STATUS

A REPORT ON WOMEN IN ASTRONOMY

JUNE 2012

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GPS[1] Groups: A peer-problem-solving approach to mentorship

By Evgenya L. Shkolnik (Lowell Observatory), Alexandra Surcel (Johns Hopkins University School of Medicine), Anat Shahar (Carnegie Institution of Washington), Hannah Jang-Condell (University of Wyoming)

From left to right: Alexandra Surcel, Anat Shahar, Hannah Jang-Condell, Evgenya Shkolnik. Photo credit: A. Dragushan.

Dismal retention rates of women and other underrepresented minority (URM) groups in the academic pipeline of STEM disciplines are a well-documented phenomenon. And yet having more diversity among STEM researchers means a greater pool of qualified scientists. After all, diversity leads to excellence [1]. Increasing the number of women (and other URM) requires repairing the 'leaky pipeline', wherein they drop out of the academic system due to the lack of support, family commitments, and feelings of isolation and exclusion.

Closing the gap between education and retention requires significant changes, both at departmental and institutional levels. In concert with those efforts, people can also take action on their own behalves. Mentoring has often been highlighted as an essential element in maintaining URM individuals in STEM fields. Traditional mentoring relationships are valuable but one-directional, i.e. senior mentors junior. Here, we argue that peer problem-solving groups provide a level of support and professional and personal growth unattainable in traditional mentorship relationships, and that participation in such groups can play a significant role in retaining URM individuals in the academic pipeline.

[1]Goals & Problem-solving for Scientists

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aas.org/cswa/STATUS.html

GPS Groups *continued*

Peer mentorship has been used successfully outside academic environments. Benjamin Franklin popularized the notion in his autobiography nearly 300 years ago [2]. Napoleon Hill [3] describes peer mentorship in a "Mastermind" setting for business entrepreneurs, which Hill defines as a place for "the coordination of knowledge and effort of two or more people, who work toward a definite purpose." Because scientific research in many ways can be considered entrepreneurial, application of a mastermind model in academic environments can have similar positive effects. More recently, a group problem-solving approach was described by Ellen Daniell [4]. In her book, several women in Berkeley, California (including members of the National Academy of Sciences, researchers, professors and industry scientists) met every other Thursday for over 25 years, and credit the group for their many professional and personal successes.

Through GPS (Goals & Problem-Solving for Scientists), we reinvented a wheel which needed reinventing. Although the model we present here would benefit all scientists, the main focus of GPS is to cater to women and other URMs. We formed the first GPS group three years ago in the D.C.-Baltimore area, at a time when we were all postdoctoral fellows in the physical and biological sciences, and with young children, making us particularly vulnerable to the leaky pipeline statistics. Our GPS group was a life-saver, or rather a career-saver, for each of us.

Reflecting On Our Time Together, Meeting Every Other Week, Our Group Was By All Measures A Success:

- Three of us applied for and are now in tenure-track academic positions in our fields of choice.
- Three of us have had second or third children in this time and managed to avoid leaking out of the pipeline.
- Each of us is committed to beginning another GPS chapter that mirrors her current career status in her new city.
- We successfully applied the problem-solving skills acquired in the GPS group to our other personal and professional relationships.
- GPS has propelled us to apply for fellowships/jobs/conferences outside of our normal bounds of motivation and confidence.

These achievements were possible in large part because of the peer-mentorship model – seeing how one's advice positively impacts others leads to enhanced self-confidence when it comes time to make key judgments about personal situations. Each of us has come away from GPS more empowered, confident, and focused.

Such a group also helps with identifying and conquering workplace bias and self-esteem issues, including the "imposter syndrome". Additionally, vetting concerns with other women helps relieve much of the competition often experienced among women in the workplace, a phenomenon Stone (2007) referred to as "horizontal hostility" [5].

Note from the Editor, Katy Garmany

We are delighted to welcome Nancy Morrison as a new associate editor for STATUS. I have appreciated Nancy's writing style and her keen eye for typos for many years, and look forward to working with her. See her review in this issue of a very interesting workshop on self-promotion that she attended.

Special congratulations to Meg Urry, contributing Editor to STATUS, for receiving the Van Biesbroeck prize from the AAS. The Van Biesbroeck prize honors an individual for long-term extraordinary or unselfish service to astronomy, often beyond the requirements of his or her paid position. This year, the committee cited Meg "for her tireless efforts to enhance the participation of women in astronomy and other scientific disciplines, through the organization of meetings, written works, lectures, and effective mentoring, done outside and in addition to her work as a scientist." Meg is responsible for enabling us to reprint the "Call for Action" from the American Chemical Society in this issue. Least you think that the issues discussed in this article apply only to our colleagues in chemistry, watch for a report in STATUS from the second AWIS/AWARDS workshop at which the AAS was represented: there are some disturbing statistics!

We always welcome ideas or articles for publication, especially from younger members of the society. Megan Reiter, currently a graduate student in astronomy at Steward Observatory, has offered to help with this, and we look forward to her first article in the January 2013 issue.

Want to start your own GPS group?

The goal of GPS is utilitarian: it exists to solve problems that individual members face in their professional environment involving, but not limited to, professional development, goal setting, productivity, conflict resolution, mentoring, scientific writing, interview skills, work-life balance, and harassment. The private and close-knit nature of the GPS group ensures that members can thoroughly explore concerns in an atmosphere that is both supportive and exacting. Members are required not only to resolve their own conflicts, but also to act as a sounding board, reference point, and source of perspective to others.

We have developed the following guidelines for people interested in starting their own GPS group.

1. Selection of members: A group consisting of four to six people is ideal and members should fit criteria with regard to peer similarities, e.g. early-career women, scientists with children, etc. To set up a new group, we have found two approaches valuable: (1) Approach a like-minded individual, preferably not from your department, with the idea of forming a GPS group and inquire about other individuals who may be interested - this is in fact the way that the original GPS group was started. (2) Set up a large informal get-together with other URM individuals across career stages. Such meetings, which we have held at our homes with 30-40 attendees, are not just a great way to recruit new members, but also serve as an excellent networking opportunity. Adding new members to an existing group should be a unanimous decision.

2. A commitment to meet every other week: One of the primary benefits of the GPS group is to leave each meeting with the expectation that one will be held accountable for following through on outlined solutions. Showing up at each meeting must be a top priority. Members should treat GPS meetings the same way that they adhere to other professional commitments. We have attended meetings on the eve of proposal deadlines and job interviews and with newborns in tow when necessary. This type of commitment, while perhaps initially difficult, engenders a feeling of mutual respect among members and ensures the long-term viability of the group.

3. A commitment to complete confidentiality: This creates a safe and comfortable environment to ask questions, show weaknesses, test ideas, and give critical advice.

4. Restricted times: Each meeting should be 2 hours in length. Meetings start with a 30-second "check-in" during which each member states her (or his) points of discussion

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for the meeting. Each member requests an amount of time she predicts will be sufficient for a thorough discussion of her issue(s) of choice. The group decides how strict they need to be to stay on track, but this step helps gauge the seriousness of the topics for that meeting, i.e. a member who only wants to speak for 5 minutes probably has a less pressing or more easily solvable issue than someone who allocates 20 minutes of the meeting.

5. Choosing topics of discussion: Members should focus discussions on problems where they seek an active resolution, or on issues relevant to all members. This is critical, as GPS meetings are not merely "venting sessions" – participants must then be willing to do the work needed to overcome pertinent issues. In the event that a member does not have an issue to be addressed, his/her role is still critical for the group. During those times, she fulfills the peer-mentorship component of GPS.

6. Honest feedback: The ability of members to both give and receive feedback makes the GPS model a mentoring success. Peer mentorship means that individuals are likely to be more receptive to internal critical review than in the context of a traditional mentoring relationship. It is not enough to simply meet and discuss problems – it is essential that members be exacting and honest in their feedback. The hardest, but most rewarding part of GPS, is pinpointing personal weaknesses, and then having the support of a close-knit group to work through them.

7. Protocols for the beginning and end of each meeting: As with any group, inter-personal conflicts can arise. If such an issue between two or more members is left over from the previous meeting, it should be discussed first thing during the next meeting (before the "check-in" time) in order that the meeting continues comfortably and productively for everyone. At the end of each meeting, members should list concrete goals to be achieved before the next meeting. This strengthens the sense of collegial accountability and is often the cornerstone for the next meeting.

Being part of a GPS group with other dedicated female scientists is one of the most important commitments each of us has ever made. And while working in an environment driven by competition and plagued by bias, it is a huge resource.

New GPS chapters are sprouting up around the globe. If you'd like to find out more information, or reach other people interested in forming a group, visit GPSGroups.com.

A version of this article appeared in the proceedings of the 2011 Learning Across Disciplines mentoring conference at the University of New Mexico. This version is based on the one that appeared in the Spring 2012 issue of the APS Gazette.

References:

[1] Woolley, A. W., Chabris. C. F., Pentland, A., Hashmi, N., and Malone, T. W. 2010, Science, 330, 686-688 "Evidence for a Collective Intelligence Factor in the Performance of Human Groups"

[2] Franklin, Benjamin. The Autobiography of Benjamin Franklin. Philadelphia: J. P. Lippincott & Co, 1868.

[3] Hill, Napoleon. Think and Grow Rich. Chicago: Combined Registry Company, 1937.

[4] Daniell, Ellen. Every Other Thursday: Stories and Strategies from Successful Women Scientists. Yale University Press, 2006.

[5] Stone, Erin. Women and Workplace: a Study of Horizontal Hostility, MA thesis, Oregon State University, 2007. Retrieved from http://ir.library.oregonstate.edu/xmlui/handle/1957/5010.

A Workshop on Self-Promotion Techniques for Women

By Nancy Morrison, The University of Toledo (retired)

Have you ever voiced an idea in a meeting, only to have it ignored and then repeated a few minutes later (without attribution) by a male?

In professional contexts, do you ever struggle to find a balance between wanting to be seen as friendly and helpful and wanting to appear competent (traits that are sometimes viewed as contradictory)?

These situations were among those covered in a career development workshop, "Boosting, Boasting, and Banning Bashing: Self-Promotion Techniques for Women." It was held on February 19, during the the 2012 Annual Meeting of the American Association for the Advancement of Science, in Vancouver, BC, which I attended. The presenters were Prof. Bianca L. Bernstein and two of her graduate students, Natalie Fabert and Kerrie-ann Wilkins. All are at Arizona State University. Bernstein is the PI on an NSF grant that funds the CareerWISE web site, http://careerwise.asu.edu. This article summarizes what I took away from the workshop, along with reflections based on my own experiences. In the following, material in single quotes is a direct quote from my notes, hence a direct quote or close paraphrase from the workshop.

From the meeting program: "... The workshop is designed to help graduate students, postdocs, and faculty 1) understand the influence of gender, work culture, and psychology as related to career advancement, 2) recognize common forms of self-sabotage, 3) learn to silence self-criticism and increase positive self-talk, and 4) develop self-promoting and support-facilitating communication skills. ..."

This set of goals is impressive for a one-hour session, but the workshop accomplished at least some of them. A major theme was the importance of managing the impression we create with other professionals, especially being proactive in making a good first impression. 'We project ourselves in every moment. It's impossible not to communicate our image. What we have to do is make sure that the image we project is the one that serves our professional interests.'

Taking Control of Your Image: The Elevator Speech

In a group activity, we were all asked to create a one-minute elevator speech and then try it out on the person next to us. The elevator speech would help you introduce yourself to, for example, a senior person in your field, especially a future supervisor or mentor. Since you might possibly be nervous in this situation, it would be good to have the speech rehearsed and ready to go. Practice it in front of a mirror or with a friend, if that is what it takes. Having it ready will pre-empt others' expectations of you and allow you to control the image you project.

The elevator speech should introduce you by your talent, not your title. It should emphasize what you want to be known for, what you specialize in, and what you are really good at. Despite this advice, I think it must be difficult or impossible not to mention your station in life. So when I turned to the young woman next to me, I said that I am a retired faculty member from Toledo. I continue to do research in stellar astrophysics, but I am also active in the AAAS Section on Astronomy and in the American Astronomical Society. In response, my neighbor said she was a postdoc doing research in a molecular biology topic that I had read about, and we began a lively conversation. Discussions broke out all over the room.

The Double Bind

After Prof. Bernstein restored order, the presenters listed some ways in which young people, especially women, often undermine their professional identities.

- 'Be indirect'
- 'Be silent'
- ' Use qualifying hedges'
- 'Offer unnecessary preambles, apologize in advance:' "I'm not really sure I should bring this up, but ..."
- 'Ask a question' when you should make a statement: "Do these results indicate ...?" when you mean, "These results are evidence that ..." (Unless you really don't know, of course.)

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A Workshop on Self-Promotion Techniques for Women *continued*

Also avoid the common mistake of raising your voice at the end of a sentence so that your statement sounds like a question.

All of the above having been said, that you should never make definite statements about material you are unfamiliar with or make your conclusions appear less uncertain than they really are.

A particular concern is the double bind, which is that males sometimes react negatively to confident, knowledgeable women. On the other hand, being helpful and friendly leaves you open to being thought incompetent. We all want to help others, but helpfulness can be distracting and deprive you of focus. Finding the right balance is crucial. It's important to communicate your needs directly, honestly, and respectfully.

To find the right level of assertiveness on the spur of the moment, it can be helpful to prepare scripts. For example, if your supervisor wants you to work on Saturday night to meet a deadline, you might say, 'I have plans Saturday, but could we finish the project Sunday afternoon?' Or, suppose you find yourself doing all the cleanup tasks in the machine shop, and one day you arrive to find the place a mess. You can say, 'We should find a system to share these responsibilities.' Anticipate as many situations as possible and have an appropriate response ready.

It seems to me that, for a grad student, being assertive with your supervisor may be difficult, since s/he has considerable power over you. However, you are not powerless, since s/he has already invested time, a research project, and perhaps grant funds in your career. Calmly try to defuse unreasonable requests, and be careful not to overreact to them.

It's important to learn to say No to 'low-profile, low-impact assignments.' The workshop suggested some helpful techniques. For example, 'set boundaries and stick to them.' You could announce that you will be working at home and off line during specified hours of the week, if that's what you have to do to avoid distractions.

Don't allow people you supervise to delegate tasks to you. Provide help when needed, but politely suggest that they accomplish tasks on their own. And remember that 'the world won't fall apart without your help.' One of my formative experiences as a grad student was having a problem that I thought I couldn't solve, looking frantically for my adviser, learning that she was in a long meeting, returning in frustration to my desk, staring at the problem a few minutes longer, and figuring out the answer on my own.

Indeed, I managed without my adviser's help at that time.

Another situation many people have trouble with is 'receiving and responding to feedback.' If the feedback is delivered in an unpleasant manner, try to identify the valid underlying issue and respond to that, not to the unpleasantness. Once the issue is dealt with, you can focus on the unpleasantness if you have energy left.

'Never minimize your work.' If you receive a compliment, avoid saying, 'It was nothing, I was only ...' Graciously say thank you, add a suitable remark, such as that you enjoyed the work and think it is valuable, and acknowledge any help you received. It goes without saying that you shouldn't oversell your work, either.

Self-Presentation: How Do You Come Across?

Try to be aware of how you present yourself to others. 'Are you the same across contexts?' Different situations may demand different personal styles: class or seminar presentations and interactions with your adviser require a professional demeanor, while off-duty interactions with other students and with friends and family may go better with a more playful, relaxed approach. Be flexible and able to portray yourself differently in different contexts.

What about the scenario in which someone else gets credit for a suggestion originally made by you?[2] Many in the workshop had experienced this situation, and it gave the group another opportunity for discussion. We came up with some suggestions. If it's your supervisor who takes credit for an idea you proposed in another context, it's a good idea to document it and talk to him or her later. Or, immediately say, 'Great, I'm glad you brought that up, remember I mentioned it to you.' Or, 'I'm glad you like my idea. It sounds like you're building on my original suggestion, and I certainly support that.'

In general, if you have to disagree with someone, or point out someone's error, do it without being disagreeable. State your ideas affirmatively and, when possible and appropriate, put them in writing.

[2] Also see the article in this issue by Gerrit Verschuur.

A Workshop on Self-Promotion Techniques for Women *continued*

From my own experience, I can vouch for the value of having prepared scripts. On one occasion years ago, I attended a departmental seminar for undergraduate students at which the presenter, who was from another department, made a sexist remark. I sat tongue-tied, with no response ready. For several days afterwards, I agonized over what I should have said and finally found something. I never had the opportunity to use that particular script, but years later, in a somewhat similar situation, I did spontaneously find the right thing to say. I think the experience of developing a script can train us to find the right response to a variety of situations.

Yes, concerning yourself with the impression you create takes energy away from science. That is precisely why your reactions to difficult situations should be at least semi-automatic: time and energy will be saved later.

To find out more about the issues covered in the workshop, the CareerWISE web site is a good resource. Because of accountability to the funding source, registration is required. Once you have registered and logged in, a huge amount of material is available, organized around a problem-solving method. Working through the problem-solving material would take some time, but it would be worthwhile if you have a problem that is consuming your mental energy anyway. Some of the material in this workshop is included under "The Impression You Make." From the home page, under the heading, "*Learn* Skills," click "Learn More" and then look in the first section, "Understand Yourself."

On Hearing What is Said

By Gerrit L. Verschuur, University of Memphis

A cartoon in the British humor magazine, *Punch*, shows five men and a woman sitting around a conference table with the smiling chairman saying, "That's an excellent suggestion, Miss Triggs. Perhaps one of the men here would like to make it."

On the CSWA web site this scene is vividly recreated.

> Have you ever been in this situation: you're sitting in a meeting and make what you think is a great suggestion; you're ignored. Ten minutes later, someone else makes a similar suggestion and everyone thinks it's just the greatest idea. Are you invisible? Did you imagine it? Were you really speaking out loud?

Miss Triggs would relate. The CSWA web site under Advice, item #7: http://www.aas.org/cswa/advice.html "Being Ignored in a Meeting: Suggested Solutions" discusses the problem and suggestions are offered on how to deal with this "invisible person" phenomenon. For example, speak slowly and clearly. Obvious, one might think, but I recently had an experience that suggested that certain hidden variables might be playing a role in creating the phenomenon.

At a recent meeting in our city I was standing around with several neighbors including a local TV weatherman when someone told him that he had seen the weatherman's new female assistant do a weather report the previous weekend. "I didn't understand a word she said," this neighbor reported. In the ensuing discussion, we learned that many of us older men had a terrible time understanding what certain female TV characters in popular nighttime shows were saying. My wife, Joan Schmelz (Chair of CSWA), drew my attention to the CSWA web site advice and that led to my talking to my son, Carl Verschuur (an associate professor of audiology), about this.

Listening presents a challenge to the auditory system. It is well known that women tend to lose low frequencies somewhat more, and high frequencies a bit less, compared

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to men but, critically, they tend to lose the same amount of hearing about 8 to 10 years later than men. Thus in a small, random, group of somewhat older men and relatively younger women, the men would have more trouble hearing the high frequencies. Add to that a general loss of hearing and background noise and our hearing system is additionally challenged. As an example, listening to a language or accent we are not familiar with requires a longer time to process the input and thus it is more difficult to understand what is being said.

No doubt unconscious (or even conscious) gender bias or other personality factors may play a role in creating the "invisible person" syndrome and the CSWA web site offers useful hints on how to minimize its effects. There may be more to the story than has been appreciated, however, and there is some research that backs up this hypothesis. For example, Kilic & Ogut (2004) showed that female speakers were significantly harder to understand than male speakers when normal hearing subjects listened via a simulation of high frequency hearing loss.

I do not mean to imply that senior male hearing loss is the sole or even major reason for the "Being Ignored in a Meeting" scenario described on the CSWA web site. Miss Triggs and the Punch audience can certainly attest to the fact that hearing loss had nothing to do with the overtly sexist remark made by the chairman at the conference table. But what about the supportive men – the men who want to help women succeed in astronomy? It has always been a bit of a mystery as to why they do not seem to hear women's comments. Perhaps the medical aspect of hearing loss has been the missing piece to the puzzle in our attempts to understand why this happens so frequently.

Hearing is actually an incredibly complex process. The fact that computer automatic speech recognition is still far less than perfect illustrates what a tricky task this actually is. It's just that we take hearing for granted, and normally perceive it as easy, so long as we don't have any hearing loss and listening conditions are not too bad.

The brain can only do so much and the auditory system has limits as to what it can process. When listening to the spoken word we are dealing with a signal involving several variables. First there is the frequency spectrum of the speech. In the case of high-frequency hearing loss, understanding what is being said becomes difficult. Key frequencies are missing and hence the words begin to lose their meaning. For example, the sound "s", which is very important in English, is entirely in the very high frequency range, e.g. above 4000 Hz, so high that most of it is lost in telephone conversation, and with any degree of high-frequency hearing loss. The problem is that the listener is not aware that this is going on. In addition, if the speaker has an intrinsically high-pitched voice the ability of the older (male) listener to understand what is being said becomes more difficult.

Now add to this yet another variable: the speed of speech. It takes the auditory system a certain time to register and interpret the meaning of the words. If you listen to someone talking really fast you have to concentrate that much harder to understand what is being said. That speed issue combined with the high-frequency hearing loss renders the task even more difficult and the auditory system will literally tune out. Add to that background noise. The peak signal may inherently be above background noise, but when combined with the challenge faced by the auditory system in dealing with the hearing loss and the speed factor, the extraction of a signal from the noise may be rendered well nigh useless. One may be aware that words are being spoken but that does not mean they will be understood. In fact, this is exactly what happens in all but the most extreme hearing loss – the listener knows something has been said but isn't absolutely sure WHAT was said.

In the meeting situation illustrated in the *Punch* cartoon, if a man is listening to a younger woman who is unconsciously speaking more rapidly because she is nervous, then an additional factor obstructs the communication. Speaking faster because one is nervous increases the pitch and the problem of perception is heightened.

This may, in part, explain the often-perceived phenomenon of a woman in a committee meeting with older men whose suggestions appear to go unheard. The men literally may not have heard (consciously) what she said, not because they were overtly discriminating against her, but because of their innate inability to discriminate what she said, literally.

Add to that unconscious gender bias and the consequence may be that once a senior male in the room begins to feel that a given women isn't making much sense to him (because of the above factors), he will be less likely to listen the next time she speaks.

On Hearing What is Said *continued*

The weatherman referred to above was able to inform his young assistant, still a student as it turned out, and she reported back to her college and they worked on getting her to speak more slowly and more consciously project her voice for maximum effect. Apparently those two steps made a huge difference.

In conclusion, this is an intriguing phenomenon that deserves to be investigated further to determine what can be done to enhance the experience of women both in committees (populated by males) and how to produce the maximum effect when women give talks at conferences. In the meantime do heed the advice on the CSWA website.

Acknowledgement: I wish to thank Dr. Carl Verschuur of the Institute of Sound and Vibration Research, University of Southampton, for valuable information and perspective.

Kilic, MA, Ogüt, F. 2004, Rev Laryngol Otol Rhinol (Bord), 125(1). 35-8
http://www.ncbi.nlm.nih.gov/pubmed?term=kilic%20speech%20intelligibility

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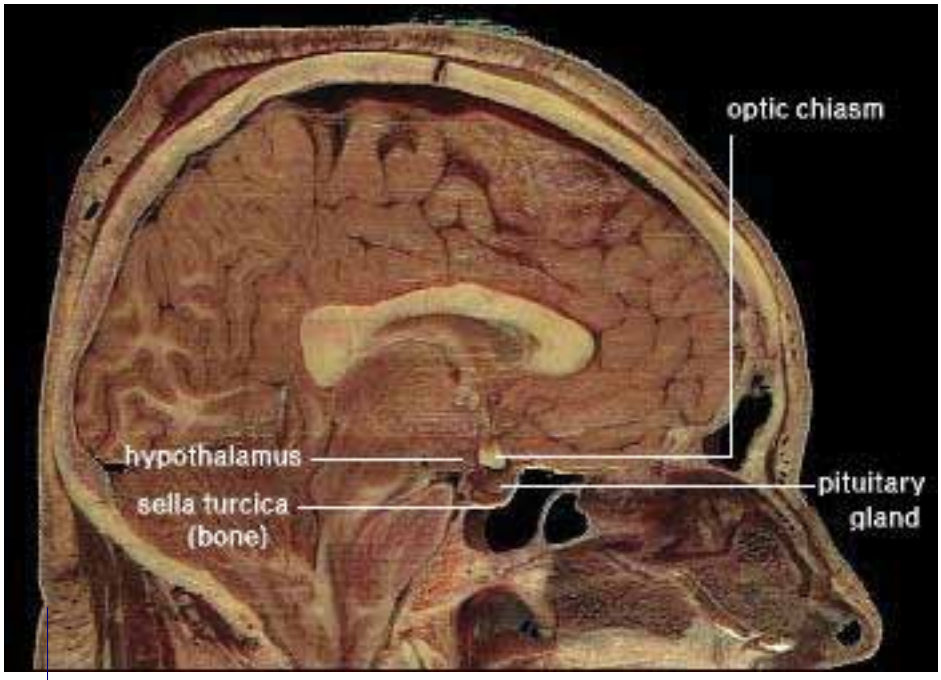

Figure 1. Location of Hypothalamus Found at http://arbl.cvmbs.colostate.edu/hbooks/pathphys/endocrine/hypopit/anatomy.html. It is a public domain image available here-used with permission.

Gender-Specific Brains: Fact or Fiction?

By Laura L. May Hoopes

There is a lot of hype in the popular press these days about how women can't perceive spatial relations because of brain differences, or about how men can't show empathy because they lack certain brain structures. In writing this article, I set out to identify the evidence behind these claims. Are there consistent differences between male and female human brains? If so, are these differences clearly linked to any known aptitudes or behaviors? Because there is a second article in this issue of AWIS Magazine on brain differences rooted in sex hormone controls, I have not included evidence related to that topic here. There are at least four recent books, all by women, on this issue, all of which take a skeptical position on this issue, and all of which are discussed below. I found a few well-replicated differences between men and women in brain structure, but little clear evidence of behavioral differences attributed clearly to them.

Immediately, I found a big difference between male and female brains that is well known, and which almost no one discusses in the popular press: brain size. Like most sex differences, the distributions of male and female brain size overlap greatly, but on the average, male human brains are about 9% larger than female human brains (3,4). Whether this difference should be used to correct other observed differences in the sizes of brain structures is controversial. Some groups correct for whole brain weight, others for relative size of two parts, others apply no correction. What is true is that no one knows the best way to correct for the brain size difference when comparing subregions of the brain, or even if any correction should be applied for accurate comparisons. The data are inconclusive regarding the implications of these size differences for function.

It is certainly not true that males average 9% better performance on intelligence tests as a result of having larger brains, although they appear to be able to visualize objects in space better on average than do women. In her recent book, Jordan-Young cites a meta-analysis of 78 studies of sex differences in spatial abilities (6). These studies estimated a medium effect size of 0.56. She provides an example of what that difference means, assuming that a test has a mean score of 100 and the scores are normally distributed. For example, scores of 140-145 would include approximately 24% of women and 76% of men, while scores of 90-95 would include approximately 56% of women and 44% of men. These examples illustrate the substantial overlap between the sexes in performance on spatial rotation tasks, although the popular press talks about this difference as if it were all-or-none in favor of men.

In rats and birds and many other animals, certain brain regions clearly differ in size between males and females. In humans, despite many claims of such findings in the popular press, there are few such findings and those that exist are mostly in conflict with similar studies in the literature. It's important to note that even when there are reproducible differences between male and female brain structures, they could be the results of differences in behavior or environment rather than causes of differences.

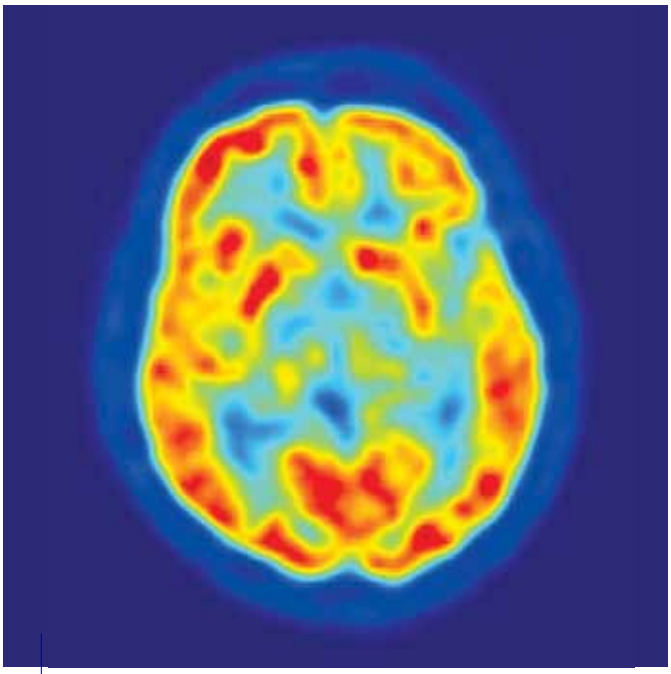

Figure 2. This is a transaxial slice of the brain of a 56 year old patient (male) taken with positron emission tomography (PET). The injected dose have been 282 MBq of 18F-FDG and the image was generated from a 20 minutes measurement with an ECAT Exact HR+ PET Scanner. Red areas show more accumulated tracer substance (18F-FDG) and blue areas are regions where low to no tracer have been accumulated. Used with permission from the owner, Jens Langner (http://www.jens-langner.de/).

Fine's recent book does not claim that there are no sex differences in the human brain, but does point out fallacies in the design of many experiments that purported to show such differences (4). One difference in brain region size with mixed findings is that women have a larger corpus callosum than men. Since this region connects the right and left hemispheres, much speculation connects this finding to gender-specific behavior patterns, including strategies for spatial perception differences known to occur between males and females. Fine argues that the larger the brain, the larger the corpus callosum, so since men have larger brains on average, there appears to be a sex difference. But the difference is actually rooted in size, not gender. In her book, Eliot concludes there is not a consistent difference; she cites an extensive review and several other recent papers challenging that a difference even exists (3). However, Fine concludes that studying sex differences in the brain would be worthwhile, pointing out that women's brains and men's brains may solve the same challenge in different ways (4).

In a recent review article, Cahill argues for the importance of sex differences to neuroscientists designing experiments, pointing out that some published work cannot be interpreted due to uncontrolled use of people or animals of both sexes, while others use just one sex and generalize their findings to both (which he also criticizes) (6). He includes a figure that illustrates many differences in size between male and female human brains, if corrected for the size of the cerebrum. The main message from this figure is that assuming males equal to females would be dangerous for the experimenter. However, this figure was based on a post-mortem study and therefore no behavioral correlates with the apparent differences in brain structure size could be obtained.

Cahill highlights a larger, more neuron-dense CA1 region of the hippocampus in men than in women (6). The hippocampus is important in memory formation. Cahill cites animal studies suggesting that the amounts of different neurotransmitters seem to vary in animal studies of male and female hippocampi (implying different sets of neurons). But brain findings often do not translate between species, so these findings may not apply to humans. Further, Cahill cites a finding that chronic stress causes damage in the male hippocampus in rats and monkeys, while it does little or no such damage in females. This finding is intriguing in that primates were included, but still it is impossible to know if it applies to humans because such experiments cannot be done. Eliot discusses the evidence that the hippocampus is among the most flexible and variable of brain regions, and urges caution in interpretation of any differences in size in this region (3, p. 225).

Cahill also notes that the medial nucleus of the amygdala, which appears from animal studies to have a role in reproductive behavior, is sexually dimorphic in humans, being larger in men than in women (6). This finding is based on the post mortem study explained earlier, corrected for cerebrum size, and is corroborated by another study in which the structure sizes were compared with whole brain sizes. Cahill presents evidence that connects the amygdala with memory of emotional events. He cites studies from his own group where visual images with emotional impact were presented to men and women during brain imaging. These studies found that the left amygdala preferentially responded in women, but the right amygdala in men. Susan Pinker offers another recent book on this subject. In describing related studies using PET scans that followed blood flow patterns, Pinker noted evidence for sex differences in amygdala involvement in emotional reactions, suggesting that women use both hemispheres in responding to emotional pictures, while men often use only one (7). She notes the potential difference in size of corpus callosum connecting hemispheres and concludes, "Scientists infer that this allows women to process emotion with dispatch" (7, p. 116). Given the conflicting evidence regarding sex differences in the corpus callosum, these findings should be questioned.

Eliot discusses the amygdala with regard to risk taking and fear (3). In imaging studies similar to those mentioned above, brain activity was monitored while men or women were presented fear-inducing pictures. Women showed stronger activation in the left amygdala while men showed stronger activation in the right amygdala. Apparently, then, the lateralized emotional response pattern works similarly across emotions.

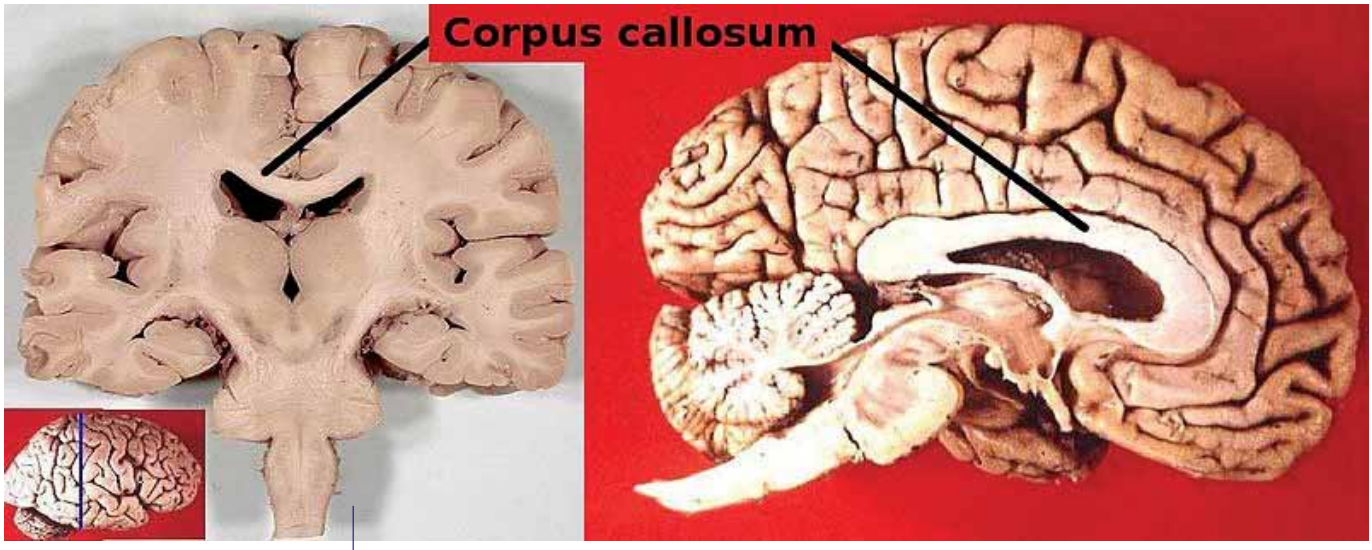

Figure 3. Location of the corpus callosum, the large nerve fiber bundle connecting the two cerebral hemispheres. Left: coronal section of a human brain. Right: human brain cut sagitally. This image was made by combining two images from Wikimedia Commons, Image:Human brain midsagittal cut . JPG and Image:Human brain frontal (coronal) section.JPG. Used with permission.

Another brain region that has often been linked to emotion is the hypothalamus. In rats, a tiny cluster of cells near the hypothalamus called the SDN-POA (sexually dimorphic nucleus of the pre optic area) is dramatically larger in males than in females. Attempts to identify the homologous area in humans have been frustrating (6). Early attempts to identify it claimed a sex difference in the first interstitial nucleus of the anterior hypothalamus (INAH1), but the first attempt to replicate the findings was negative. Later, differences were found in the second and third nuclei (INAH2 and INAH3). Only the difference in INAH3, (which was larger in males than in females), has been replicated. In a controversial study, LeVay found that in the brains of gay men, the INAH3 was smaller than in normal men, more like the size of that in women (5). This finding was partially replicated by Byne and his collaborators, when he found the region was smaller in women than in men due to having fewer neurons (1). Gay men did not have fewer neurons, yet the volume of INAH3 had decreased relative to the whole brain weight. So, although the main point of LeVay's study was supported, the fact that the mechanism of size change appears different calls the assumptions into question.

This fascinating field is rife with methodological problems and controversies, and it is also of such interest to the popular press that any findings can become quickly distorted and their meaning and the caveats proposed by the original investigators can be drowned out. It seems that the most solid conclusions today show a brain size difference and differences between the sizes of some small but important regions of the human brain. More intriguing is the idea that as additional functional studies are completed, we may find strategy differences between men and women solving tasks that go far beyond the few structural differences that have been demonstrated clearly. It's important to evaluate new evidence carefully and not to jump ahead with methods to address presumed learning differences that are not well founded in the actual evidence neuroscientists have obtained. ■

References

1. Byne, W., Tobet, L., Mattiace, M., Lasco, E., Kemether, M., Edgar, S., Morgello, M., Buchsbaum, M., & Jones, L. (2001) The interstitial nuclei of the human anterior hypothalamus: An investigation of variation with sex, sexual orientation, and HIV status. Hormones and Behavior 40, 86-92.

2. Cahill, F. (2006) Why sex matters for neuroscience. Nature Reviews: Neuroscience 7, 477-484.

3. Eliot, L. (2009) Pink Brain, Blue Brain: How Small Differences Grow into Troublesome Gaps—and What We Can Do About It. Boston and New York: Houghton Mifflin Harcourt.

4. Fine, C. (2010) Delusions of Gender: How Our Minds, Society, and Neurosexism Create Difference. New York: W.W. Norton.

5. LeVay, S. A. (1991).difference in hypothalamic structure between heterosexual and homosexual men. Science 253,1034-1037.

6. Jordan-Young, R.M (2010) Brainstorm: The Flaws in the Science of Sex Difference. Cambridge, MA: Harvard University Press.

7. Pinker, S. (2008) The Sexual Paradox: Men, Women, and the Real Gender Gap. New York: Scribner.

ACS Awards: A Call for Action

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By Vicki H. Grassian and Valerie J. Kuck, Co-chairs, ACS Awards Task Force

Along with six other societies, the American Chemical Society is partnering with he Association for Women in Science in a National Science Foundation-funded program entitled: "Awards: Advancing Ways of Awarding Recognition in Disciplinary Societies". The goal of this effort is to develop processes that increase the diversity of scientific award recipients and to use the lessons learned from this work to formulate best practices for other disciplinary societies .

Two years ago, ACS formed the Awards Task Force to critically review the nomination and selection processes used in the society's national program, to identify ways of increasing the diversity of ACS national award nominees and recipients, and to recommend appropriate changes to ensure equity in the selection of award recipients.

The Task Force has reviewed the gender of the nominees and recipients for ACS national awards granted from 2007 through 2012. The society has 62 national awards. Fifty-two of them are presented annually, nine are given out biannually, and one is awarded triennially. Because individuals can be renominated for a given award for up to three consecutive years, the pool of nominees reflects the summation of the nominees for an award for each of the six years reviewed rather than the number of distinct individuals who were nominated for an award.

Analysis of the data showed that women were under-represented among nominees. Women accounted for only 13% of the nominees -- substantially less than their fraction of the membership, which is 21 %. Moreover, women represented 13% or less of the nominees for 44 of the 52 awards that recognize outstanding technical accomplishments. A dozen technical awards had no female nominees.

Women were also underrepresented among recipients. Over the six-year span, women received just 12% of the technical awards. But that percentage was significantly and positively affected by the fact that women had done extremely well in being selected to receive several specific awards. More than 33% of the recipients for seven awards were women. In sharp contrast, there were no female recipients for thirty-one of the technical awards. Clearly, immediate action is needed to address the under-representation in the nomination and selection of women receiving technical awards.

During the past two years, the task force has taken a number of actions. It has supported the formation of canvassing committees for all of the awards having few or no female nominees. Those committees are responsible for assisting ACS in the identification and nomination of deserving women as well as individuals from groups that are underrepresented in the awards program.

In other efforts, the task force prepared supplementary information for the award selection committees. And it developed a best practices document that describes ways for ensuring that all nominees are evaluated fairly. To further assist selection committees, the task force provided committee members with a summary document, video presentation and PowerPoint presentation on implicit associations. Several studies in the social sciences have shown that implicit biases and nonconscious hypotheses and stereotypes-- often about competence--unintentionally discourage diversity in nomination and selection processes. Selection committee members are asked to discuss the implicit association materials before they commence their discussions on nominees.

In another effort, ACS surveyed previous selection committee members on the criteria they used in choosing an awardee. Analysis of the responses showed that there is a wide variation in the criteria used to evaluate nominees. In collaboration with the Board Committee on Grants & Awards, the task force is developing a list of consistent criteria to be used by all selection committees. This set of criteria is expected to result in a more equitable distribution of the awards.

Despite the society's efforts to promote diversity in the chemical sciences, our analysis of the data clearly shows that many technical awards have few or no female nominees or recipients. This situation must change and you can play a key role in making this happen. We call on you, the ACS membership, to identify and nominate qualified women for ACS National Awards. Specific information on each of the awards is posted on the ACS website (www.acs.org/nationalawards) along with the material that must be included in a nomination package.

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ACS Awards: A Call for Action *continued*

We also ask you to volunteer to be on a canvassing or selection Committee that acknowledges outstanding technical accomplishments in your field of expertise. If you are appointed to a Canvassing committee, enthusiastically work toward broadening the pool of applicants and finding nominators who can prepare competitive nomination packages for women and underrepresented minorities. If you are on a selection committee, make certain that all of the nominees are treated fairly. You can make a difference!

Members of the task force hope and expect that their work can help increase diversity in divisional, regional, and local section awards, as well as prestigious lectureships, by laying the foundation and putting processes in place that can be used by these selection committees. With your help, ACS can take tangible steps that demonstrate it is an inclusive society.

Views expressed in this page are those of the authors and not necessarily those of the ACS.