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# Strategies to Support Women in the Academic Physical Sciences: Reflections on Experiences and Efforts

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*In this article, the authors describe a concerted, long-term effort by academic women chemists to provide mentoring and training for their colleagues to survive and change the negative climate of their profession and to develop successful careers in spite of these barriers. Data came from records kept by the group, observations of their activities, and extensive reflections of key participants. Concepts from the social science literature regarding successful organizations are applied to the analysis. Important elements identified are strong and consistent leadership, use of social networks to maintain a diverse and committed membership, using data to develop and change programs, and an organizational culture that supports norms promoting deliberative task orientations and a supportive socioemotional climate.*

Women currently receive almost half of all doctoral degrees that are awarded, but their representation varies substantially from one area to another. For

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instance, in 2009, they earned only 28% of doctoral degrees awarded in the physical sciences and computer science (U.S. Bureau of the Census, 2012). In chemistry, the focus of this paper, 39% of all doctoral degrees, 47% of all masters degrees and 50% of all bachelor degrees were awarded to women in 2009 (National Center for Education Statistics, 2010).

The representation of women on the faculties of academic departments of chemistry has not changed at the same pace as the representation of women among doctoral degree recipients. At the 50 schools with the highest expenditures on chemistry research, a standard measure of hierarchy in the field, 32% of all doctorate degrees in chemistry awarded between 1996 and 2005 were given to women (Nelson, 2007). However, in 2007-2008, the most recent data available, women comprised only 14% of the faculties and only 22% of those at the assistant professor level in these highest ranked departments. This is substantially below the percentage of doctoral degrees awarded to women by these schools in the earlier decade and a half (Kuck, Nolan, & Buckner, 2004; Morrissey, 2006; Nelson, 2007; Raber, 2007).

Explanations of women's underrepresentation on chemistry faculties point to two general factors. The first involves options outside the academy, for chemists also have numerous employment opportunities in the industrial sector. The second explanation, however, involves a negative gender-related climate within the academy. A recent study of women chemistry faculty found that a large proportion received little professional support through mentoring (Greene, Lewis, Richmond, & Stockard, 2010b). The study showed that women felt their campus environment was not always supportive of women, and that there were substantial differences in the resources and privileges awarded to men and women faculty, especially in areas that are most likely to be related to career advancement such as salaries, workload, space, and recognition for research. Women in the study reported that gender-related issues affected their department's ability to recruit and hire and had a negative impact on the progress of women's careers. Women chemists were significantly less likely than those in a national sample of academics to report being satisfied with their jobs and were significantly less likely than those in the national sample to agree that women and minorities were treated fairly.

This article describes one group's response to this negative gender climate and the positive impact it had on those who were involved. This concerted, long-term effort by academic women chemists provided mentoring and training for their colleagues to survive and change the negative climate and to develop successful careers in spite of these barriers. We use data gathered from

records kept by the group, observations of their activities, and extensive reflective conversations among key participants. First, we describe activities that the group has sponsored and outcomes of this work. We then discuss the development of this effort, using concepts from the social science literature regarding organizations and social movements to help provide theoretical context. This context is important to both understand the group's success and help guide efforts of others desiring to replicate the efforts. The article concludes with implications of the work for others wishing to promote women's success in the academy, especially in fields that are hostile to the entrance of women.

### **Committee on the Advancement of Women Chemists (COACH)**

The grass roots effort COACH (the Committee to Support Academic Women Chemists) began its work in 1997. Its structure involves a chair, an active advisory board, and a small support staff. The initial COACH Advisory Board was comprised of a dozen tenured women full professors in chemistry, including several who also served in administrative posts. The advisory board has since grown to include 20 tenured women faculty members from 18 different universities who represent many scientific disciplines.

The major focus of their work has been helping women develop skills they can use to build and enhance their careers, counter the hostile environments and career barriers that many of them face, and promote departmental and institutional changes to produce a more inclusive work environment. The work involves three general aspects: (a) sponsoring workshops to assist in career advancement of women scientists and engineers, (b) promoting networking among these women, and (c) contributing to more equitable policies and procedures in the scientific community. As described more fully below, these activities developed through deliberative, strategic processes and actions by the COACH chair and advisory board.

#### **COACH Workshops**

The COACH workshops have been the most visible activities of the group. Content of the most commonly sponsored workshops is described in Table 1. The first workshop that was developed (number 1 in Table 1) centered on effective negotiation techniques and was soon expanded to include communication skills. The impetus for the creation and dissemination of this workshop

Table 1

**Examples of COACH Workshops**

<i>Skill</i>	<i>Description</i>
1. Effective Negotiation and Communication Skills	This workshop focuses on teaching and practicing professional skills that enable participants to take a more proactive role in directing their career paths, such as negotiating for needed resources, resolution strategies for difficult conversations, communication methods that are particularly effective for women and underrepresented groups, and the art of self-promotion.
2. Effective Leadership Techniques	This workshop gives participants basic tools to further leadership skills in STEM environments, including the classroom, and running a research group. Participants learn about concepts of leadership; reflect on their leadership challenges, strengths and weaknesses; and explore knowledge regarding gender and race in leadership situations.
3. Developing and Maintaining a Balanced Career Portfolio	This workshop helps participants take more control of developing and maintaining a healthy work-life balance throughout their career. Individuals identify their own strengths, values, aspirations, needs and priorities and use this information to develop a career-life portfolio to make changes in their current situation to achieve the optimum balance.

*Note.* Workshops 1 and 2 are offered in a variety of formats including workshops for underrepresented minorities, for postdoctoral associates interested in moving to academic positions, for women who have completed the workshops earlier and want to expand upon their skills; and for department, institute, and center chairs (both men and women).

was an experiment at one of the first COACH Advisory Board meetings where several experts in higher education were invited to introduce concepts in negotiation as a mechanism to open dialogue about gender-related barriers experienced by advisory board members. Training in effective negotiation skills and communication skills beyond scientific communication was rare for those in the physical and computer sciences. The availability of such workshops for physical scientists was also rare at that time, and there were no workshops designed specifically for women scientists.

Participants reported that this first experiment resulted in a rich dialogue among members about the difficulties that nearly all of them faced in day-to-day aspects of their developing careers. These difficulties ranged from inadequate research facilities, heavy committee loads, and low levels of technical and clerical support to having their contributions ignored in department meetings and losing research laboratory space. In addition to receiving lower salaries than their male colleagues of comparable or lesser productivity, many

felt that they were bypassed for chaired positions in their institutions, offers to move to another institution, invitations to give plenary talks at important meetings, and distinguished lectureship positions in well-respected departments. Through discussions with other advisory board members and with the advice of the workshop facilitators, all left with skills and strategies to use once they returned to their home institutions. They planned to report on their experiences at the next board meeting a few months later.

Participants recalled that the outcomes shared at the next meeting were very positive. Board members reported having successful negotiations for higher salaries, recapturing lost laboratory space, an appointment to a desired administrative post, more positive outcomes in faculty meetings, and more productive dialogue with difficult colleagues. These outcomes motivated COACH members to extend the impact to the broader community through developing and disseminating this and additional career building workshops to other women in chemistry. In addition to focusing on communication and negotiation skills, workshops have provided training in leadership techniques effective for women, transitioning from a postdoctoral position to the academic world, and achieving a healthy work-life balance (see Table 1).

Participants reported that the process of workshop development was deliberative, time consuming, and data driven. Two to three years typically elapsed between the development of the initial idea and the formal launch of a program. All workshop ideas were initially discussed at biannual advisory board meetings. A key element of this discussion was whether the content of a proposed workshop addressed an issue that was documented to be of widespread concern or hindrance to women scientists in their career paths. Board members reported that only some of the workshop ideas made it beyond this initial consideration.

Once the content of a workshop was determined, the board looked for professional facilitators who would work with them to produce a workshop with the appropriate content. The review process that the board used to vet different potential workshop facilitators followed a format similar to a scientific review in that it was rigorous, inquisitive, and detailed. In commenting on this process, board members talked of realizing that they “needed experts” and that they had to “set very high standards for the workshops.” They reported how they “beta tested” workshop facilitators, inviting each potential facilitator to try out their workshop on the board members. Noting that they wanted to be “good scientists,” they set the bar high, eventually rejecting about half of all potential presenters. The selected facilitators tended to be experienced profes-

sional women in human resources, leadership training, teaching, and higher education administration, with extensive experience.

When a newly developed workshop passed this critical process, the board worked with the facilitators to “fine-tune” it for the scientists and engineers who were the target group. Thus, the board rejected “off the shelf” or “packaged” presentations, wanting to ensure that their products were appropriate for the intended audiences. Although the first workshops were directed toward senior women in the field, later workshops were conducted for those in junior academic ranks and, more recently, for postdoctoral fellows and graduate students. Workshops have also been especially developed for minority participants, for those with leadership positions in higher education (geared toward both women and men), and those in research positions. Workshops typically last one-half to one full day and involve aspects such as analysis of individual strengths and characteristics, role-playing, and other activities to help participants learn and practice new skills.

COACH launched its “COACH-sponsored” workshops at the meetings of various professional chemistry associations. This included national meetings, such as the American Chemical Society (ACS), American Institute of Chemical Engineers (AIChE), Council of Chemical Research (CCR), and those oriented toward specific racial-ethnic groups, such as the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCCHE) and the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS). Attendees for these workshops received travel funds and lodging expenses to attend the workshop through grants from federal funding agencies including the National Science Foundation, the National Institutes of Health, and the Department of Energy.

Once the board members were satisfied with the quality and the content of the new workshops at the chemistry-oriented meetings, they were marketed to other groups through the website, word-of-mouth, publications, and seminars that the chair gave about COACH at scientific meetings, academic institutions, and informal gatherings. To maintain quality, facilitators were routinely brought back to the COACH Advisory Board meetings to provide updates on the workshops. Evaluative research was conducted around the COACH sponsored workshops to fine-tune them. Board members indicated that the workshops considered most successful were ones where the content was data-driven, built on current research and best practices, and were updated periodically.

Work published elsewhere has detailed the impact of the workshops on participants (Greene, Lewis, Richmond, & Stockard, 2010a), and we only

briefly summarize the results here. In general, the participants expressed overwhelmingly positive views regarding the workshops. In response to queries obtained in written surveys immediately after attending, over 90% of respondents rated the sessions as “very” or “quite” useful, and negative views were quite uncommon. When contacted again two to six years after participating and asked to complete internet-based surveys, the attendees had overwhelmingly positive attitudes. The vast majority of the attendees reported using many of the workshop skills that they had learned and indicated that the skills helped improve their communication and negotiations within their academic departments. They reported feeling more in control of their careers, more comfortable negotiating for themselves or others, and experiencing less stress about meetings or negotiations.

Reflecting on their experiences, members of the advisory board noted similar long-term effects on their own careers. They reported that specific behaviors they learned in the workshops, such as how to present a point effectively in a meeting or how to react to someone who was upset, and explained how they used this knowledge to help advance their own careers. One board member described the experience as “paradigm shifting.” She said that the experience was so transformative that people remember and talk about what happened “BC,” as in “Before COACH” and “AC,” as in “After COACH.”

Over the past 12 years, more than 6000 women scientists and engineers have participated in COACH-sponsored workshops at over 100 professional meetings, representing more than 60 academic institutions. Participants have included women chemists, physicists, mathematicians, biologists, computer scientists, geologists, medical faculty and students, material scientists, and engineers of all types. The women participants in chemistry came from 270 different chemistry departments in 48 different states. In recent years, COACH has also offered workshops in a number of overseas locations, including China, Spain, and Cameroon. Current plans call for extending the workshops to national research laboratories, which employ many scientists, and to more locations in other countries.

## Networking

COACH has also helped promote networking among women scientists, largely as a byproduct of its workshops. By participating in workshops at national meetings, participants meet other women scientists and share their experiences in the academy and the experiences of learning new skills. The workshops provide a unique setting for women scientists to discuss concerns,

aspirations, problems, and successes with other women faculty. COACH also sponsors receptions and other gatherings at professional meetings as a way for women to meet others in their field and renew previous acquaintanceships. Evaluations on the long-term impact of the COACH workshops showed that almost three-fourths of the attendees reported that their COACH experience helped them develop more supportive professional networks (Greene et al., 2010a).

The COACH board plans to strengthen its attention to networking in the future. While the in-person workshops and opportunities for meeting others will be maintained, they intend to use cyber-networks more extensively. They hope this will allow greater opportunities for linking scientists within the United States and internationally. To this end, they have been meeting with social science experts in electronic networking and exploring potential directions. As with the initial formulation of their workshops, the work with cyber-networking is developing gradually and will be piloted with small groups before being introduced to a wider audience. Initial experiences with cyber-networking indicate that this approach may be especially successful with younger members of the profession.

### **Broader Issues in the Field**

While the major focus of COACH has been on helping individual women negotiate an environment that can often be hostile and demeaning, the group selectively worked on broader issues related to discrimination in the field. As with other efforts, these activities were targeted and thoroughly discussed before beginning. This has, again, allowed the group to be strategic.

One avenue of work with broader issues involved collaborating with other organizations to present diversity-oriented workshops. One of the most well documented efforts was a series of workshops geared toward department heads to examine issues related to both gender and racial-ethnic diversity (Greene, Lewis, Richmond, & Stockard, 2011a,b). Members of the COACH Advisory Board joined with other scholars in the planning and execution of the events. Descriptions of these workshops and their outcomes are given elsewhere. Although some workshops were more successful than others, all of them documented significant changes in the understanding and commitments of department heads. Workshops that had the greatest involvement of the COACH board promoted the greatest changes (Greene et al., 2011a).

Another way in which COACH affected the field was through subtle pressure on funding and professional organizations to alter practices and proce-



dures that are felt to be discriminatory, such as the way that awards are allocated or criteria used in rating grant proposals. In large part, this impact on the profession has been indirect. By enhancing women's skills in navigating a hostile work environment, women are empowered to promote change, whether it is in their immediate work environment or in the field at large. Board members suggest that there have been substantial alterations in several policies and practices over the years, in large part as a response to lobbying from COACH participants. Anecdotal evidence suggests that, in recent years, women were more likely to be honored with positions on editorial boards and nominations for awards. Issues related to equity were also more often included as criteria for grant competitions for departments and institutes. Even though COACH's efforts in this area were indirect, we assert that the impact is real.

## Understanding the Success of COACH

A well-established literature in the social sciences has documented a relatively low level of success in "diversity" oriented projects (e.g., Cotton, 1993; Kalev, Dobbin, & Kelly, 2006; Naff & Kellough, 2003). In reflecting upon why their efforts have countered this trend, the COACH board pointed to several key elements in their development, each of which is discussed in the social science literature regarding successful organizations. These elements include: (a) characteristics of the organization's leadership, including both the chair and the advisory board, (b) the way it promoted and used social networks, (c) the importance of social science research in developing and evaluating the short and long-term impact of COACH products, and (d) the organizational culture that has embodied norms promoting careful, deliberative task orientations and a supportive socioemotional climate. Each of these elements and how they affected the organization are discussed in more detail below.

### Leadership and Key Personnel

Social science literature describes the important role of leaders in organizations, stressing that their power and influence develops from interactions with others in the group (e.g., Scott, 1987; Stockard, 2000). Social scientists have found no simple description of characteristics that apply to effective leaders across a range of situations. However, the consensus seems to be that effective leadership traits and behaviors vary depending on a particular situation, and effective leaders must be flexible and sensitive, able to adapt a range of behaviors to particular situations (Avolio, Walumbwa, & Weber, 2009; Ho-

gan, Curphy, & Hogan, 1994; Scott, 1987; Smith & Peterson, 1988; Trice & Beyer, 1993). Observations of COACH and the reflections of key members indicate that their leaders displayed these characteristics, and leaders' flexibility and sensitivity to current situations and new opportunities have contributed to their success.

COACH began through the efforts of one well-respected and established woman chemistry faculty member who has remained as the chair of the organization throughout its existence. During her years in the academy, she became increasingly concerned that women in the field were not experiencing the same types of career opportunities and advancement patterns as their male colleagues. In 1999, she reached out to about a dozen other senior women chemistry faculty. She asked them to attend a meeting with two experts in leadership development to discuss effective negotiation and leadership strategies for women professionals. As described earlier, this session allowed the women to discuss openly with other women scientists the difficulties that they were facing in their departments and organizations for the first time. The lessons they learned from the experts inspired these women to develop the program of workshops and, eventually, the other activities, described above.

In reflecting upon their work, members of the board stressed the importance of the chair's personal characteristics, including her entrepreneurial nature, energy and focus, in maintaining the organization's activities. In addition to a strong scientific record, she has good communication skills, a strong commitment to promoting equity, and extensive networks in the scientific and funding world. As opportunities evolved and needs changed, she helped the organization look for and act on new opportunities. Some literature distinguishes leadership skills oriented toward the "start-up" phases and the "implementation" or "maintenance" and "on-going" phases of organizational work (e.g., Avolio et al., 2009). COACH's chair has demonstrated skills in all of these areas.

In addition to providing the initial impetus for the group, the chair's entrepreneurial nature and contacts with funding sources produced a continuing stream of financial support. Initial funding came from private foundations. In recent years, the federal government has become more aware of the importance of a diverse workforce in promoting a competitive STEM environment and included these concerns in funding agendas. Thus, funding in recent years has more often come from federal agencies that typically support research in chemistry and other STEM fields. The funding has supported workshops at national meetings, a full-time staff support person, social science researchers and other expenses associated with maintaining the organization.

When suggesting that a strong leader is central to a group's success, the answers to two questions need to be considered: (a) Is such a visionary, entrepreneurial leader an essential element of the program? and (b) Can the group endure if the leader were to withdraw? Of course, the final answer to these questions await analyses of replications of COACH's activities. To date, anecdotal evidence suggests that many elements of the programs have been replicated successfully in other physical science areas including physics, geology, and mathematics. Early indications are that a large proportion of the group's endeavors can be adopted by other organizations.

The board members also praised the composition of their group, stressing that their success reflected the long-term commitment and involvement of each participant. The members of the board were carefully chosen and have remained highly committed over the years, with four of the original eleven board members still actively participating. Organizations often people their advisory boards with "star power," selecting those with the most high-powered reputations to enhance their visibility and status. The members of the COACH board are all well respected within the field, but members report that they look for other characteristics in recruiting new members. The most important traits are a deep-seated concern for fair and equitable treatment and the ability to work well with others, putting the good of the group ahead of their own career aspirations. Board members noted that new members were added slowly to allow adjustment of the individuals to the group and vice versa. They reported only a few times when a potential board member was "not a good fit," and these situations ended amicably through mutual recognition of the differences.

COACH has been successful in obtaining funding; therefore, it has a paid staff member who handles the vast array of logistical details associated with workshops, board meetings, grant applications, and other day-to-day issues. The staff member also helps maintain institutional memory and is a key contact person for all interactions with COACH. Given the many professional demands on board members, it is unlikely that COACH could have succeeded with only volunteer efforts. The board members were unanimous in stating that the staff member's skills and contributions were crucial to their success.

## Social Networks

The social science literature stresses the importance of social networks in both effective social movements and career advancement. While strong ties, such as those with family and close friends, provide important emotional support, weak ties, such as those with acquaintances and business associates, are

much more important in individuals' career development and in developing the broad base of support needed for successful social movements (Granovetter, 1973, 1995; McAdam & Paulsen, 1993; Rosenthal, Fingrutd, Ethier, Karant, & McDonald, 1985). Such "weak" ties are important because they provide linkages to opportunities and resources that are less likely to be known by one's "strong" ties.

The outreach used to develop and maintain the board reflects this literature. Although aware of each other's academic reputation prior to their first meeting, few women in the group knew, on a personal level, more than two or three of the women who attended. The women were also diverse in background and career path. They represented different types of academic institutions and sub-areas, came from varied graduate school backgrounds, and included women of a wide range of racial-ethnic heritages. Over time, membership on the board has expanded beyond chemists to include women in materials science, engineering, physics, geoscience, and mathematics. It has maintained its racial-ethnic diversity, with substantially more diversity than in the field as a whole. Over time, the board has also become more diverse in age through adding more faculty members at mid-career levels.

Long-time board members described the development of the board as being "purposive and thoughtful," choosing people who could help to build a culture where issues could be discussed openly and where constructive solutions could be developed. They also noted the importance of only including members with the type of selfless orientation described above, who would be dedicated to the goals of the group and could prioritize group objectives above their own career aspirations. Invitations to join the board were made through a board nomination process that involved discussion of potential candidates, interviews with the candidates to gauge interest, and visits to a board meeting. Reflecting in later years upon this development, the board members noted how important this careful outreach was in broadening the impact of the project throughout the field, but also in maintaining the culture that has made it successful.

### **Research-Based and Data-Driven**

A strong norm regarding the importance of empirical evidence also undergirds COACH's activities. All of the workshops sponsored by COACH use facilitators who base their activities on well-grounded social science research. Long-term facilitators routinely update their workshops with the most recent and relevant research findings. In addition, they rely on feedback from the

workshops to adjust the presentations so that they are most helpful to participants.

In addition, as described above, decisions regarding whether to use a workshop and/or to alter COACH's activities are based on data. Workshops are tested only after a careful review of perceived needs. Potential workshops are thoroughly examined and only placed in the field after the COACH board is convinced that they will meet the defined needs. The impact of participation in both the short and longer-term is examined through standard social-science research techniques.

## Culture

Finally, the reflections of board members stressed the importance of the group's culture and forms of interaction in promoting its success. The classic literature on organizations describes two distinct facets of organizational interactions and leadership: instrumental leadership and norms, which deal with the tasks or work of an organization, and expressive leadership and norms, which deal with interpersonal relationships within the group. Organizations, and especially small work groups, operate more smoothly if tasks are accomplished and if the people within the organization have positive feelings about the organization and their relationships with one another (Bales & Slater, 1955; Etzioni, 1965). Literature in the sociology of gender suggests that women are more likely than men are to incorporate both roles in their interactions and organizational activities (Johnson, Stockard, Acker, & Nafziger, 1975; Stockard & Johnson, 1981). The style of the COACH leader, as well as the content of board meetings, exemplifies this combination. The reflections of the board members stressed the importance of cultural elements related to both socioemotional and task-oriented orientations in promoting their success.

Socioemotional related norms are apparent throughout the COACH Advisory Board meetings as well as in the workshops and other activities. Each meeting of the board begins with a "time of sharing," where members provide updates on both their professional and personal lives. A strong norm of noncompetitiveness is reported to pervade the interactions, with members sincerely supportive of professional accomplishments and personal life changes. In reflecting upon their success, all of the board members stressed the importance of the climate of trust and openness. As one person put it, "The feeling that one can say anything and know that others have my best interest in mind is huge." Another frequent response is that the COACH

meetings and interactions at these meetings provide a welcome and soothing departure from the highly competitive and aggressive atmosphere in which most conduct their everyday professional scientific lives. The board members talked about how this attention to socioemotional issues helped promote an atmosphere that was “true friendship.” They stressed the importance of having a racially and ethnically diverse group. Terms such as “being valued and accepted as equals,” “affirmation,” and “openness” appeared often in the reflections of all board members. They repeatedly talked about the support they felt from others, the sense of inclusion for all, especially racial-ethnic minorities, and a sense of caring, both among each other and also within their sponsored workshops. All board members stressed that the norms regarding inclusiveness, caring, and mutual support have been key to their impact.

The terms most often used to describe the group’s instrumental, or task-oriented, activities were thoughtful, purposive, strategic, deliberative, and caring about quality. The discussions above that described the development of the workshops, the expansion of other activities, and the reliance on empirical evidence illustrate these norms. Board members suggested that these traits reflect their training as scientists. They realized that it was crucial to diagnose the problem, or issue, they wanted to deal with before launching any action. They also recognized that they needed experts to have the most useful workshops and that “experts” varied in quality. Thus, they exerted a great deal of effort into finding the right people and making sure that offerings were research based and useful. As one board member explained, “In the scientific world some experiments work and some don’t and one looks at the empirical evidence to determine the answers.” Finding the most effective paths for change takes time, testing, and reflection on the data.

The nature of the socioemotional and task-oriented norms has helped the group maintain a culture that is open to reflection and change. Board members reported that the open and trusting communication, as well as the concern with evidence of whether activities work, allows participants to talk about new directions and possibilities thoroughly and freely. The board members suggest that this has allowed COACH to thoroughly vet potential endeavors, move away from those that are less successful, and enter into new areas of work. The emerging activities described above, such as greater involvement with women scientists in other countries and work with chemists outside academe, grew out of this process.

## What Can be Learned

The experiences of COACH show that it is possible for a small group of academic women to develop an organization that can provide meaningful, long-lasting support to those who are often marginalized within a discipline. While their efforts have not erased the hostile environment, their work has made it easier for many women to work within it and to feel more confident in their abilities to negotiate and lead within their disciplines. In addition, connections between women scientists have become more extensive. As a result, women scientists are better positioned to promote change in the academy.

The analysis presented here suggests that groups wishing to replicate their efforts should pay attention to each of the elements of success described above. The experience of COACH indicates that characteristics of four elements may be of key importance: time and deliberation, the people involved, the culture that is developed, and having adequate support. Even though COACH has devoted its efforts to the physical sciences, their lessons could be helpful to those in all areas of the academy. It could be suggested that all women in the academy are concerned with issues such as the skill development, professional networking, and career balance that are addressed by COACH.

First, it is clear that it takes time and deliberation to assess, develop, and produce activities that work. COACH's first workshops for the chemistry community launched two years after the group began to meet and only after careful testing and review. All subsequent activities were thoroughly examined before implementation. The development of new programs was deliberate and slow, including pilot runs, assessment of the pilots and subsequent revisions, and a willingness to change directions when needed. In reflecting upon their success, the board members were unanimous in pointing to the importance of their slow and deliberate process. They suggested that while this takes more time initially, it results in programs that are more attractive to funders and worth the money and time expended. The board chair echoed these comments and stressed the important role of consulting widely with board members. As she put it, "There have been several times that I would have taken us in a bad direction had I not consulted the board. And when I disagreed with them I still followed their advice and they were always right." In short, all participants agreed that, while they devoted a lot of time and effort to what they termed "due diligence," the quality of the final product resulted in a great deal of saving of both time and money.

Second, COACH's experiences illustrate the importance of having dedicated and involved people in the organization. Other organizations could be

well served by emulating their attempts to tap into diverse networks while also taking time to ensure that participants will mesh well with the group's culture and goals. This requires that organizers go beyond their usual network of professional acquaintances. It also requires investment of time and energy, devoting the same deliberation to the selection of board members and staff as should be given to developing activities.

Third, the experiences of COACH illustrate the importance of attending to both the socioemotional and task-oriented norms of a group. The board members repeatedly commented on the trusting, noncompetitive, relationships that they had formed and the open patterns of communication that they had developed. They stressed that the trust and open communication were necessary ingredients in honestly evaluating current and potential new endeavors. In other words, their strong and supportive socioemotional norms facilitated the quality of their task-oriented activities.

Finally, other groups wishing to replicate COACH's success should seek sufficient support to ensure that they can complete their activities. Although a great deal of COACH's efforts are voluntary in nature, they have the support of a paid staff member, and board members are reimbursed for major expenses, such as travel and lodging. Given the heavy demands that professional women face, it would be naïve to expect that activities such as those of COACH could be accomplished through volunteer efforts alone.

Obtaining such support may, however, seem daunting, especially to those in fields with less access to grant opportunities than the physical sciences. Those in fields with less access to funds are, however, should consider finding alternative ways to support efforts. For instance, it should be noted that much of COACH's budget is devoted to travel costs. The rapid development of electronic means of meeting could make it easier to facilitate contacts without travel costs and could diminish the time commitment of board members. Other possibilities include linking activities with other events members are likely to attend, such as annual conferences or other professional meetings.

The COACH Advisory Board and chair noted that their initial attempts to obtain funding and recognition were the most challenging efforts that they faced. For instance, proposal reviewers suggested that senior women scientists did not need help because they were already tenured, much as authorities today might suggest that women in student services are doing just fine because of their high rate of representation in the field. Only with persistent efforts were these views changed. When initial funding proposals were unsuccessful, grant officers helped the board write proposals that were able to obtain funding. Other groups could model this behavior by seeking such professional



advice and counsel. In addition, some within the profession initially suggested that the COACH Advisory Board members were only trying to advance their own careers, an accusation that one could imagine leveled at those in any sector of the academy. These suspicions gradually died out over time as the workshops continued to develop and attract participants. Taken together, the ways in which COACH addressed these difficulties illustrate how, with concerted, focused efforts, other grass roots groups throughout the academic world can also succeed.

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