visits, lectures, and seminars.
- Broaden admission criteria and cast a wider net in recruiting students.

## What department chairs can do:

- Create an image of the department as female friendly and feature this image in promotional materials and on the department’s web site.
- Communicate with faculty about the importance of diversity in recruiting.
- Support and reinforce a faculty member’s commitment to advising and encouraging female students and postdocs through service awards and recognition during tenure and promotion reviews.
- Monitor the allocation of resources to students and survey students’ opinions.

## What deans and provosts can do:

- Communicate with department chairs about the importance of diversity in recruiting.
- Sponsor competitions, contests, career days, bridge programs, campus orientations, and other efforts to bring prospective students to campus.
- Monitor departments’ progress in increasing the percentage of female students and postdocs.
- Conduct school-wide assessments of status of women.

## What presidents can do:

- Publicly state the institution’s commitment to diversity and inclusiveness whenever possible.
- Create an institutional structure, such as a standing committee to address diversity issues within the student body. Charge that committee with monitoring diversity across the institution and with making recommendations to increase diversity.
- Demonstrate the institutions’ commitment by meeting with female students and postdocs and devoting resources to programs that assist them.



**SNIPPETS** *continued*

*"In my younger days when I was pained by half educated, loose and inaccurate ways which we all had, I used to say, 'How much women need exact science.' But since I have known some workers in science who were not always true to the teaching of nature, who have loved self more than science, I have said, 'How much science needs women.'"*  
-Maria Mitchell (1818-1889)

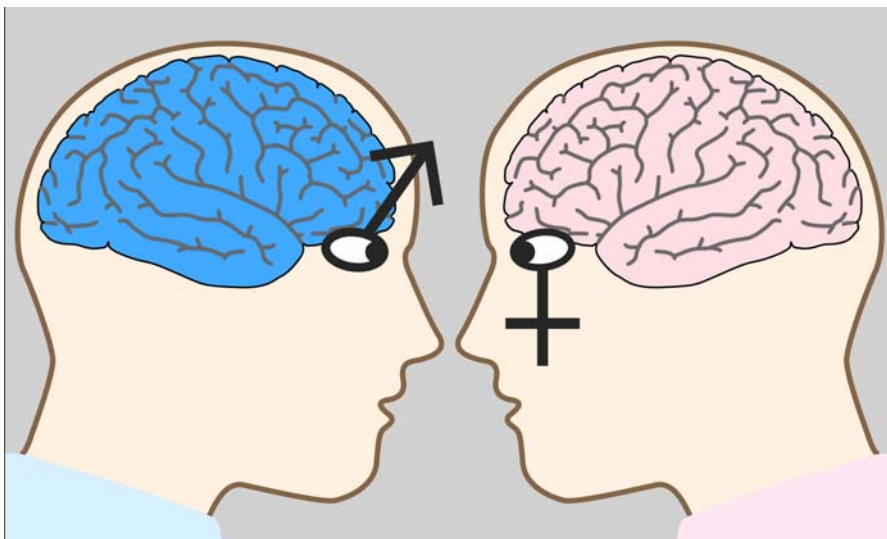
**Maria Mitchell Women in Science Award**

The MM-WISA Committee is pleased to announce the selection of Margaret B. Bailey, Ph.D., P.E., Kate Gleason Endowed Chair and Associate Professor in Mechanical Engineering, Rochester (NY) Institute of Technology as the recipient of the 2008 Maria Mitchell Women in Science Award. Dr. Bailey is the founder and executive director of WE@RIT (Women in Engineering at Rochester Institute of Technology), a dynamic organization working to improve the retention of current women engineering students, and expanding the pipeline of future women engineers through a series of outreach programs for K-12 girls and women. Mentoring is at the core of the WE@RIT programs from linking first-year with upper-level engineering students, utilizing undergraduate engineering students in the K-12 outreach programs, and a bi-weekly workshop series for RIT female engineering students. Dr. Bailey has also created a two week engineering camp for 4th-9th graders, "Everyday Engineering," led by RIT women engineering students, and

a program where RIT undergraduates shadow professional engineers. Clearly a catalyst for improving gender diversity at RIT, Dr. Bailey's programmatic ideas and initiatives are easily replicable at colleges, universities, schools and workplaces. Dr. Bailey plans to use the \$5000 MM-WISA cash award, funded by the Henry Luce Foundation, to work with a small group of science and math teachers to improve the quality and transferability of the "Everyday Engineering" curriculum to other universities and/or 4th-9th grade classrooms. The award will be presented at the Maria Mitchell Women in Science Award Celebration on Friday, September 19, 2008 at 6:00 pm at the Coffin School, 4 Winter Street.

**Award Background**

Maria Mitchell (1818-1889) was America's first woman astronomer and first woman astronomy professor. The MMA believes that a significant legacy left by Maria Mitchell was the vision and quality of education she gave to her students. The women she trained during her 23 years at Vassar College went on to make enduring contributions to the progress of women in all fields of science. Teacher, mentor, role model--Maria Mitchell epitomized the full measure of what a woman scientist could be. Were she with us today, her remarkable energies would surely be focused on academic and social reform, and career advancement opportunities for women in science.

**Study finds women have thicker skulls**

Researchers from the Ford Motor Company and Tianjin University of Science and Technology created a non-invasive method of measuring geometric characteristics of the human skull.

They then examined head scan images of 3,000 patients at the Tianjin Fourth Central Hospital in China. The scientists found the average thickness of women's skulls is 7.1 millimeters -- 9 percent greater than the average of 6.5 millimeters for men. Men, however, have skulls that are 3 percent greater in front-to-back distance and 4 percent wider than the skulls of women. The researchers also determined the skulls of both women and men shrink slowly after reaching adulthood. The scientists said their findings will help in the design of devices that more effectively protect the head during vehicle collisions and other accidents. "The next step will be to find out how these differences translate into head impact response of male and female, and then we can design the countermeasure for head protection," said Jesse Ruan, a Ford biomechanics researcher.

The study appears in the International Journal of Vehicle Safety.

Now, if only we could also develop thicker skins.....

*Graphics courtesy Stephen Bartlett.*

SNIPPETS *continued*



ASP announces a women in astronomy resource site (below). Andrew Fraknoi has put together a nice site with print and web resources on women in astronomy. Like other sites on women in astronomy (see below or just try a Google search), the ASP site has some excellent material – particularly on historical figures – but is rather idiosyncratic in its choice of current women astronomers. Expanding such a site would be a fabulous job for the AAS’ Committee on the Status of Women in Astronomy. Here’s a wacky idea – how about if every astronomy professor gives credit to a student who writes a paragraph biography of an accomplished woman astronomer who is not already posted on these sites..... And the AAS edits and compiles the best 50 these on the CSWA site – with prizes for those that get published. Now that’s putting your AAS subscriptions to good use.

[http://www.astrosociety.org/education/resources/womenast\\_bib.html](http://www.astrosociety.org/education/resources/womenast_bib.html).

<http://www.distinguishedwomen.com/subject/astrono.html>

<http://www.loc.gov/rr/scitech/womenastro/womenastro-intro.html>

**Which country awards the highest percentage of physics PhDs to women?**

I ask this question of everybody but I have never heard anyone guess the right answer. It’s not the US, or Russia, or the UK – or one of those Scandinavian countries that have unbelievable parental leave policies and seem to be run by women presidents, prime ministers and major politicians. No, it’s Turkey. Now that’s a topic for conversation at the group/lab/departmental lunch table. What are they doing right in Turkey to attract women into physics, I wonder.

From <http://www.aip.org/statistics/trends/reports/iupap05.pdf>

| <b>Appendix. Percent of Physics Bachelor's and PhD Degrees Awarded to Women in Selected Countries: 2-year Averages.</b>  |                              |   |                        |   |
|--|------------------------------|---|------------------------|---|
|  | <b>% Bachelor's to women</b> | <b>Ave # of Bachelor's per year, both sexes</b> | <b>% PhDs to women</b> | <b>Avg # of PhDs per year, both sexes</b> |
| Turkey   | 39                           | 2,219   | 28                     | 50  |
| Greece   | 34                           | 588   | 25                     | 39  |
| France   | 33                           | 2,601   | 24                     | 491                                       |
| South Korea  | 30                           | 2,189   | 10                     | 125                                       |
| Sweden   | 29                           | 55  | 17                     | 60  |
| Latvia   | 26                           | 12  | 20                     | 3   |
| Canada   | 23                           | 503   | 13                     | 118                                       |
| Australia  | 21                           | 182   | 20                     | 100*                                      |
| United Kingdom   | 21                           | 1,755   | 18                     | 415                                       |
| Norway   | 21                           | 72  | 20                     | 28  |
| USA  | 21                           | 3,770   | 13                     | 1,237                                     |
| Taiwan   | 20                           | 825   | 10                     | 24  |
| Slovenia   | 19                           | 26  | 15                     | 17  |
| Estonia  | 18                           | 20  | 10                     | 5   |
| Mexico   | 18                           | 162   |                        |   |
| Denmark  | 17                           | 95  | 20                     | 51  |
| Japan  | 13                           | 3,314   | 10                     | 374                                       |
| The Netherlands  | 12                           | 206   | 12                     | 68  |
| Germany  | 9                            | 2,173   | 10                     | 1,570                                     |
| Switzerland  | 9                            | 206   | 9                      | 109                                       |
| Poland   |                              |   | 13                     | 182                                       |
| <b>21 Countries</b>  |                              |   |                        |   |
| * Include Master's degrees.  |                              |   |                        |   |
| 1998-99 data are presented for countries in blue. For all other countries, 1999-2000 data represented. To be included, countries had to provide appropriate data from reliable statistical agencies. |                              |   |                        |   |
| Compiled by AIP Statistical Research Center.   |                              |   |                        |   |



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## Congratulations to Andrea Ghez, astronomy professor at UCLA, on her MacArthur award!



This is the so-called “geniusaward” given by the MacArthur Foundation to people showing exceptional creativity. It is a delight to see this award given to Andrea – not only an outstanding woman astronomer but also a strong supporter of

women in astronomy.

Quoting from the UCLA press release: Ghez uses novel, ground-based telescopic techniques to identify thousands of new star systems and illuminate the role of supermassive black holes in the evolution of galaxies. “I am really thrilled,” Ghez said. “I will be able to take more risks with my research than I could before. The current shortage of federal funding for science can lead scientists to take fewer risks, but my selection as a MacArthur Fellow will allow me to pursue new ideas; it says

to me that I should be brave and take risks.” The mother of two sons — Evan, 7, and Miles, who will turn 3 in October — says the MacArthur funding is “particularly exciting” for women in science. “The MacArthur Foundation funding will allow me to be much more effective and flexible and will definitely help with the balancing act,” she said. “I’m frequently away from home and from my children, conducting research. Now I will be able to bring them with me more often.”

Her website (<http://www.astro.ucla.edu/~ghez/>) also lists several women astronomers she has supported as grad students and post-docs.

Just a idea..... if your institution bought and displayed the set of Women In Science posters (<http://www.math.sunysb.edu/posterproject/posters/index.html> e.g., as advertised at the Women In Astronomy II conference in Pasadena 2002) then the Andrea Ghez poster “Swimming Through Time” might be a suitable location for a celebration of her MacArthur award.

Congratulations also to fellow 2008 MacArthur awardee Adam Riess, professor of astronomy at The Johns Hopkins University and Space Telescope Science Institute. Great achievement, Adam!