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TAKING THE INITIATIVE

A LEADERSHIP CONFERENCE FOR WOMEN IN SCIENCE AND ENGINEERING

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CONFERENCE REPORT

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ASSOCIATION FOR WOMEN IN SCIENCE

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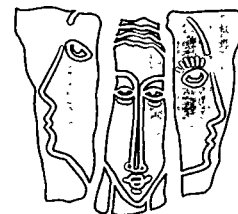
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INTRODUCTION

Taking the Initiative

Over 150 invited women scientists and engineers from government, business and industry, and academia gathered for the better part of three days last spring in Washington, D.C., to “take the initiative” as leaders in their fields. They came to learn about leadership, about themselves, and about each other. In many respects, they succeeded.

The conference, sponsored by the Association for Women in Science, the National Aeronautics and Space Administration, and the Department of Energy, resulted from many discussions on the current climate women experience in the science, mathematics, engineering, and technology fields. The Association for Women in Science’s interest in this subject has, of course, always been intense, but it was recently sparked particularly by the insights Mary L. Good, Undersecretary of Technology of the Department of Commerce, offered to a 1993 National Research Council conference in Irvine, California. Commenting on the few women on corporate boards and in positions of influence, Good concluded that many women who excel in their fields of training lack the skill needed to assume leadership roles. She believes, as do most conference participants, that leadership skills can be taught and that women should have the opportunity to learn them.

The Association for Women in Science immediately recognized its role in addressing Good’s suggestion and began to solicit input from individuals and institutions to bolster the number of women scientists and engineers who lead. Responses showed that women working in science, mathematics, and technology in all employment sectors want information on this subject but can’t find much. They are also looking for supportive structures that would foster communication about leading. The conference, like this document, is a beginning not a culmination.

Neither the National Aeronautics and Space Administration nor the Department of Energy, which cosponsored the conference, could accommodate all the women who wanted to attend. Conferees were active, articulate, energetic, ready to learn what they could, to share what they knew, and clearly hoping for more opportunities to continue working on the leadership qualities, some of which seem universal, others that appear to require skills in specific fields. Conferees met in small groups, heard panel and individual presentations by successful women scientists, physicians, policy makers, academicians, engineers, and--as speaker Ruth M. Davis put it--“techies”.

Among Washington’s attractions for potential leaders is its proximity to the federal government, and participants capped their first day with a Congressional reception on Capital Hill where they met congressional legislators and other national leaders whose position has often had particular impacts on issues affecting scientists, engineers, and women.

Participants’ evaluations helped determine what worked, what didn’t, and what steps should be taken next. Although conferees by no means agreed on all, or even most, issues, they did reach strong consensus on the value of gathering women scientists and engineers nationwide (and, ideally, worldwide) to share their experiences, network across disciplines, and tackle a shared agenda.

This publication will help all women in science, mathematics, engineering, and technology. It will also serve the organizations in which they work. Women--people--with strong leadership skills are productive, valued employees and executives. Conference presentations have been augmented with interviews from a number of the speakers on their personal paths to leadership.

Another conference consensus echoes in this document: Leadership skills exist in all areas at all levels. Being and becoming a leader is a lifelong quest, adventure, and achievement--not a mode one assumes after tenure, promotion to an executive level, or fulfillment of whatever professional goal.



Like this conference, we offer a practical, informative report. Both are small first steps for womankind in science, engineering, and mathematics. We will take more--shaped by your responses.

Let us hear from you.

Catherine Jay Didion
Executive Director, Association for Women in Science



VISION AND DIRECTION

Leadership: A Tripartite Process

Setting the framework for the work of the conference was AWIS President Penelope Kegel-Flom of the University of Houston. "In order to lead effectively," she pointed out, "one must understand something about how leaders function." Just as a person becomes a heroine only when she performs heroically, so must one lead before she may be called a leader. A central focus of the leadership conference, therefore, was to come to understand how the leadership process works, and to learn how established women scientists lead. Participants then applied their knowledge to actual problems they faced in their workplaces.

"Leadership is not a position or a place," Kegel-Flom emphasized. "It is a process that can be learned." When a woman's knowledge base combines with self-understanding, she can choose to engage in learning experiences and to take the risks that can help her develop into a leader."

Studies of effective leaders have concluded that what distinguishes leaders from others is their ability to effect change in the best interests of the group or organization. But how do leaders go about this? Basing her remarks on the work of John P. Kotter (1990), Kegel-Flom described three common elements of effective leadership:

- Establishing a vision and direction
- Aligning people to the vision
- Motivating and inspiring people to stick with it

Establishing Vision and Direction

Leaders, said Kegel-Flom, are people who can assess an organization's strengths and weaknesses within the current context of society and develop a vision and a direction to move an organization ahead in ways that are both desirable and feasible. "Vision," she continued, quoting Warren Bennis (1989/1992) "is a signpost pointing the way for all who need to understand what the organization is and where it intends to go."

The vision must be "appropriate, well-articulated, and easily understood," she went on. "It must clarify where the organization is going, inspire enthusiasm and commitment, and expand the organization's horizons. It must capture the heart as well as the head." For example, when President John F. Kennedy said that the nation would put a man on the moon within a decade, he stimulated the nation's imagination at the same time he challenged our scientific community. And, when Nelson Mandela looked to "one day, one person, one vote," he set the direction for the future of South Africa.

Aligning People

Whereas establishing the vision identifies the direction to go, alignment communicates it in ways that persuade and inspire commitment in others, Kegel-Flom pointed out. "This process, not an easy one, involves frequent, effective communicating of the vision--speaking, writing, publicizing, explaining how all constituencies of the organization, and the society, will benefit." It requires being a role model for the vision, or, as one chief executive officer describes it, "walking the talk."



There is no more powerful engine driving an organization toward excellence and long-range success than an attractive, worthwhile, and achievable vision of the future, widely shared.
--Burt Nanus, 1992

Leadership is creating a state of mind in others.

--Senator Barbara A. Mikulski (D-Maryland)

The function of aligning is to get people lined up behind a vision . . . so as to help produce the needed change. It is a major communications challenge.
--John P. Kotter (1990)

You cannot manage men into battle. You manage things; you lead people.
--Admiral Grace Hopper, U.S. Navy

Alignment also requires identifying coalitions within an organization and leaders within those coalitions who will themselves communicate and demonstrate the vision. Most importantly, said Kegel-Flom, "alignment involves empowering individuals by giving them real responsibility for acting to implement the organization's vision. When a custodian at NASA, asked what she is doing, responds, 'I'm putting women in space,' you know that a vision is shared."

Motivating and Inspiring

Major change within an organization is never a smooth process, Kegel-Flom pointed out. Obstacles appear, conditions change, people experience setbacks, and the end product may seem remote and unattainable.

"Here, leadership meets its third and perhaps most important test, motivating and inspiring people to continue despite the inevitable obstacles," she explained. "Leaders have to clear away obstacles where possible; support and reward workers' effort; and recognize and fulfill basic human needs for achievement, belonging, encouragement, support, a sense of control over life, and recognition for achievement."

Motivating and inspiring lie at the core of the phenomenal success of many corporations, Kegel-Flom said. She cited as an example, Mary Kay Cosmetics (founded in 1963), which now employs more women earning over \$50,000/year than any other corporation in the world.

Leadership And Management: In Symbiosis

Quoting Business Edge (1993), Kegel-Flom emphasized that "Leaders do not control. They enable others to act."¹ She then distinguished

	Management	Leadership
Purpose	Orderly results <i>Efficiency</i>	Produce Change <i>New direction</i>
Agenda	Plan/Budget <i>Eliminate risks</i>	Establish direction <i>Take risks</i>
People	Organize/Staff <i>Specialty/assign</i>	Align people <i>Integrate/commit</i>
Execution	Control/Contain <i>Predictability</i>	Motivate/Inspire <i>Empower</i>

between the purposes and processes of leadership and those of management.

"Leadership aims to produce change by aligning and motivating people to move organizations in new directions; management functions to produce order and consistency," she said. "Leaders risk setting new agendas and directions; managers plan and budget, organize and assign people to carry out those plans cost effectively, on time, and with minimum disruption." She continued the contrast: "Stability, control, predictability (no surprises) characterize effective management; risk-taking, commitment to vision, and inspiration underlie successful leadership." Further, she pointed out:

- Both are needed in effective, successful organizations.
- Leadership without management can lead to disorder, even chaos.
- Management without leadership can result in rigidity and deterioration.
- Most U.S. organizations are overmanaged and underled.

All organizations--government, academia, and industry--need both good management and good leadership, Kegel-Flom concluded.

¹O'Data, Charles N. (1993, June, 1993, July). The call to leadership. *Business Edge*, pp. 13-15, pp. 28-29.

Central References on Leadership

Kotter, John P. (1990). *A Force for Change: How Leadership Differs From Management*. New York: The Free Press (Macmillan).

For a person beginning in formalized leadership training, this book is a good starting point. It clearly defines the modern view of what the leadership process is and how it differs from management and other activities such as strategic planning. Kotter's articulation of the leadership process is widely accepted and taught.

Bennis, Warren. (1992). *On Becoming a Leader*. Reading, MA: Addison-Wesley. (Original work published 1989)

This book moves from research and scholarly issues to the practical matters of how to become a leader. Bennis refers to familiar people and describes steps to leadership, a key process being developing, listening to, and trusting the "inner voice."

Morrison, Ann M., White, Randall P., Van Velsor, Ellen (Center for Creative Leadership). (1994). *Breaking the Glass Ceiling: Can Women Reach the Top of America's Largest Corporations?* Reading, MA: Addison-Wesley.

A research report on barriers that restrict women from achieving key positions in corporations that also applies to other organizations.

Nanus, Burt. (1992). *Visionary Leadership: Creating a Compelling Sense of Direction for Your Organization*. San Francisco: Jossey-Bass.

The first of Kotter's three components of the leadership process, creating a vision, is probably the most difficult to teach. Kotter and others explain important points about vision in leadership, while Nanus focuses on the practicalities--what a vision really is, how it relates to leadership, how it works, how to know whether a new one is necessary, if so how to set it, and its properties. Nanus also explains what is not a vision.

AWIS President Penelope Kegel-Flom, Ph.D., associate professor of psychology and optometry and director of the College of Optometry's Office of Educational Research at the University of Houston, has long been active in equal opportunity issues. Her 20 publications focus on performance factors--particularly noncognitive ones--predictive of effectiveness in the health care professions and leadership concerns.

Leading Into the Vision: Leadership Is as Leadership Does

When the conference has ended, predicted Yvonne Blanchard-Freeman of the National Aeronautics and Space Administration Equal Opportunity Office, delegates will have looked at the "dynamics of leadership and some of its various styles. You will have thought about how people lead organizations and about the outcomes and byproducts of effective--and flawed--leadership.

"In the process, I hope many of you will also have learned how to effect change in the science enterprise. "To do so," she continued, "you will need to know how to

- recognize leadership in action
- look at leadership as a process involving vision, alignment, inspiration, and feedback
- motivate and inspire others and facilitate their efforts to overcome obstacles
- align people to the vision
- distinguish leadership (people) from management (things)
- recognize the purpose and need for leadership
- gain insight into your own leadership strengths and styles
- learn which skills need further development
- know when to lead and when to concede (go home)
- transfer leadership skills to others
- lead in various work environments and among diverse ethnic populations of both genders



Leadership, said Blanchard-Freeman, (at least what we as women know of it) may not be recognized as such by certain ethnic and gender groups unfamiliar with our definition of the concept as specifically based upon human needs. Leadership, as an experience, she went on, “can transcend limitations. It can influence, orchestrate, and conduct.”

What do leaders do? asked Blanchard-Freeman. “They create conditions for others’ empowerment and balance the forces in an organization’s ecosystem. They encourage an environment that fosters intellectual and creative resources. They see people as stakeholders, as investors in processes, as enablers, and as catalysts, instead of as objects to be managed and manipulated.”

Leaders plan carefully, define, focus, and direct, she pointed out. They develop milestones and metrics for measuring the goals that grow out of vision so as to assess progress and performance. To lead effectively, she emphasized, “one must work from a vision. To establish a vision one must consider, in a marketing context, ‘what do I want to dream, with whom do I want to share my dream, from whom do I want investment in my dream, and what outcomes do I expect?’”

Defining vision is the first step towards achieving goals and making changes by providing ideas and foresight, Blanchard-Freeman believes. “Visions stem from the intellectual foresight that clarifies competent, discerning perception of an issue or subject. Visions are not immutable but dynamic, changing and growing as they are augmented with new information and resources.”

Before trying to implement your vision, try the “why” technique, she advised. Why

- do I want it?
- do I want someone to share it?
- bother?

If you are satisfied with the answers to your “whys,” said Blanchard-Freeman, then it is time to create a framework to define direction and a plan to integrate that vision with other ideas and processes. A satisfactory vision is desirable in that it meets the needs of the organization’s constituencies--customers, shareholders, or employees--and feasible in that it incorporates a sensible strategy for implementation that takes into account the competition, the organization’s strengths and weaknesses, technological trends, and so forth, she believes.

“A vision must follow a direction, which provides an authoritative indication of where the organization should be in the future--often the distant future--and a strategy for getting there,” according to Blanchard-Freeman. “This direction should be methodical and well thought out; while it can be novel, it often is not. It should reflect a broad range of information especially from customers, or clients, that challenges conventional wisdom and analytically looks for patterns that solve basic questions.”

Good leadership should continually offer improvement to ensure quality, she said. “Such a state can be achieved by generating and then testing alternative directions against the original understanding and experimenting with many options before choosing the best.” Refining the direction of the vision should never really end (although the process can go through periods both of activity and relative inactivity), she warned.

A clear direction helps produce “useful, significant, nonincremental change” by pointing out where a group or activity should move, by showing how it can get there, and by providing a “motivating and uplifting message.

“If I have learned anything at all about leadership,” Blanchard-Freeman summarized, “it is that nobody is perfect.”

In a compilation of his journals, *Farther Reaches of Human Nature* (1993),² Abraham H. Maslow amended his previous hierarchy of maturity by asserting that its highest state is not self-fulfillment but self-transcendence. He writes, said Blanchard-Freeman, that people often

²New York: Viking/Penguin.

want to be part of a cause not only to fulfill but also to transcend themselves for a purpose that will live on after they die.

"People desire to leave a legacy, to make a difference," she said.

On the other hand, "chronic individual problems can become organizational, as the constituent members bring their personal problems and challenges to the workplace and as the urge for instant gratification conflicts with the considered solutions necessary to perplexing, deep problems."

Blanchard-Freeman quoted Stephen R. Covey (1990, 1991) on a number of leadership principles. Trust, Covey believes, empowers others to buy into the organization's vision and direction, and succeed as independent self-managers. Covey suggests that what he calls "criteria transformations" begin at the personal level before they can become effective interpersonal work relationships.

For many women leaders, unfortunately, trust can be hard to earn, not only because it often takes time to develop but also it is essential if they are to be taken seriously. This handicap is confounded for members of ethnic and racial minorities and persons with disabilities, Blanchard-Freeman pointed out. "Leaders with a difference must be skilled at developing comprehensive managerial processes that create an environment that works for all employees including the boss."

Covey identifies operating principles for four levels of leadership. They are organizational, managerial, interpersonal, and personal. The four, he believes, are the basis for leadership; however, he notes that each level is "necessary but not sufficient."

"Leadership is about relationships among people not among things or concepts," said Blanchard-Freeman. Understanding the increasingly diverse ethnic and gender makeup of the changing American workplace is central to successful leadership. Leadership of a diverse population requires that the leader take time to learn, to understand, and to question.

It involves personal awareness of differences and similarities among individuals and among members of underrepresented groups. It calls for valuing what people bring with them, not making it--or them--over. Leadership in a diverse workforce requires skills to cope with bias, prejudice, racism, and sexism.

In addition, "I have noticed," Blanchard-Freeman said, "that people generally perform as they are expected to. I suggest that--as leaders--you also take a good look at what people expect of you. Don't guess! Ask.

"In return," she continued, "tell them what you expect, and look at how they fulfill *your* expectations as you work to fulfill *theirs*." Blanchard-Freeman concluded with this advice, "Talk *with* your colleagues not *at* them. When I was a teen, my mother used to say, 'it's not always *what* you say but *how* you say it that matters.'"

Yvonne Blanchard-Freeman, Ed.D., associate administrator for Equal Opportunity Programs at the National Aeronautics and Space Administration, is responsible for helping the Agency integrate its workforce and ensuring fairness in personnel decisions, Minority University Research and Training Programs, and distribution of resources. She comes to the Agency from work at the Jet Propulsion Laboratory (California) and the U.S. Department of Agriculture, where she did similar work on behalf of minorities and sciences and engineering education.

Freeman's Favorites on Leadership

Beside's Covey's "seven habits" book, also cited as highly useful by Linda C. Cain and Cindy Musick, Freeman added a second Covey volume-- (1991). *The Principal-Centered Leadership Book*. New York: Simon and Schuster.

and
Careen Brace. (1994). *Walk Tall: Affirmations for People of Color*. San Diego: RPI.

What Kind of a Leader Am I?: Alpha, Beta, Gamma, Delta



*Remember
Ginger Rogers
did everything
Fred Astaire did,
but she did it
backwards, and
she did it in high
heels.
—Faith
Whittlesley, on
the challenge of
being a woman
in the Reagan
Administration*

Before arriving in Washington, each participant individually completed the *California Psychological Inventory (CPI)*, a personality test assessing leadership styles and skills. At the conference, she was provided with an interpretation of her personal profile. In addition, Sandra L. Davis, president of the MDA Consulting Group, Inc. (Minneapolis), twice addressed the gathering to explain how the inventory--developed in the 1950s and researched and revised into the 1980s--helps individuals to understand their leadership approaches, skills, and potential.

Used extensively in work settings and reliably shown to measure characteristics predictive of managerial and leadership behaviors, Davis said that the test, by increasing knowledge of individual leadership styles, can lead to greater effectiveness in the workplace and beyond.

During Davis's presentation, each delegate received her personal profile. The individual profiles recorded scores on 20 different empirically derived scales such as *dominance, independence, empathy, responsibility, tolerance, intellectual efficiency, and flexibility*. A high index on a particular dimension indicates the significant presence of that quality. Thus, someone with a high flexibility score tends to like change and variety, be adaptable, and be easily bored by routine; a person with a low flexibility score is deliberate, single-minded, even stubborn.

The mean profile Davis created of the 134 scientists and engineers attending the conference showed a group of independent, assertive, self-confident women, persons willing to lead, to value innovation and creativity, and to prefer working free from close supervision. At times headstrong, they may resist convention and challenge the status quo. As a group, Davis told conferees, "You are intelligent, clear-thinking scientists who use your intellectual abilities efficiently and are strongly motivated to achieve," particularly when projects require independent effort.

Compared to women who are managers, she pointed out, the scientists and engineers at the conference scored lower on scales such as *capacity for status, sociability, and social presence*, indicating that, as a group, they may be somewhat uncomfortable in social situations and tend not to seek visible, outgoing roles. This finding, Davis pointed out, suggests that some women scientists might be wise to increase their visibility in a variety of settings, including the workplace, in order to raise their level of recognition and impact.

Overall, the group scored highest on the *CPI's dominance* scale, the index research has found to be most predictive of leadership potential. High-dominance individuals are assertive and self-confident; they take charge constructively and are willing to seize the initiative; they actively seek positions of influence and leadership and are comfortable in them.

Remember, cautioned Davis, "the description I am presenting is *normative* for the group. Considerable individual variability and exceptions to this overall picture exist among you."

The *CPI* also measures four different lifestyles--Alpha, Beta, Gamma, Delta--and the extent to which each individual is functioning optimally within her category. Leaders of every style can be effective, Davis said, but in quite different ways and with different needs:

- **Alphas** are ambitious, assertive, enterprising, extroverted, and supportive of organizational norms and goals; they seek influence and like to take charge and move ahead once the direction is set. They actively seek leadership positions and enjoy recognition. Alphas may be headstrong and need to work on recognizing divergent ideas, including others in the decision-making process, and on deemphasizing competition. Summarized Davis:

Alpha managers are goal-oriented and planful, always acting as if they know what to do. Confidence often follows action rather than preceding it. In spite of the fact that, as women in science, you are degree oriented and knowledge oriented, don't wait a lifetime to find out if you can do things. That we need knowledge before acting is the focus of our scientific careers; however, in terms of leadership, sometimes you don't need any special knowledge to lead. Alphas are well defended. They believe ultimately in their souls that they are being virtuous; that they are acting for the good of the organization. They often resist feedback. When you hear someone ask incredulously, "How did that guy get to the top? He doesn't know anything." There's a good chance he doesn't: He's an Alpha male, however, so it doesn't matter.

- **Betas** are steady, supportive persons who take their responsibilities seriously, preferring order and predictability. They keep organizations running smoothly, often working behind the scene. Introverted, Betas are steady workers who can be counted on to get the job done, who sometimes make mistakes by adhering too strongly to the status quo, and who are sometimes so soft-spoken that their ideas are not heard or they fail to receive credit for what they do. "The duck seems to be moving smoothly across the water," said Davis, "but you don't see its webbed feet paddling."

- **Gammas** are innovators, change agents, skeptics of the status quo who actively seek ways to do things differently. Gammas are the generators of new ideas, always ready to start on new projects. Extroverted, headstrong and at times downright disruptive, Gammas as leaders should acknowledge the need for follow-through, accountability, and the danger in taking on too many projects at one time. "Because of the way they challenge the system, it's rare to find a Gamma in a top military post," Davis noted.

- **Deltas** are detached and personally reflective. They are sensitive, reserved, introverted persons who prefer the creative, behind-the-scenes project where they can work alone or in small groups. They do not usually seek leadership positions, preferring to operate outside of the norm. They may make mistakes by keeping information to themselves and by forgetting about practical realities. "Deltas celebrate that people do things differently," Davis said.

Lifestyle Scales/Orientation			
		Norm-favoring Rule-abiding Supportive of mores	
		Alphas charismatic ambitious assertive enterprising outgoing self-seeking manipulative defensive	Betas steady nurturant inspirational insightful cautious conventional moderate unassuming
Externality Involved Participating			Internality Detached Self-sacrificing
	Norm-doubting Rule-resisting Challenging of mores		
	Gammas innovative adventurous clever headstrong progressive rebellious skeptical disruptive	Deltas reflective creative perceptive preoccupied quiet reserved sensitive worrying	
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*No one can
make you feel
inferior without
your consent.
--Eleanor
Roosevelt (1937)*

Fifty-eight conferees (43 percent) were Gammas; 50 (37 percent), Alphas; 15 (11 percent), Deltas; 11 (8 percent), Betas.³ Overall, Davis said, the surveys indicated that each group of individuals was functioning at above average potential for their type, indicating general satisfaction with their lives and work. On the preconference questionnaire, delegates most often cited the following as personal strengths or competencies: Communicating verbally, people skills, solving problems, and creating and developing alternatives. As skills they needed to develop, they most often cited resolving conflict, delegating responsibility, challenging others to perform, and persuading and influencing people not directly supervised.

Conference participants generally agreed that the personal assessment helped them to identify their personal strengths both compared to the other women scientists attending and to the population as a whole. Recognizing one's strengths and weaknesses can enable a person to act knowledgeably as she develops her leadership potential.

Understanding the various lifestyles sheds light on how and why people differ in their approach to work and other aspects of their lives, Davis pointed out. A woman diagnosed as a Gamma might at last realize why she is perceived as a rebel or iconoclast in her highly traditional organization. A Beta might come to understand that, in order to be fairly rewarded, she may have to become more outspoken and visible. The Alpha could learn why her ideas are not always endorsed by the subordinates she has failed to include (align) in her decision making. And the Delta may now understand her sense of alienation and begin to think of ways to bring her personal creativity to the fore.

Understanding more about the different ways of approaching the world and of leading successfully, Davis is convinced, cannot help but increase harmony and effectiveness on and off the job. And, she concluded, "The best leaders are conscious not unconscious. Leadership is learned by doing, by experiences."

Sandra L. Davis, Ph.D., cofounded and is president of the MDA Consulting Group, an industrial psychology consulting firm. After completing her doctorate in counselling and psychology at the University of Minnesota, she remained as a faculty member to run the counselling outreach office in the Institute of Technology.



³Rounded percentages do not add to 100.

BARRIERS

When the Unexpected Happens--Overcoming Conflict

The Friday afternoon workshops focused on overcoming obstacles to success on the job. This time, the groups dealt with regular workplace problems complicated by an emergency situation, in this case, the loss of an important player on a project with a critical deadline.

Groups concurred that the ability to recognize and act on key issues, as well as to maintain a high level of team motivation was essential to solve the crisis. Leading questions steered the groups to define immediate and secondary issues, deal with them, and plan a method to motivate the team as a whole. When the groups reconvened to discuss decisions, they had arrived at several similar courses of action.

Most groups saw the immediate crisis as lying in the realm of scheduling and compensating for the loss of the manager. All eight considered issues directly involved with project output to be primary. Five of the eight agreed upon family strain, interpersonal relationships, morale, and team dissatisfaction as secondary concerns.

Common solutions for dealing with the situation included the use of outside resources, team brainstorming and communication, and rescheduling. Participants also advocated the use of temporary staff, interns, and calling upon the wisdom of former managers about ways to spread out duties so as not to overload individuals. Among other approaches were weekly meetings to list ways to improve and boost team morale.

To counter declining motivation, a debilitating if sometimes invisible condition, conferees suggested encouraging staff "ownership" of the crisis, which would bring a sense of personal responsibility for its solution, "making families part of the solution rather than the problem," and offering rewards, such as recognition, bonuses, celebration of successes, flex time, and small perks.

In addition to these solutions, groups also came up with a number of "highly creative and innovative suggestions," noted workshop coordinator, Lynne Friedmann. The process was meant to "impress upon members of the audience the almost infinite ways in which problems could be solved and to encourage them to think beyond "obvious" solutions," Friedmann commented. One conferee said that the workshop was "helpful" and "applicable." The situation is one "I can relate to," agreed another.

The Task:

You're leading a group on a long-term project that will culminate in the development and installation of a customized information and communications system for your organization. The time line for completion of the project is twelve months. You've brought together a talented team, and the project proceeds smoothly for the first several months.

Midway through the project, however, a key manager leaves because of a sudden illness. Without her presence, deadlines start to slip, interpersonal conflicts arise, and a number of software glitches are discovered that further delay progress.

You recruit several strategic members of the team to work late and on Saturday mornings in order to get the project back on track. Your family begins to express dissatisfaction with the additional hours you are spending at work, and you learn that many of your team members are facing similar issues.

The workshops on alignment and motivation followed participants' exposure to presentations of seminal ideas and theories with workshop sessions where members of small groups could apply what they had learned (as well as their individual experiences) to the solution of common problems.

On the one hand, workshop coordinator Friedmann looked for (and found) "validation" as the several similar ideas that occurred to a number of teams reinforced each others' conclusions. On the other, she enjoyed the "unique and highly innovative contributions" made by individual groups.

"The goal was to provide tools for identifying and solving problems as well as to leave participants with the message that there's more than one right track across hard places," said Friedman.

Facilitators were AWIS executive board members Nancy M. Tooney, Jaleh Daie, Ellen C. Weaver, Harlee S. Strauss, Linda C. Cain, Penelope Kegel-Flom, Alix I. Robinson, and Sheila M. Pfafflin.

Be Willing to Be Irreverent On All Occasions And Refuse to Be Blackmailed



Women do more research, hold less power, get less money, and cost less than men, although per unit dollar, they put out more work, according to Florence P. Haseltine, physician, researcher, and administrator at the National Institutes of Health's Institute of Child Health and Human Development. "Women run smaller labs and titled units and do most of the hands-on science, while men in the megalabs get more funds and do less," she continued.

"When I started out," she remembered, "no place was good for women--particularly for women gynecologists." Haseltine measured the federal government's commitment to women's health in the mid-1980s as follows: When she came to her current position as director of the Center for Population Research, the National Institutes of Health employed 3 permanent gynecologists, 39 veterinarians, and 4,000 "other professionals." Among Haseltine's missions was changing those statistics, and, although the statistics are unavailable, the veterinarians now number 17 and she personally knows at least 10 gynecologists.

By age six, Haseltine was sure, in spite of lifelong dyslexia, that she would work in science. "That mission is still being accomplished," she said, musing, "I can enumerate the many little hits that knocked me from field to field (from biophysics to medicine) until I ended up as a government bureaucrat." Other precedents besides the "little hits"? "My father worked for the Department of the Navy," Haseltine explained, "and so I knew that the government did basic research. The National Institutes of Health were particularly prestigious."

In Haseltine's current job, she finds that she can implement certain processes rather easily. She oversees, for example, an operating budget to set up meetings that act as catalysts for scientists with similar interests. Haseltine believes that, to become a leader, one has to have education and opportunity. Some people seem, however, to have a virtual "biological imperative" to find people, interact with them, and lead them into projects. Others take more pleasure in doing projects.

"Sometimes," Haseltine said,

You have to gather people together and get things done. If I need to know a law to do my job, I'll sit down and learn it. You can be blackmailed by persons with information you lack by letting them have undue influence over your decisions. In this case, you must fight your blackmailer through more information. What you must never do is be held hostage to pieces of information that you could learn.

"The main thing, however, is trying to get the job done," she summarized, noting that she loses her temper a lot less than she used to, "seething more now. If I'm up all night thinking about a problem," she laughed, "I have the solution in the morning, and the next night someone else may be up thinking about it."

Haseltine noted that, when starting a job, one often has to succeed in others' worlds and on their terms before trying to change things. "You have to get inside before you can do that," she warned, "and you can't always make inroads even then."

For example, she observed as head of a lab at Yale, very little respect for the basic researcher: "They didn't value laboratory time." Her solution: "I'd say that I was taking care of patients, when I was taking care of mice. If people thought I was dealing with people patients, that was their incorrect assumption."

Haseltine has, fundamentally, pared her life down to family and career. In the Washington area, where she spends most of her Monday-Friday work week, she has only a couple of personal friends; her focus in Connecticut is on her husband and her daughters, ages 13 and 15. On the other hand, she has many personal and professional contacts up and down the AMTRAK corridor.

She explained, "You can't do everything, so I've had full-time child care from the time my children were born. You have to delegate the basic care of the kids to someone else if you can't do it. It costs money. All my income is spent freeing up my time. It's very hard."

"I don't think people have to have kids in their 20s," she said. "They should probably have them in their early 30s, after preparing for their careers."

After Haseltine's medical training was complete and her schedule became her own, she and her husband decided to complete their family. "I kept miscarrying," she remembered, "but eventually I had two successful pregnancies" [at ages 37 and 40].

Haseltine believes that part of every job package should be day care. "Our nation needs children, but day care is often unavailable for people who need to work. Day care should be part of the working environment, like having safe water to drink. Although her daughters live in New Haven with their father, who also works full-time, Haseltine does not think either parent "has missed important events in our girls' lives." Her husband and their domestic help take care of day-to-day weekly parenting responsibilities, and Haseltine responds quickly to her daughters' beeper messages and routinely takes one of the children to each of her many professional presentations.

Further, one of the "blessings" of her current position is that she no longer has to be on call on weekends.

Some of Haseltine's (printable) pearls of advice follow:

- If the senior people aren't happy, no one's happy.
- Don't beg off anything using child care as an excuse. Say instead that the car broke down.
- Just because you're an adult doesn't mean you have any sense.

Working for Healthier Women

In 1990, Haseltine founded the Society for the Advancement of Women's Health Research; she also serves as the Society's president. Since then, funding for women's health research at the Institutes has increased approximately 60 percent. While this is a great stride, there are many more to be taken: Women's health research represented only 14.2 percent of the Institutes research budget for 1994.

Haseltine also hailed former Institutes Director Bernadine Healy's launching of the Institutes' "Women's Health Initiative," which will increase women's awareness of health risks and disease prevention. It is intended that this 14-year, \$625 million clinical study across the United States will provide the scientific community with valuable knowledge on the design and implementation of future clinical studies. The Institutes are also fostering increased enrollment of women in biomedical research and education and supporting them in assuming leadership roles in the health professions.

Women in science wishing for more advice from Haseltine should condense their concerns to one paragraph and send it to her at the Center for Population Research, National Institutes of Health, 6100 Executive Boulevard, Room 807, Bethesda, MD 20892-7510.

Florence P. Haseltine, M.D., Ph.D., board-certified in obstetrics, gynecology, and reproductive endocrinology, has since 1985 directed the National Institutes of Health's Center for Population Research (Bethesda, Maryland), where she "watches over and nurtures" reproductive biology. She came to the federal government from the position of supervisor of the Human In-Vitro Fertilization Laboratory at Yale University.

In Spite of Injustice, Ask, Learn, Do



Ellen C. Weaver, recently retired from San Jose State University and immediate past president of AWIS, entered college as an art and music major at Flora Stone Mather College of Western Reserve University, but quickly realized that she "had to eat."

Having temporarily to support her new husband, physicist Harry E. Weaver (now retired but then in graduate school), she switched to chemistry, a field with greater financial potential and, to her, more appeal, than the traditional "women's work" of the 1950s--teaching, nursing, or secretarial positions. After five years of work as a B.S. chemist--including some time on the Manhattan Project in Oak Ridge, Tennessee--and after enduring a series of "mostly wretched" bosses (along with a few reasonable ones who realized she "had a mind"), Weaver met a woman Ph.D. chemist of about her age. This role model, plus a supervisor who yelled at Weaver "Remember, you only have a bachelor's degree, and you don't know anything!" were catalysts--positive and negative--that made her decide to go for a doctorate.

So she and her husband changed roles: He worked during her quest for the advanced degree (in genetics), which is "the union card that lets you do your own thing. Because of my experience as a technician, I make sure those people helping me understand the rationale for why they have to perform procedure in a particular way." Weaver emphasized that she always treats technicians as colleagues rather than subordinates.

Often lugging little children along to classes and seminars, Weaver produced research on genetic crossing over in fruit flies that earned her the necessary doctorate. Once completed, she used the credential to make a "right angle turn into photosynthesis, a field about which I knew nothing," Weaver said: "Everything I did professionally, I learned on my own."

Nonetheless, she counts herself deeply fortunate in marrying "a very fair-minded man who was willing to support me as I had him" both in domestic and professional spheres. Her husband's seminal work on electron paramagnetic resonance (EPR), and his invention of the first commercial EPR spectrometer in the 1950s, caught his wife's interest as well, when she observed that algae (which are photosynthetic) become paramagnetic in light and lose much of the EPR signal in the dark. In spite of the fact that their styles of working and writing were and are "completely different," the Weavers wrote several papers together: When the joint papers were published, Weaver said, "it was like having another baby."

Weaver was successful in obtaining grant support from federal agencies to support her EPR work but not in finding a stable position. At Stanford, she was told that a woman biology professor was unthinkable. After several years of success in obtaining grants as a research associate there, she was forbidden to put her name on proposals. She then received a National Academy of Sciences/National Research Council senior postdoctoral appointment at the National Aeronautics and Space Administration (NASA) and, provided generously with

sophisticated equipment, did productive research, published extensively, and spoke by invitation nationally and worldwide, becoming the only woman to be a guest at the National Academy/Union of Soviet Socialist Republics meeting (1972). Nonetheless, she learned that she would have to leave the NASA lab, when a powerful man's protégé exercised his right to refuse to work with a woman. "I wish I'd fought that one," Weaver said many years later. "What I didn't realize then was that without continued access to sensitive instrumentation, I would never be able to get back into the EPR work."

A fortuitous and "wonderful" collaboration with John Arvesen, a NASA mechanical engineer from another division, led Weaver into another entirely unknown field, when she agreed to work with him on the remote sensing of chlorophyll. "Sometimes women tend to worry too much about getting formal training," she mused, "about getting the right tools." For example, having become interested in remote sensing as a measure of the ocean's productivity, she traveled to the Scripps Institution of Oceanography in La Jolla, "tramped around the halls introducing myself and asking questions," and was welcomed aboard a scheduled cruise, the first of many she would make in pursuit of her research. This pragmatic path, like many of Weaver's other approaches, accords with her belief that, if you're interested in something about which you're ignorant, "find somebody who knows and ask."

With Arvesen, she worked to make a significant contribution to the understanding that the ocean's color--the scattering of blue and green light--varies according to how much chlorophyll there is in the water. Their approach led ultimately to the Coastal Zone Color Scanner, launched aboard a satellite in 1978, which for the first time mapped the chlorophyll distribution of the world's oceans on a repetitive basis. "Remote sensing of ocean color," Weaver remarked, "transformed oceanography."

She still publishes in the field, recently producing monographs on ocean color and on algae of economic value. Among those with whom Weaver and Arvesen collaborated was oceanographer Jacques Cousteau, to whose "enthusiastic and gracious" letter of recommendation, Weaver thinks she owes her permanent job: "I felt a little hurt at the dramatic effect of that letter," she remembers. "I was the same person with or without it. But it did get results!"

Still without a secure position 10 years after earning her doctorate, in 1969 Weaver accepted a part-time temporary job at San Jose State University and was the first to benefit from a cooperative program to funnel NASA money into the University. She taught at least one course most semesters, even during five years as a grants administrator, and eventually was accepted as a regular faculty member. In 1977, she was granted tenure. Over the years, she has produced "about" 30 papers (she has not kept exact count), mostly as sole or senior author.

Weaver was appointed interim executive vice president of the University in 1978, a post she enjoyed despite the fact that it had no science component. The experience of running the nonacademic aspects of the University brought insights, she said, continuing "Being a leader is much less stressful than being a professor. I never had to shout, and my decisions were respected."

Weaver regrets that her determination to return to "real science"--which turned out to mean full-time teaching--kept her from pursuing administrative jobs, and she now wishes that she had aimed for a college presidency. "I basically enjoyed running the place," she confessed, noting that among her models was San Jose President Gail Fullerton, along with other leaders whose acquaintance she made and then whose approaches she studied. While most of her leadership experience has been in academe, she believes it is "generally applicable. One should be practical, adaptable, not too sensitive to slights, and always able to do something else."

"I fundamentally like to set my own challenges and define my own satisfactions," Weaver confessed. "I like to see what needs to be done, set events in motion, and I derive great satisfaction from seeing the results of such efforts, even though I may not at all be identified

"Be generous with yourself." Weaver concluded with a favorite--but unattributable--quotation: "There's no limit to what you can accomplish if you don't care who gets the credit."

with them. It's not an ego thing." Leadership, she thinks, is "90 percent people skills," continuing, "it's important to listen and consult as widely as possible before coming to a decision. But then, be decisive, and accept responsibility for the consequences."

In part because she has retired, Weaver sees herself as a woman with "nothing to fear. I am in a good position to speak out on issues affecting women in science, and I probably will do so as long as I have a voice." She advises women hoping to lead to "take any opportunity that you see or can create to learn leadership skills. Volunteer for any task that needs doing." Professional societies often offer such opportunity, she said, and "You only learn by doing."

Ellen C. Weaver, Ph.D., professor emerita and associate dean from San Jose State University where she taught 1969-1991, is the author of over 30 papers in botany and marine biology. Past president of AWIS and the recipient of many awards, her extensive research was federally supported, and she is active in many scientific organizations.

The Uphill Climb Continues



M. R. C. Greenwood, associate director for science of the White House's Office of Science and Technology Policy, cited numerous statistics from the National Science Foundation⁴ and the Commission on Professionals in Science and Technology⁵ to show that--while women in science and engineering have come a long way toward overcoming their underrepresentation--they still have a long way to go.

The data Greenwood gathered demonstrate that not only has graduate enrollment in science and engineering by women steadily increased, but also has their number of Ph.D.s. "Our challenge," she said, "is to proactively foster women's representation in engineering and

Women in Science Succeeding

Sally Ride, Ph.D.--First woman in space

Kathryn D. Sullivan, Ph.D.--First woman to perform a space walk

Kathryn Thornton, Ph.D.--Astronaut

Antoinette Betschart, Ph.D.--Director of the Western Regional Research Center of the Agricultural Research Service

Phyllis Johnson, Ph.D.--Associate Director of the Pacific West Area of Agricultural Research Service

Elizabeth L. Klepper, Ph.D.--Research Leader of ARS, Oregon

France Anne-Dominic Córdova, Ph.D.--Chief Scientist for National Aeronautics and Space Administration

Mary L. Good, Ph.D.--Under Secretary for Technology at the Commerce Department

Arati Prabhakar, Ph.D.--Director of the National Institute of Standards and Technology

Salome G. Waelsch, Ph.D.--Professor Emeritus of Molecular Genetics, Albert Einstein College

Vera C. Rubin, Ph.D.--Astronomer and Staff Scientist at the Geophysical Laboratory of the Carnegie Institution

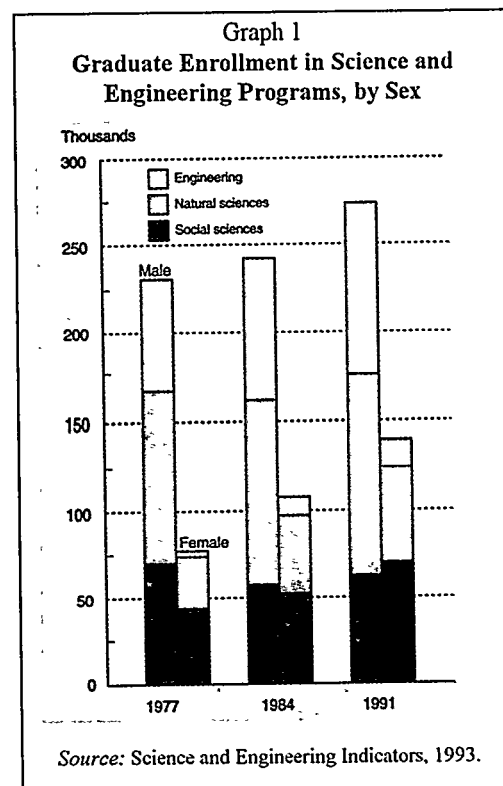
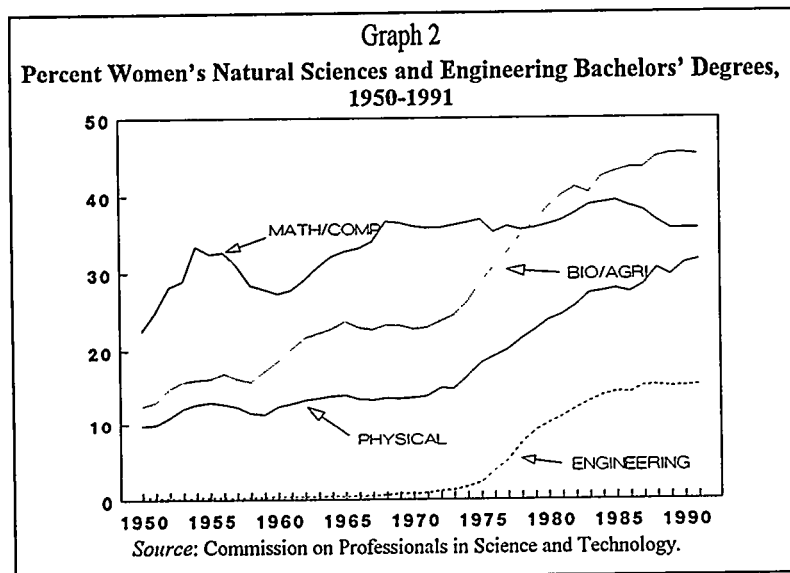
⁴All National Science Foundation data come from the National Science Board (1993), *Science and engineering indicators* (Washington, DC: Author).

⁵CPST, 1500 Massachusetts Ave., NW, Suite 831, Washington, DC 20005.

the physical sciences, both in their studies and in their career choices.”

Among the helping precedents are the slow but steady emergence of a number of female role models leading in science and engineering whose presence can give young women starting out hope that there will continue to be room at the top for people of their gender.

“Many of you here,” Greenwood told participants, “are leaders and mentors who have paved the way for women scientists of the future. Role models play an integral part in professional development and enhance science’s attractiveness in a variety of fields.



What the Statistics Show

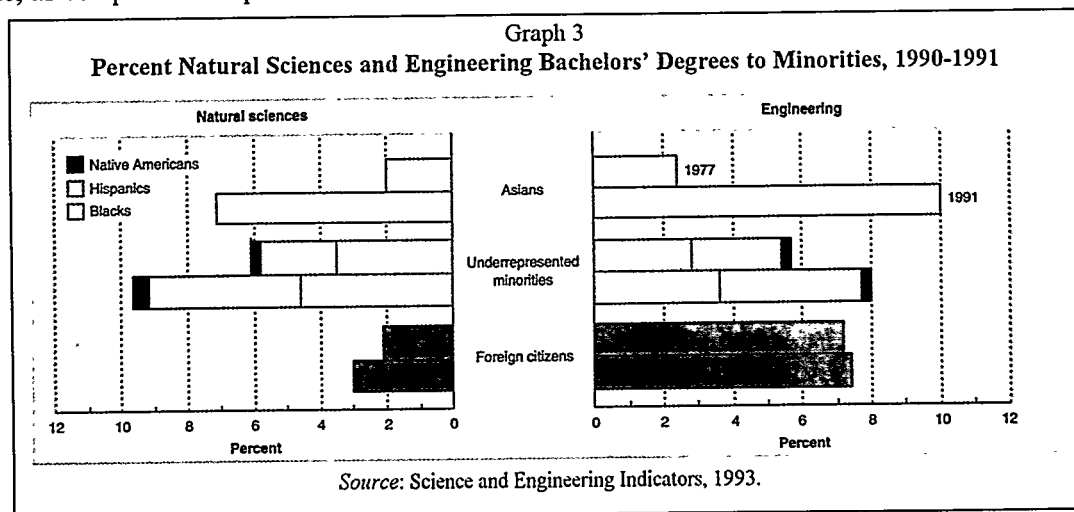
The most recent Foundation data indicate that graduate

student enrollment--both at the masters’ and doctoral levels in science and education--grew steadily at a rate of 2 percent per year from 1977 to 1991. This steady increase was fueled by women enrolling in graduate programs, Greenwood pointed out.

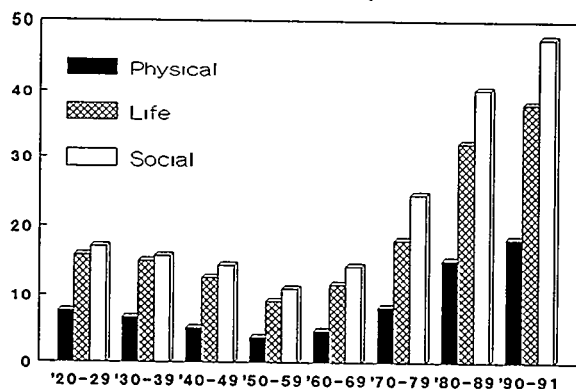
Statistics indicate, she noted, that enrollment in science and engineering programs rose from 78,000 in 1977 to 142,000 in 1991. By 1991, about a third of the graduate science and engineering students were female, as compared to a quarter in 1977.

Women’s presence varies by field, she pointed out. “We see strong representation by women in the social sciences, least, in engineering.” This field, however, does show an overall increase in female representation from 1977-1991, but still only about a sixth of the engineering students in 1991 were women.

Greenwood pointed out that over the last 40 years, there has been a gradual increase in the percentage of bachelors’ degrees awarded to women in the physical, biological, and agricultural sciences. This is also true for

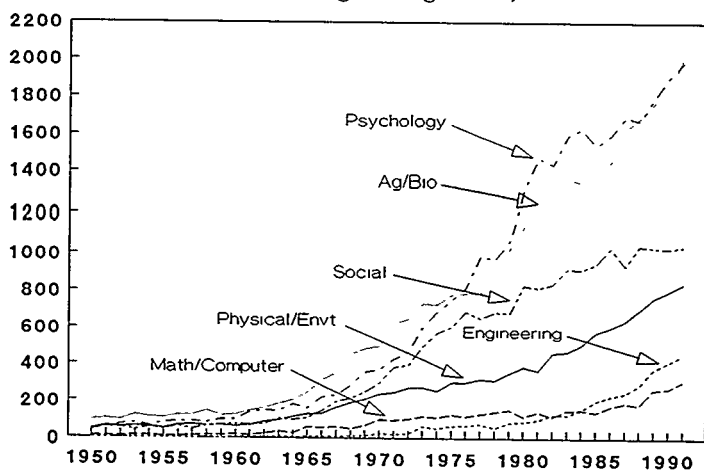


Graph 4
Percent Women Science Ph.D.s by Decade 1920-1991



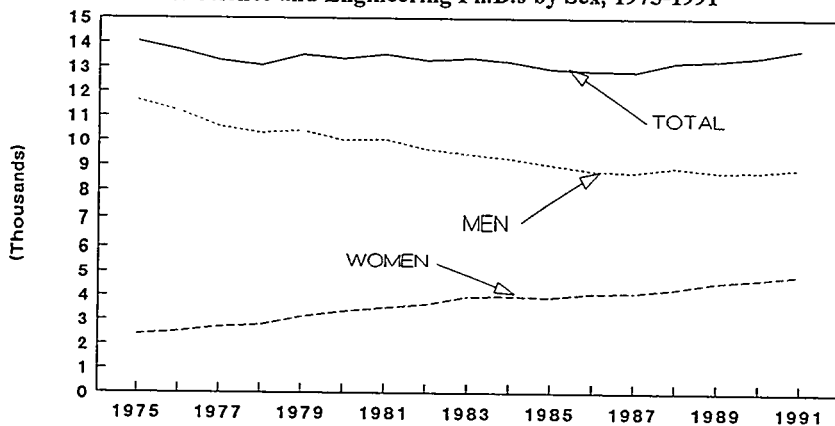
Source: Commission on Professionals in Science and Technology.

Graph 5
Women Science and Engineering Ph.D.s, 1950-1991



Source: Commission on Professionals in Science and Technology.

Graph 6
U.S. Science and Engineering Ph.D.s by Sex, 1975-1991



Source: Commission on Professionals in Science and Technology/ Table from NSF pp. 284-285.

degrees awarded to women in engineering since 1975. Degrees awarded in mathematics and computer sciences have fluctuated over the 40 year period, taking a slight dip in the late 1980s.

"Unfortunately," Greenwood continued, "minorities receiving bachelors' degrees in science remain underrepresented with respect to their proportions in the population."

Greenwood noted the overall increase in the proportion of Ph.D.s granted to women in science from the 1920s to the 1990s. "We see close to 20 percent of the Ph.D.s in the social and life sciences going to women in the 1920s and 1930s, whereas, the percentage for Ph.D.s in these areas more than doubles in the 1990s," she pointed out. "The 1950s shows an 'unexpected drop' in the percentage of Ph.D.s granted to women in all sciences."

Greenwood presented another graphic depiction of Ph.D.s granted to women in science and engineering from 1950-1991, pointing out the "dramatic" increase in the number of Ph.D.s granted in the biological and social sciences and less so in the physical sciences, math, and engineering.

The following graph shows the number of Ph.D.s granted to men in science and engineering going down, while the number of Ph.D.s granted to women are going up. "When will they meet or cross?" Greenwood asked.

Despite the broad gains women have made in science, Greenwood said, there are "troubling trends" as well. Although the percent of women on faculties increases consistently from 1975-1989, the percent of women faculty in math and physical sciences remains less than 10 percent; in engineering, less than 5 percent.

The average faculty salaries for women by rank are all lower than those for men at the same rank, Greenwood noted. The smallest difference in salaries between men and women, at the instructor level, is about \$1,600. The greatest spread, at the professor level, averages more than \$7,000!

In 1991, data show that more than 60 percent of psychologists are women, Greenwood summarized. Women are also fairly well represented as economists, faculty, and in the life sciences, but they are underrepresented as physicians, architects, geologists, and engineers and they make up only 8.2 percent of employed engineers.

Challenges

As scientists in today's rapidly changing world, we have serious responsibilities, Greenwood said. Among them:

- finding cures for diseases such as AIDs
- promoting human health in general
- capitalizing on advances in biotechnology
- dealing with bioethics
- working for food safety and consumer confidence
- understanding global climate change
- maintaining environmental security
- fighting illiteracy
- controlling violence
- improving the economy and creating high quality jobs
- reducing nuclear arms

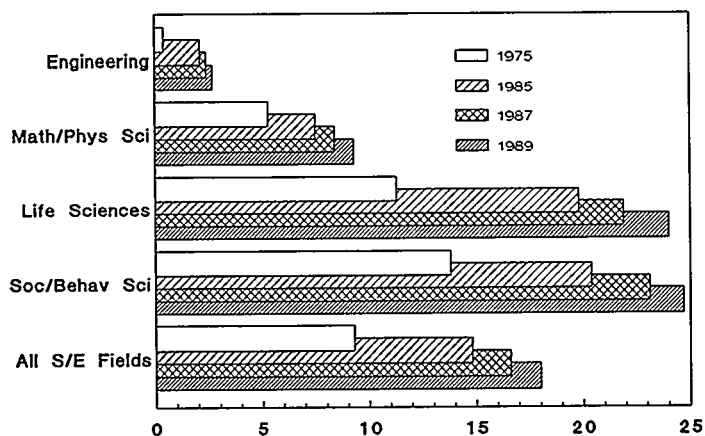
"The list goes on," she said.

These challenges can be met with a strong commitment to scientific research and education. What Vannevar Bush wrote in a 1945 report to President Truman--"Without scientific progress, no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world"⁶--is unchanged.

"We have much to be proud of in U.S. science," Greenwood said. "Our nation is without peer in many areas of scientific outcomes--whether we measure that success by counting our Nobel prizes, listing the type and number of discoveries and publications, or uncovering the potential for a new industrial, informational revolution. And we cannot fail to mention the occasional quantum leaps in science," she went on, "such as the servicing mission of the Hubble telescope, which inspired all of us as one people and sparked the imagination of our children.

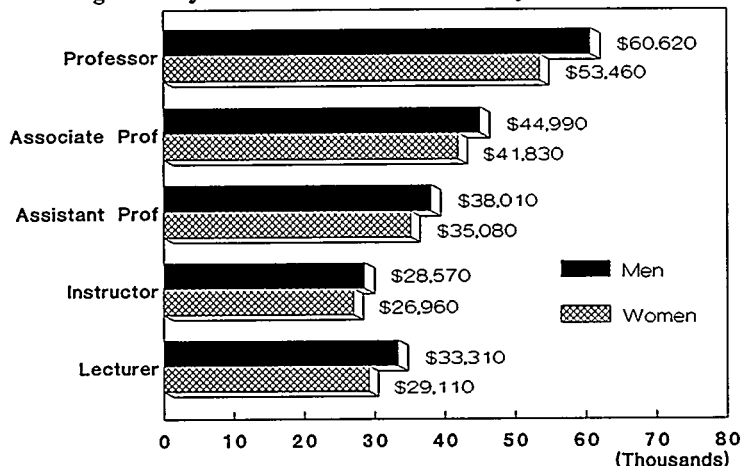
"Clearly, we are privileged to live in a time of extraordinary opportunity and excitement."

Graph 7
Percent Women on Ph.D. Faculty in Broad Fields, 1975-1989



Source: Commission on Professionals in Science and Technology.

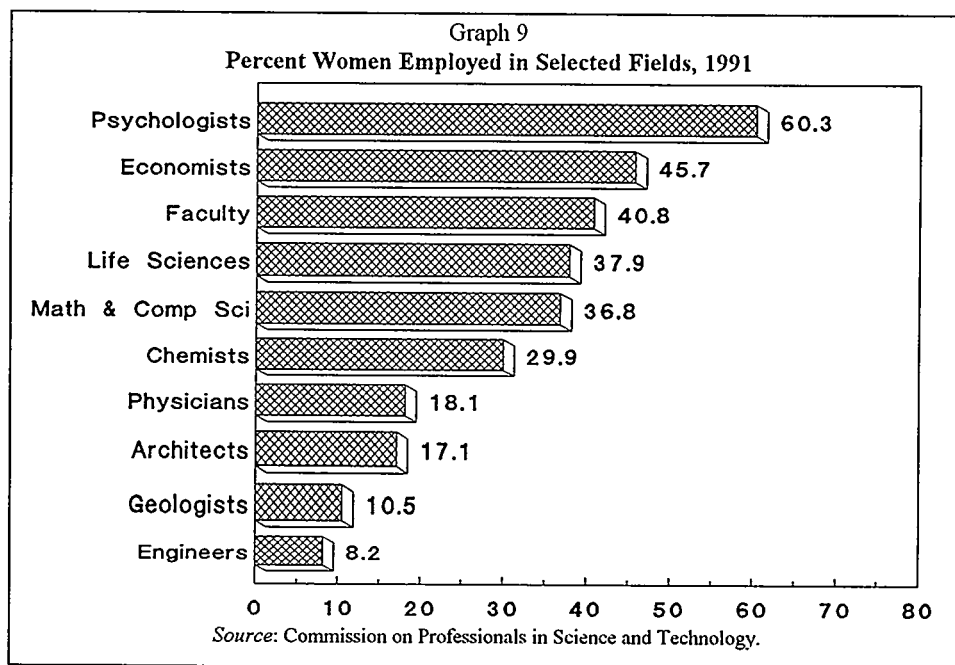
Graph 8
Average Faculty Salaries for Men & Women by Rank, 1992-1993



Source: Commission on Professionals in Science and Technology.

⁶(1960). *Science: The endless frontier* (Report to the president on a program for postwar scientific research). Washington, DC: National Science Foundation (Original work published in 1945).

And, she told delegates, “we have an important role to play as women scientists,” inviting them to “join me and other women in science in a continued quest for the undiscovered, in search of professional excellence, and with the hope that any path one chooses will offer exciting new opportunities--in the 21st century and beyond.



M. R. C. Greenwood, Ph.D., a member of the Institute of Medicine of the National Academy of Sciences, came to her present post in the Office of Science and Technology Policy from her position as Dean of Graduate Studies at the University of California, Davis. Greenwood, the author of over 200 scientific presentations and publications, has won international recognition for her work on the genetic causes of obesity; the recipient of numerous awards and honors, she also sits on several editorial and educational governing boards.

The AWIS Nomination Committee

Greenwood had special praise for this Committee, which “recognizes and nominates women scientists for high honors and other awards, as well as for membership on expert panels and committees.” She lauded the “process in place that acknowledges the many women in science who contribute to our society through dedicated work and encourage others to attain their professional best.”

The Best Offense Is a Good Defense

Bernice Resnick Sandler, who for the past 25 years has led and belonged to a number of national groups working for female educational equity, told conferees that men are “frequently confused about how to treat professional women. They tend to try to cast women in social roles,” she said, “either as cute and adorable or as motherly.

“This is especially true in male-dominated science,” Sandler believes, remembering occasions when male copanelists had been introduced as “Dr. X and Dr. Y,” while she was, “Ms. Sandler.

“I lost my doctorate,” she complains gently, under such circumstances.

Sandler defined three barriers to success for women, each of which is “higher for women of color.” They are

- individual--psychological, such as lack of confidence or assertiveness, or lack of knowledge, such as how to handle a budget
- institutional--programs and policies such as inadequate child care or family leave
- sociological--expectations about the way men and women communicate

In 1973, Sandler said, the words “sexism” and “sexual harassment” came into currency. The events they had been describing, however, she pointed out, have been in existence “forever.”

Women suffer two kinds of sexual harassment in the workplace, she said. It ranges from the overt, “Sleep with me or get fired,” to the subtler poison of a “hostile work environment.” In spite of the outcome of the confrontation between Supreme Court Justice Clarence Thomas and Anita Hill, however, there is now increased concern about the legal consequences of sexual harassment.

There are many subtle sexist workplace behaviors that women often face, Sandler noted. Women

- receive less eye contact than men
- are called upon less often than men when they volunteer
- are more likely to be asked specific, not substantive, questions
- are interrupted more frequently than men
- have their suggestions ignored
- get less feedback.

A typical response when a woman enters a formerly or virtually all-male field is that “they’re” taking over, Sandler smiled. The reality is that a single woman stands out in a crowd because she is “the only.” Illogically, the views of that one woman are often taken to represent those of all women.

And Sandler noted a number of examples of a “double standard.”

- Men are “courageous,” women are “dragon ladies.”
- Men are “assertive,” women are “aggressive.”
- Fact: Both men and women rank articles with a man’s name listed as author higher than those with a woman’s.

Many women tend to denigrate themselves, Sandler said, when they speak in low voices, qualify their responses, frame opinions as clever questions, and raise their voices at the end of sentences, a habit that makes their statements appear to be queries.

Such hesitance can have value, however, she emphasized. “It promotes community and communication. Both modes of speaking are valuable.”



We all like clones of ourselves as to origin and gender, she noted. Therefore, because men hold most positions of power, it is not surprising that women find it more difficult than men not only to find mentors but also to gain power in a primarily male organization.

"Mentoring is not something that just happens to you. You need to take an active role. Look for multiple mentors," Sandler advised, noting with approval the Massachusetts Institute of Technology's policy of making mentoring part of new faculty's job descriptions.

Sandler's Advice: In the Face of Unacceptable Behavior

1. Write incidents down.
2. Talk to other women.
3. Talk to other men.
Then others also "own" the problem.
4. If interrupted, say, "I'm not finished."
5. Use humor.
6. At raunchy jokes, say "I just don't get it."
7. If someone offers not to tell an off-color story, say "thank you."
8. When faced with persistent harassment, write a letter
 - * stating the facts about the offensive behavior
 - * explaining the effect this behavior has on you
 - * requesting specific action--usually that the behavior stop
 - * Send it return receipt requested.

She also suggested that one of the central questions to a mentor should be, "What is really important that isn't written down?"

Women wishing to discuss mentoring and other leadership issues with Sandler may write to her at the National Association for Women in Education, 1350 Connecticut Avenue, Northwest, Suite 850, Washington, DC 20036.

Bernice Resnick Sandler, Ed.D., works for the National Association for Women in Education (Washington, D.C.), where she edits the newsletter About Women on Campus and consults with and speaks at colleges about "chilly climate" issues relating to equity. She played a major role in the passage of Title IX and has written extensively about the problems faced by women in academe.



"Obviously I'm Wonderful, But We're a Wonderful Gender"

Closing speaker Estelle R. Ramey, professor emerita at Georgetown University, has been making waves for nearly 80 years with her brain, her wit, and her estrogen, which she calls "the elixir of life." She catapulted into the women's movement during the presidential campaign of 1968 when, among Hubert H. Humphrey's many problems, was his friend, Edgar Berman, a former surgeon who complained, that he didn't "understand all this crap about women's rights. Women, because of their raging hormones every month, are simply unfit for jobs of responsibility. Men didn't do that to women. God did it."

In response, Ramey wrote a widely quoted letter to the New York Times and the Washington Post arguing that, under those circumstances, women should not be allowed to take care of children. The letter led to a debate between Ramey and Berman at the Press Club, which was picked up by the media:

"You know, Dr. Ramey," Berman said. "I really love women."

"You know, Dr. Berman," Ramey replied, "so did Henry the Eighth. Luckily his wives' menstrual cramps kept them from writing letters about him."

"Neither Dr. Berman nor I have been troubled by raging hormones for some time," she continued.

"Speak for yourself, Dr. Ramey!" he exclaimed.

"I keep forgetting how sensitive men are about their virility," Ramey apologized. "We women don't worry about ours."

Shifting briefly to a serious tone, Ramey noted that among the great leadership qualities of Washington, Lincoln, and (Franklin Delano) Roosevelt are traits that many women have, citing for example, insight into what people really want and the ability to make compromises for survival.

"The effect of estrogen on leadership results in women's ability to lead and to survive," she said, in flat contradiction to the argument that men are equipped to lead society because of their testosterone, which she said the New York Times described in the late 1960s as the "take-charge hormone."

The preposterous position was, she remembered, that without testosterone (which women actually have), you're unfit for leadership. "Golda Meir, Margaret Thatcher--no one called them weak," she pointed out.

As an early president of AWIS, Ramey's threatened boycott of a major publisher, which had illustrated its anatomy textbook in a manner more appropriate to Playboy than to science, eventually got the text withdrawn. She didn't bother to appeal to Williams and Wilkins' fairness but went for the bottom line, which "for a publishing outfit, or any other business that has to make money, is, of course, their profit margin."

Attacking chauvinism through laughter, in the pocketbook, with political clout--Ramey swivels her leadership tools to fit the situation. Leadership, in Ramey's definition, "is getting rid of prejudice that stands in the way. I don't care where the brains are," she admitted. "Just find ways to make life better."

Born before women could vote, she remembered after her 1937 graduation from Brooklyn College, "my anger at the unimaginable waste--of all those summas and magnas, I was the only one who went on to a career. What happened to those women who could have been used for the good of all society?"

Ramey believes that "the major determinant in life is luck: Where you were born. If you were a woman in Bosnia with the brain of Einstein and leadership of Alexander the Great, you would still be raped and murdered." But this philosophy has served to spur her to change things for other women. "I was always the only woman," she said. Someone--in her case



*No woman is
an island entire
of herself.
Every woman's
putdown
diminishes me,
for I am part of
humankind,
and, therefore,
my sisters,
never send to
know for whom
the bell tolls. It
tolls for thee.
-- Ramey's
revised version
of John
Donne's
quotation.*

Roland Whittaker, a department of chemistry chair ahead of his time--opened the doors for her. She has since worked to open them for others.

"Why did you call me?" she asked Whittaker. "You were probably one of the best students I have had," he responded, "and you were ambitious and energetic. That's what I wanted in my department." "But I am a woman," she worried. "What the hell difference does that make?" he returned.

Despite her acknowledgment of benevolent male influence in her life, Ramey calls for a particular commitment among women, voicing her worry that "what bothers me most is what women do to other women, which could be a threat to many." If women misbehave in the leadership struggle in the ways men do, the struggle could be pointless. "If women think that there was a war, and we won it," they are in danger of jeopardizing victories that are still incomplete. The glass ceiling may be cracked, but it's not shattered.

"We have some mutual understanding that does not occur across the sexes," she said. "We have a special responsibility to each other."

Estelle R. Ramey, Ph.D., professor emerita of physiology and biophysics at Georgetown University and former AWIS president, has published more than 150 papers and 2 books, held leadership positions in 17 community organizations, taught at about 30 colleges and universities, and given countless speeches to groups of many kinds. The holder of 17 honorary degrees and 20 other major awards, Ramey (who has been active in the women's rights movement for over a quarter of a century) donates her lecture fees to shelters for battered women and children and for fellowships for women students.



ALIGNMENT AND COMMUNICATION

Making An Organization Look Like America

Women and minorities do not appear in most science, engineering, and mathematics fields in numbers proportionate to their presence in the population (respectively 51 and 33 percent). Although they earned 27 percent of the science fields' doctorates in 1993, women now make up 16 percent of the profession. Conferees broke into workshops to try to find ways of aligning members of a large organization in active commitment to increasing the ethnic and gender diversity of their science/technology-based workplaces.

"Because the field is not like the population," observed a conferee, "you have to start with the young. But we need both long- and short-term proposals and relief."

The goal for workshop participants: To make a company's staff mirror the demographics of the major metropolitan city in which it is based. The given: Senior management supports the goal.



Conferees in eight small groups pondered the following questions:

1. Who are the target groups inside and outside the organization that need to be reached?
2. What forms of communication need to take place?
3. Who should do the communicating?
4. What messages need to be communicated?
5. How do you evaluate whether the message got across?

1. *Target Groups:* In addition to working with the appropriate administrators, senior officials (particularly those with hiring authority), lower-level staff, and the Office of Equal Opportunity within the organization, one group suggested alerting the organization's outside recruiters. Others called for including outside allies such as advocate, scientific, and professional organizations and nearby postsecondary institutions (particularly those with large minority populations).

2. *Communication:* Groups called for discussions in workshops and bag lunch sessions, informal networking, staff meetings, and formal exit interviews. In addition, various groups advocated using newsletters, recruitment ads, public relations, and mentors. One conferee cited with approval the hiring pitch of a friend's boss: "My job is to get you tenure."

3. *Speaking and Listening:* Talk to peers, groups agreed, and--said one group--"Involve men." Managers should be part of the process; professional development sessions should actively promote diversity; mentors should be encouraged; high school personnel should be approached.

4. *Messages:*

- People are valued; there is no revolving door.
- This is a good place to work for everyone.
- We want you; we will support you; we keep our promises.
- We aren't going to hire you because you are a woman or black or Native American but because you're good.
- A clearly defined career ladder awaits you.
- We will not only attract, but also retain, promote, spend money on child care, and provide flex time.

5. *Outcomes:* Exit interviews again seemed a good idea; so did “goal setting revisited.” One group recommended pre- and postemployment surveys.

Lynne Friedmann, a biologist and journalist by training, operates her own business as a public relations consultant to scientific and biotechnology organizations. Based in San Diego, she has over the past 12 years participated in and organized a number of skill-building workshops similar to those she ran for the leadership conference.

Schooling and Leading



Linda C. Cain, who works primarily on precollege programs for the Department of Energy in Oak Ridge, Tennessee, noted that research suggests that many of those underrepresented in science, engineering, and mathematics eliminate themselves from such careers in upper elementary and middle school.

Cain is convinced that “keeping girls and children of color motivated, interested, and taking courses that will keep the doors open” is essential. “It may be possible to keep them on if they somehow choose undergraduate degrees in science fields, but they’re mostly gone way before that.”

Cain, who taught high school science for 15 years before entering government service, thinks that providing teachers with generous opportunities for significant professional development can both improve teacher retention and emphasize the importance of encouraging the underrepresented. Although she admits that it’s “hard to prove,” she believes that “good teachers may stay longer if revitalized by such activities.”

The balancing act for Cain and her family led her to choose to teach and earn a degree in science education until her children were in late high school. “It was financially clear that I had to work,” she said, and it was equally clear that “I was not going to be able to work full-time, be a full-time chemistry student, and handle two little kids.” So she taught school, took a master’s in chemistry, earned a doctorate in science education, and “never regretted anything.”

“As a classroom teacher,” she said, “I learned many skills such as the ability to communicate and to build consensus that transfer well to other settings.” The move in leadership processes nationwide, Cain noted, is from the hierarchical to collegial. Traditional top-down leadership is becoming less commonplace; and the now popular horizontal consultation is often more typical of women’s approaches than men’s.

Cain’s Advice

1. Establish yourself professionally; do the best job possible, and don’t initially involve yourself with women’s issues. Wait until later when you have professional credibility.
2. Get along with your colleagues. You may have to expand your horizons to include both football and needlepoint.
3. Put yourself into an environment where you can learn. Get involved in professional organizations.

“There are definite skills and characteristics that help you lead,” Cain said. They are built through experiences, some of which haven’t been open to women. For example, sports experience helps develop leadership skills, and until recently few girls were participants. “It’s great to say that we don’t want to compete,” she laughed, “but the fact is that we do.”

"Women may well lead differently than men because of the way women have had to lead," she analyzed. "If you don't have power--and historically, we haven't--you can't lead by commanding or by fear and intimidation. You can't punch people out, if they're bigger."

Though as a teacher Cain was often responsible for up to 150 students (plus, to a certain extent, their 300 or so parents), she now manages between 8 and 15 colleagues, and she is finding the situation a "real learning opportunity. My vision of leadership and teamwork and management isn't everyone's," she explained. The hierarchial point of view survives in many places both in school systems and in the federal bureaucracy. "And there are happy campers in that system at both at the top and bottom of the organizational chart." Top-down management can make the world a much safer place, she pointed out because responsibilities can rest with someone else.

"You don't move people or organizations overnight," she said. "Everyone is learning to do things in a different way, and that's scary." Overall, she thinks, "women--but not all women--have more to gain than men from the consensus approach to leadership."

Her approach? "I try to find out where people are and talk about where they want to be and help the organization to be supportive first with small tasks and then the bigger ones," while modelling appropriate behavior.

Women interested in discussing leadership issues with Cain may write her at P.O. Box 117, Oak Ridge, TN 37831-0117.

Cain's favorite book on leadership is the same as that of Cindy Musick and Yvonne Blanchard-Freeman: Stephen R. Covey. (1990). *The Seven Habits of Highly Effective People: Powerful Lessons in Personal Change*. New York: Simon and Schuster.

Linda C. Cain, Ed.D., program director of precollege programs, Science and Engineering Education Division, Oak Ridge Associated Universities, is active in many scientific and education organizations. A former high school teacher, her contributions to science education have earned her national recognition.

Anything Less Than Win-Win Is Win-Lose for *Somebody*

The Department of Energy's Cindy Musick has made it her personal and professional business to ensure that what happened to her own bent for science and engineering does not happen to her four daughters, to schoolgirls, and to women in science within and without the federal sector. Although her precollege career tests indicated strong engineering aptitude, family and academic advisors gave this quality no encouragement, and Musick graduated as a German major.

Musick regrets her lack of formal technical background, but notes that even well-educated engineers must work to keep their skills from becoming outdated, and welcomes every opportunity for training--formal and independent. All of her six children are comfortable in and enthusiastic about math and science, and the programs she funds aim to make their experience national. Her responsibilities run throughout the educational spectrum from precollege through graduate. "Our aim," Musick explains, "is to get more girls into the pipeline and more women into science and technology."

With the National Aeronautics and Space Administration and AWIS, the Department of Energy cofunded the May conference as a symbolic joining of federal to independent and corporate programs to increase the female presence in science.



Musick points out that her agency has made active moves to involve its 169,000 federal and contract employees in increasing the numbers of underrepresented groups in science. Several of Energy's facilities and labs host "Expanding Your Horizons" programs for girls in grades 6-12. In these programs, the young see women and minority scientists as role

models and participate in activities that introduce the possibility of a variety of scientific and technical careers.

Musick listed a number of other Energy programs devoted to increasing the number of women in the Department. They include making senior managers accountable for hiring and advancing women, increasing women's job mobility, holding symposiums, and providing employee education sessions. She

also cited mentoring programs and the Department's commitment to flexible, family-responsive work environments, including support for effective child care arrangements.

In spite of such efforts, "a lot of women still run into the glass ceiling," Musick said (see Table).

Of her own situation, she said that her personal and professional responsibilities "require 200 percent of my time." She would like to find "more time for policy and monitoring as opposed to running programs," and she serves on a number of inter- and intraagency projects.

"Energy can use the unique resources of its labs, facilities, and people to enhance science education and literacy for teachers and students across the educational boards," she pointed out.

Musick sees her leadership skills as fostering collaboration and providing encouragement to others at all professional levels. "Give support to people," she said, "and they will grow into responsible roles." The main issue, she believes, is communication, and she sees her role as a "harmonizer getting people in differing positions to work together."

Musick's Picks

Musick's favorite speaker on women in science issues is the Massachusetts Institute of Technology's Mildred S. Dresselhaus, with whom Musick worked when the former was chair of the Committee on Women in Science and Engineering at the National Research Council.

Her favorite book on leadership, like that of Linda C. Cain and Yvonne Blanchard-Freeman, is Stephen R. Covey's *The Seven Habits of Highly Effective People*.

Some women mirror the male model of leadership to their own and others' disadvantage," Musick worried. "When women achieve power and

treat people the same way certain (irresponsible) men do, I don't think their approach is helping the cause." On the other hand, she continued, "Male bashing concerns me. I truly believe in diversity, in synergism, that one side is not necessarily better.

"Vive la différence! Many women listen better and achieve better collaboration than do some men."

Women in science wishing to contact Musick about leadership concerns may write to her at 1000 Independence Avenue, Southwest, ET-32, Washington, DC 20585.

Agency	%Women	% Women at GS-15 Pay Grade		
		Engineering	Physical Sciences	Mathematics/Computer Science
DOC	52.1	0	3.1	18.9
HHS	41.9	0	14.6	12.8
DOI	38.0	0	4.0	0
DOA	37.6	0	4.5	0
EPA	26.8	3.6	6.8	0
DOE	26.5	3.8	7.8	16.7
NASA	24.0	4.0	8.6	0
DOT	22.2	2.5	0	11.4

Notes: DOC, Dept. of Commerce; HHS, Health & Human Services; DOI, Dept. of Interior; DOA, Dept. of Agriculture; EPA, Environmental Protection Agency; DOE, Dept. of Energy; NASA, National Aeronautics and Space Administration; DOT, Dept. of Transportation.
GS-15 is the highest federal pay grade outside of the senior executive service.

Cindy Musick, team leader and program manager of science education programs at the Department of Energy, manages two national grants that fund programs for teachers (both pre- and inservice), environmental education, and women. Musick, whose job also includes customer service, comes to Energy from several years experience in the Department of Education, where she worked with the Eisenhower Program for Mathematics and Science Education and the Comprehensive School Health Program.

Seeing the Broad Picture

Speaking about managing conflict effectively was Marion Cox, managing director of Resource Associates, her environmental services consulting firm with offices in Bethesda, Maryland, and Santa Fe, New Mexico. Cox, a nonscientist, works frequently with scientists and technical experts, government and industry leaders, and the general public on environmental and resource management issues.

Her work with many diverse organizations and individuals has suggested that, while scientists and technicians may be highly knowledgeable about critical aspects of environmental issues, many experts have difficulty in seeing the decision-making process as comprising numerous points of view. Cox's professional experience over the past 22 years suggests that, in general, women scientists and technicians are likely to address complex scientific and policy issues through a broad spectrum of values and concerns rather than through a single scientific lens.

"Women often acknowledge that many scientific and policy issues are not black and white," Cox said. "Instead, they take a multidimensional approach that calls for the ability and willingness to think broadly to come up with effective, long-lasting decisions and solutions to problems that respond to a variety of needs and perspectives."

Women scientists' ability to use a wide perspective is important because "environmental concerns usually combine scientific and technical issues as well as political realities. Trying to solve problems with scientific facts alone," she said, "won't be successful." While scientists are frequently brought to the table because of their highly specialized and narrowly focused expertise, the leadership or decision maker role requires broader based thinking and analysis to ensure acceptable decisions or outcomes, she noted.

Cox believes that, as the future continues to unfold and environmental problems become more and more a part of the public's consciousness, "the real leaders in the scientific community will be individuals willing to broaden their perspective to understand the underlying causes of problems." Only then, she continued, "will they work to address these issues from a perspective broader than that provided by the knowledge they bring from their scientific training."

The ability of women scientists to see a variety of viewpoints is important because environmental problems typically include scientific and technical questions as well as public values and political realities. "Trying to solve problems with scientific facts alone," Cox emphasized, "won't be successful." Women often bring a "different style to management and leadership positions." She believes such changes in the workplace benefit all workers as organization building and decision making become more inclusive and participatory.

Cox said that her own professional path has been "neither traditional nor linear," and she has frequently made abrupt career changes to accomplish her goals. At some of these times, friends and colleagues advised against such changes because of what they feared might be negative impacts on her career. For Cox, however, each move has had positive implications.



"I fall into that percentage of the population who doesn't really think of going back and doing things differently," she explained, continuing, "everything good and everything bad teaches you something. People who have been through the rough spots end up as the survivors."

In response to a question about any obstacles to success Ms. Cox has encountered, she responded that "whenever there has been a need to change directions to avoid a real or perceived professional barrier, I have always considered the task of removing the barrier my responsibility, not my boss's, and not the organization's."

The reality, she summed up, "is that I am happy and proud of where I am today professionally, and I have not yet come up against any hurdles I could not--with faith in myself and the support of friends and colleagues--overcome."

Women wishing to discuss leadership issues with Cox should write to her at Resource Associates, 4708 Drummond Ave, Bethesda, MD 20815.

Cox's favorite book on leadership is

Tzu, Sun. (1993). *The art of war* (Thomas Cleary, Trans.). Boston: Shambhala Publications. (original work published 6th century B.C.)

Marion Cox is owner and manager of Resource Associates, which specializes in helping clients and affected parties address environmental management issues. Her experience includes assisting design and development of several major U.S. environmental management programs at federal, state, and local levels, as well as internationally.



MOTIVATION AND INSPIRATION

R_x: Mentors and Mentoring

Susan A. Henry, dean of the College of Science at Carnegie Mellon University (Pittsburgh), believes that no one can have too many mentors. She listed five male colleagues she counted as mentors, as well as her husband (“the one really honest counselor I have”); her grandmother, who encouraged her interest in nature, particularly in collecting insects; and her father, who bought her books on astronomy and paleontology.

That her own mentors (with the exception of her grandmother) have been without exception male, she said, is due to the fact that, even in biological sciences, there simply were not enough women to serve as role models. Now, however, she said, there are more women “like myself coming up through the pipeline,” so the impediment to young women who don’t see role models who look like them is becoming less of a hurdle. Henry emphasized that the discouragement of many women and minorities in science fields is not always due to active bias but as well to loneliness.

Emphasizing that “the absolute goal for each individual is to succeed—that’s the bottom line,” she nonetheless advised young women to “be conscious that you can be a leader at any point.” Undergraduates can serve as leaders for high school students or for those in classes below them in college: “The point is that people can serve as leaders no matter where they are in their education.”

Young women and minorities have an especially “difficult balancing act,” she pointed out, because of the pressure they face to appear as representative figures for their gender and/or ethnicity. While doing as much as possible, they must still choose carefully, remembering that they won’t be able to help anyone unless they themselves succeed. Henry also suggested the wisdom of encouraging men who will help.

Anyone wanting to become a leader in science (or most anything else), she summed up, should find a mentor.

Henry’s own path into science did not stem from a single decision. Like most young, “I was always interested in science.” She believes, however, that her “crystallizing experience” (Howard Gardner’s term) was the high school research fellowship she enjoyed in a medical laboratory between her junior and senior year. There, she found the first of her many nonfamilial mentors.

The climate for women began to improve with the passage of Title IX of the education amendments of 1972 forbidding virtually all forms of gender discrimination against students and employees across programs in institutions receiving federal funds. The same year

- Title IX also extended the provisions of the Equal Pay Act of 1963 to administrators, executives, and professionals.

- Title VII of the 1964 Civil Rights Act (forbidding discrimination on the grounds of sex, color, race, religion, or national origin) was extended by the Equal Employment Opportunity Act to cover educational institutions.⁷

But the change in climate did not happen early enough to encourage Henry’s original desire to go to medical school (with research, not the practice of medicine, as her goal). When she earned her baccalaureate in biology, “Women were not encouraged to go to medical school in the 1960s,” she remembered dryly, so she applied to Ph.D.-granting institutions only.



⁷Another amendment, the Pregnancy Discrimination Act of 1978, specifically prohibited bias against pregnant women in terms of leave, health insurance, and other benefits.

Henry's favorite author on leadership is one of her mentors, Richard M. Cyert, former president of Carnegie Mellon University and currently a faculty member there. She particularly likes his essay (Fall, 1990) "Defining Leadership and Explicating the Process," which appeared in *Nonprofit Management and Leadership*, 1(1).

During a preadmission interview, the head of a prestigious graduate school of biology demanded if she knew why he was considering her application. "I began to mention my credentials, which were excellent," she said, when he broke in to explain, "It's this damned war. We're now admitting the lame, the halt, the blind, and the women."

"The school admitted me," Henry said. "I just didn't go there."

In 1971, when Henry earned her Ph.D., most basic biology research was being done in academic settings, and, accordingly, her path turned toward universities. Now, as dean and professor at Carnegie Mellon, she teaches freshman biology in the spring ("one of the most sane things that I do") and runs "a large and active lab," out of which in the last couple years has come some excellent science. Her administrative duties, however, make it "increasingly difficult" to be with graduate students (and she has stopped taking many more) because of her need to cope with the many emergencies deans routinely face.

Henry views the role of administrator in an academic setting as one of providing leadership by bringing out the best in others. "You do not command people," she emphasized, "You discuss; you come to consensus; you work with large groups to find paths that will work."

Not a proponent of difference between men's and women's leadership styles, Henry believes that "Each human being has a unique style. She continued, "No quantitative way of assessing" worthwhile leadership exists. Leaders, she thinks, are fundamentally made through nurture; some individuals, however, may have greater aptitude than others.

Just as Henry sees successful mentor relationships as the most valuable stepping stone towards success in both science and leadership techniques, she finds that one of her most difficult tasks is straightening out interactions between thesis advisors and students. It often takes "extremely delicate and complex counselling for both sides," she said.

Another hard job a leader faces is delivering the news to someone that what is wanted cannot be done: "The hardest thing is saying no." When this is necessary, Henry recommends putting oneself in the other person's place and looking for alternatives and compromise rather than leaving the disappointed person empty-handed.

Women striving to lead in science may contact Henry at the Mellon College of Science, Carnegie Mellon University, 4400 Fifth Avenue, Pittsburgh, PA 15213.

Susan A. Henry, Ph.D., is professor of biological sciences and dean of the College of Science at Carnegie Mellon University. Author of numerous papers in genetics and microbiology, the recipient of many academic and scientific honors, and a member of many editorial boards and scientific organizations, Henry was a professor and administrator at the Albert Einstein College of Medicine before coming to Carnegie Mellon.



From the Abstract to the Hands On

As the conference drew to a close, participants broke into seven workshops to discuss the four case studies based on complex situations faced by fictional university administrators selected by AWIS President-Elect Jaleh Daie of the University of Wisconsin--Madison. The purpose of the sessions was to engage the conferees to role-play in order to experience some of the thought processes defined and to apply some of the abstract leadership concepts presented earlier to practical situations.

Small group meetings allowed face-to-face interactions where a variety of perspectives could be brought to bear on a particular set of circumstances, based on happenings in actual institutions. Although all four scenarios occurred in academia, the issues of management and leadership were meant to be widely applicable to science careers in situations in industry and government as well.

The four case studies focused on university administrators facing issues such as how to encourage faculty participation, how a new dean or chair can establish credibility, how the head of a college should prioritize, how to minimize the pain of necessary budget cuts. Noted one conferee, "They're being told to improve results without raising the budget. That's always the case."

The sessions--facilitated by Joan Woodward and Jane Ann Lampf of the Sandia National Laboratories, Joan Vernikos and Christine Dardan of the National Aeronautics and Space Administration, Betsey Draine of the University of Wisconsin--Madison, Nancy M. Tooney of Polytechnic University (New York), and Vera C. Rubin of the Carnegie Institution of Washington, D.C.--considered the situations of leaders at the point of significant decisions.

The 7 to 15-page narratives described in some detail the situation faced by a protagonist, staff, and university community as a whole. But, as in reality, the snapshot does not (and cannot) offer full information about either the nature of the problems or the solutions. To investigate and try to offer meaningful advice, conferees role-played, worked in small groups within the workshops, and applied the leadership techniques they brought from their own workplaces and had gained at the conference.

When the case study method works, according to Sharon A. McDade (1988),⁸ it

actively engages the participant in the . . . analysis of facts and details . . . , the selection of a strategy . . . and the refinement and defense of the chosen strategy . . . [It] does not provide a set of solutions, but rather refines the . . . ability to ask the appropriate questions and to make decisions based upon . . . answers to those questions. (pp. 1-2)

Dean Perrotti's dilemma at Fairhaven worked well as a catalyst for discussion in the session facilitated by Draine, who wrote, "It generated active, even passionate discussion. It was relatively easy to infer principles or issues regarding leadership from the specific items that the group felt moved to debate."

Getting Started at Fairhaven University

New Dean Helen Perrotti of the University's Center for Continuing Education wondered how she should begin . . . The staff were waiting outside her office door. Questions raced through her mind: What was she going to do about low staff morale? What should she say to the staff right now, and how should she work with them over the next few months, to excite them, and to renew their faith in themselves and the importance of what they were doing? And what was the importance of what they were doing?

⁸An introduction to the case study method: Preparation, analysis, and participation (Cambridge, MA: President and Fellows of Harvard College).

Commented another, "My organization just reorganized after 20 years of being static. So many examples hit the target," while a third welcomed the opportunity to discuss items on "our personal agendas."

"I loved to put myself in [Perrotti's] shoes, and it was fun to role play," added a fourth. "The exercise made me think about things I hadn't thought about before," a fifth admitted.

Concluded Daie, "There was a lot of interaction. Participants were comfortable about bringing different perspectives to the problem. People were connecting," she continued, "and it seemed clear that they would be in touch with each other after they left the sessions."

More Women In Engineering = More Women Leaders in Engineering



Although women are even more scarce in engineering than in any other science and mathematics field,⁹ Jane Zimmer Daniels, director of the women in engineering programs at Purdue University (Indiana) and a founder of Women in Engineering Program Advocates Network (WEPAN) says solving the problem of how to make them into leaders is "very easy." At Purdue, she pointed out, women are only 20 percent of the engineering student body,¹⁰ but they lead 40-50 percent of the 10-15 campus engineering organizations.

Why? Daniels speculates that what "really appeals to young women is their desire to see the big picture." Women are typically "less interested in designing a tiny piece to fit into a machine," than in helping the entire mechanism function. Noting that employers say that professionals spend a great deal of their time in written or oral communication, Daniels pointed out also that women often excel in that area.

"Many women lead in a more collaborative manner than many men," she said. Women's tendency to seek consensus fits with the changing leadership styles in the United States," she continued, as a "more feminine" style of leadership is on the rise, while the formerly traditional male "autocracy" is declining.

Daniels cited researcher's studies of small children playing. Girls typically prefer to interrupt their game rather than have a friend lose a disagreement over rules, while boys mostly take care of the differences--by voting or by force--and continue. "Lines of communication and relationships are usually paramount for girls," Daniels said, "and that tends to hold when they grow up."

While the fact that the changes in organizational structure and leadership models sought to benefit women will probably result in overall good for men, women, and ethnicities, it's still not easy, Daniels admitted, dealing with the ego involvement of many scientists and engineers: "They're often very bright and hard to convince that there are worthwhile methods besides the ones they have always used."

⁹Nationally, according to figures adapted from the National Science Foundation (*Science and Engineering Degrees, 1966-1991* [NSF 94-305]), women engineers made up less than a percentage point of the total workforce at all levels in 1966. In 1991, women earned 16 percent of the baccalaureates, 14 percent of the masters, and 9 percent of the doctorates awarded in engineering.

¹⁰Low, but 4 percentage points above the 1991 national average.

Daniels, whose background is in sociology, counseling, and student services, will conclude a two-year position as senior program director of the National Science Foundation's Programs for Women and Girls in January. "Women in engineering recruitment and retention programs have almost always had leaders with student services-types of background," she said. Without a technical background, she feels confident about developing effective high school and undergraduate engineering programs that attract females: "I don't have to forget what I already know."

Although Daniels finds the communication and organization skills essential to effective leadership in academia transferrable to success in the world outside of university walls, she noted some differences in focus, both between engineers and other scientists and between her private and public sector work:

- In engineering, the bachelor's is often the terminal degree for both men and women; most scientists aim for doctorates.
- At the Foundation, Daniels was concerned primarily with precollege science education, the field where, in her program area, the largest percentage of proposals grouped.
- At Purdue, Daniels works mostly with programs for undergraduates. She is just beginning to focus on graduate students, although she also encourages potential engineering students in the last few years of high school.
- In Washington, the emphasis is on public policy.
- The academic engineering community is especially responsive to industry, postsecondary and federal employers, and science education institutions.

Daniels has brought leadership to women in engineering as a founder of WEPAN in 1989, as its president 1991-1993, and now as a member of its executive committee on the board of directors. WEPAN, whose members implement activities to recruit and retain women for engineering, came into being, Daniels said, almost in "self preservation, because so few institutions were offering women in engineering programs."

With a membership of over 500, WEPAN complements rather than competes with the Society for Women Engineers, which focuses on career issues for women engineers. Many women engineers belong to both organizations.

Organizations for women in science in the past often have focused on "fixing" young women, Daniels noted, rather than improving institutional policies. "We are now trying to look at how teaching and climate issues bring about the underrepresentation of women. This is a slow process, but it's definitely worth the effort."

Women wishing to discuss issues concerning women and engineering should write to Daniels at 1286 ENAD building, Purdue University, West Lafayette, IN 47907.

Jane Zimmer Daniels, Ph.D., who directs the women in engineering programs at Purdue University, is currently serving part-time there and part-time at the National Science Foundation. Founding President of the Women in Engineering Program Advocates Network, Daniels has served as a consultant to educational institutions and industry and has received many awards for her work on behalf of increasing the participation of women in engineering.

Wanted: Sociopolitical Female Techies



Ruth M. Davis, who leads the Pymatuning Group, Inc., promised conferees “blatant advocacy.” She would like to collapse science, engineering, and technology into one term--technology--and she called for women in science to shape its influence from the vantage point of those who can understand technology’s problems and promise.

“We have been too tolerant about not asserting the importance of technology,” she said. Three decades ago, when the role of science/engineering/technology was uncertain, such a stance was defensible. Before World War II, those fields belonged to the labs, to the university, or existed as a necessary but unpopular graduation requirement. Scientists were not participants in policy making. Lawyers and businessmen did that.

“Now, however, technology is clearly the basis of many--even most--important aspects of modern life,” Davis said. It has been the “prime agent” of social change. “We don’t know where the research is going,” and this uncertainty brings a balance of benefits--computers, advances in health care, and microelectronics, for example--and deficits, such as the

- depletion of the ozone layer
- increase in drug trafficking made possible by improved communication (to say nothing of the technology used to refine the drugs themselves)
- weapons of mass destruction
- potential for chemical and biological warfare

It is technology that has led to these problems; it is science and technology that hold the solutions.

“Technology isn’t kindly; technology isn’t understood; technology is essential,” she said. “A good foundation in science, engineering, and technology should be a requirement for policy makers. And, she continued, “Women scientists/engineers/technologists will do a better job at statesmanship than lawyers.”

In 30 years, Davis has seen how far women in science have come; how far they have gone; and how far they have to go. As a student at American University (Washington, D.C.), Davis was advised not to major in mathematics and not to go on to graduate school. She did both anyway. Today, the head of the chemistry department is a woman. In the aerospace industry (one of Davis’s fields of expertise), on the other hand, “women make up only 5-6 percent of the executive boards,” she said, and male-dominated science/engineering/technology fields have been the slowest of all professions to promote women. “If I am the only woman on a board, and I can’t get another woman on it,” she believes that “I’ve failed.”

“Women get ahead in these fields,” she said, “by being stubborn, by pioneering, by exploring, by being willing to take risks, and by daring uncertainty.” The most attractive features of careers in science/engineering/technology do not depend on one’s skeleton. “As we go into transition to the information age,” she noted, “people aren’t being laid off--their jobs are disappearing.” The new skills are gender-, ethnicity-, and colorblind, as the distinction between blue and white collar jobs also fades into a no-collar world whose key is skill in technology. As one set of jobs disappears, a new set is being created.

You can’t be part of technological fields without participating in the best opportunity to help--or to hurt--society.

Davis gave a number of concrete examples--“vignettes”--of technology’s importance:

- To avoid technological crime and invasion of privacy, we need electronic fences.

- Nuclear reactors do great service but produce nuclear waste problems. We need policies on nuclear waste, not just 10-year extensions. We don't know enough to be afraid.
- Urban crime can be better controlled by a police force armed with and in alliance with technology.
- To monitor arms production, we need satellite photos and electronic tagging of missile parts. Communication through technology can check up on all countries; it can replace trust as a means of keeping peace.

"This should not be the state of the world," Davis admitted, "but it is all we have until we can build trustworthiness."

Questioned a conferee: "What is the solution to nontrust?" Davis's answer: "Education times three and the feminine ability to communicate." Observed another participant, "Male scientists talk as if they were participating in a secret code. Women know that you should be able to explain scientific information to your beautician."

Agreeing, Davis concluded with a question and a warning: *Who better to make policy than women expert in technology?*

"Some relevant rules of the road" follow:

- Don't expect to pop out at a senior level without having earned your stripes in the technology trenches. But don't stay there. "Learn early how to couple technology and policy issues."
- Become involved in policy discussions as early as possible, remembering that technology- and diversity-engendered viewpoints are *essential*.

Ruth M. Davis, Ph.D., is president and chief executive officer of the Pymatuning Group, Inc., which specializes in industrial modernization strategies and technology development. She has managed multibillion dollar federal programs for the Departments of Energy and Defense (among others), initiated many major projects using technology to create significant impacts on industry, government, and academia, and received numerous awards and honors.

Putting In Time and Keeping Focused, Focused, Focused

For Jaleh Daie, professor and administrator at the University of Wisconsin, who grew up and did her undergraduate work in Iran, a 70-hour work week is typical. "Everybody's smart," she said. "How do you get ahead of them? You bust your tail."

Leading in academia is different than elsewhere, Daie said, not only because of the job security offered by tenure but also because of the tradition of faculty governance. The result, she said, is a different process than that found in corporations, although many of the latter are trying to become "bottom up" organizations. Leadership in academia is "more complex than elsewhere because decision making is more horizontal than vertical." It's the difference between democracy and autocracy, she elaborated. "The former is more sophisticated, takes more finesse, patience, and careful handling of people, but the tradeoff in consensus building is worth the sacrifice in efficiency."

Leadership is born partially from "certain characteristics shaped by early experiences," Daie thinks, adding, "This is not entirely genetics." Leadership, which stems from "a compelling desire--almost a need--to make a difference, to make life better, can be



enhanced by learning and is about seeing the big picture and taking risks,” she continued. “If you’re afraid to take chances, you can’t lead.”

Daie has reached her position in academia and AWIS leadership over even more cultural hurdles than most women in science. To rise professionally, she had to buck not only gender but also ethnic stereotyping.

Asked whether she thinks that women often have different leadership styles than men, Daie responded, “Women tend not to have huge egos, which is a plus or a minus. They know how to listen and respect other points of view more readily. In her “largely male work world, a small ego can make you miss opportunities,” she said. “For example, men can often propel themselves by the force of their egos.”

Married to a professional academic who is “very supportive” of her career, Daie sees her “professional and personal life as a seamless web.” The pair has no children, making everyday life “less complex.”

Daie’s all-female precollege education in Iran was “very rigorous,” she remembered, noting that in some U.S. universities the level of math and chemistry is not as high as in Iranian secondary schools.

But once she got to college (in Iran but modeled on American curriculum and programs), she realized how few women were in science. In a male-dominated freshman class--6 women of 400, “I was a novelty,” she remembered, finding only a slighter disproportion in graduate school. “I never felt at a true disadvantage either place, however,” she said.

Daie faced her “first women in science issue” when, as a sophomore, she resisted her home economics assignment while the boys were slated to study hydrology. “Why?,” I asked. “Because you are a woman.”

I put my foot down and saw the University president, an American man. “Why must I take home economics?” I asked again. “The girls need such skills to be good hostesses,” said he. “I learned that at home when I was 12,” I insisted. He made an exception and later changed the policy. *Then*, I dismissed it. *Now*, I see the pattern.

I was challenging the system without knowing it.

Daie’s Picks on Leadership:

Not much has been written about leadership by women in science. The best source is *A Hand up: Women Mentoring Women in Science* (Ed. Deborah C. Fort, AWIS, 1993).

There are many good books on leadership. My favorites:

Margaret J. Wheathley (1994). *Leadership and the New Science* (San Francisco: Berrett-Koehler). Wheathley relates chaos theory to leadership as a basis for organizational behavior: Disorder can play a role, she argues, in a new order.

Peter Schwartz (1991). *The Art of the Long View* (New York: Doubleday). Schwartz advocates looking into the future and using, as vantage points, the worst and rosiest possible scenarios as well as paying attention to “distant early warning signs.”

Early in her academic career, Daie “realized that there’s a game out there to play,” and she became “an astute observer of successful people. Though they didn’t even know it--any male or female whom I highly admired became a role model.” In this way, “as many men have contributed to my career advancement as women.”

As AWIS president-elect, Daie offers this advice to women hoping to become leaders in science: “Keep your mind on the goal.”

To take an anatomical metaphor, nurture your

- wishbone--(vision)
- backbone--(courage, perseverance, mental fortitude)
- funnybone--(enjoy life)

Noting that women are not typically groomed for leadership through the channels that often prepare young men, Daie intends to push for ways to offer leadership opportunities for women by working with other groups and agencies. “Leadership is the new frontier for women in science.”

Daie is also willing to be a mentor. Anyone interested in her help and advice should write her a letter describing his/her commitment and needs (The University of Wisconsin, 329 Birge Hall, Madison, WI 53796).

President-Elect of AWIS Jaleh Daie, Ph.D., a professor conducting research in plant molecular physiology, held numerous administrative posts at Rutgers University (New Jersey) before coming to the University of Wisconsin--Madison, where her work includes serving as the science advisor to the vice president for academic affairs at the 26-campus system. Active in many scientific organizations, Daie at Rutgers served as chair of the department of crop science, founding director of the Center for Interdisciplinary Studies, and director of the graduate program in plant biology.



Congresswomen Anna Eschoo (D-CA) and Marilyn Lloyd (D-TN) at the Congressional reception honoring leaders of science.

AWIS Resources

Your Guide to Special AWIS Resources

Mentoring Means Future Scientists: A Guide to Developing Mentoring Programs Based on the AWIS Mentoring Project

This 160-page volume is AWIS's full report on its three-year Mentoring Project for undergraduate and graduate students. It identifies what was effective and what was not, based on the experience of participants in the program. In addition, it discusses the special needs and concerns of undergraduate and graduate populations, women of color, and students in different fields. Appendices include sample program materials, survey data, and an extensive bibliography listing resources on women in science and on mentoring.

A Hand Up: Women Mentoring Women in Science

AWIS produced this 350-page "paper mentor" as part of its Mentoring Project. The book, published in the spring of 1993, consists of four sections. The first, "Voices," includes interviews with 37 individual women in science, mathematics, and engineering, from undergraduates to noted science professionals. The second section of the book identifies common threads among the interviews of Part I regarding personal and professional challenges. The third section offers reflections, suggestions, and "how to" information from noted scientists discussing philosophic and gender issues and proffering educational and professional advice. The final section of the book provides an extensive list of nearly 100 scientific, feminist, and educational organizations—both private sector and federal—that support women in the sciences, as well as sections on job searches and letters of recommendation.

Grants at a Glance:

In 1992 AWIS published an updated edition of Grants at a Glance, a 100-page book of funding information listing over 400 awards, fellowships, and scholarships for women at all levels in a wide variety of scientific fields.

AWIS-CAC Compilation of Recommended Career Guidance Resources

(1989 edition): A bibliographic listing of books, films, curricular materials, etc., on women and girls in science and on careers in science and engineering, produced by the Chicago Area Chapter of AWIS.

Gender and Science

A transcript of a panel discussion, sponsored by the New England Chapter of AWIS in 1987, on what is the meaning and impact of research on women in science, with an audience discussion on being a woman in science.

How Stereotypes About Science Affect the Participation of Women: Text of a Lecture given in 1989 by Mary Beth Ruskai, Professor of Mathematical Physics at Lowell University, MA.

Education For All: Women and Girls Speak Out on the National Education Goals

(1990): A paper put out by the National Coalition for Women and Girls in Education (of which AWIS is a member) that discusses "concerns which must be taken into account in implementing the national education goals to assure that women and girls are full partners in the pursuit of educational excellence."

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Buttons: (measure 2 1/4 inches in diameter)

"I Support Women in Science" and "Mentoring Means Future Scientists"

"AWIS" Lapel Pins:

The AWIS lapel pin is 3/4 of an inch across, with gold writing on a blue background.

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