Advancing Women in Science at the University of Michigan:

Faculty Recruitment, Retention and Leadership

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We write from different, but complementary, vantage points about the ADVANCE program at the University of Michigan. One of us (KSM) is an assistant professor in the Mathematics Department; ADVANCE has been a program at Michigan ever since she moved from a postdoc to a tenure-track faculty role; and one of us (AJS) is the PI on the project, a faculty member in psychology and women's studies, who began work on the work climate for women faculty in science and engineering while director of Michigan's Institute for Research on Women and Gender. Mindful of the risks of declaring success in the middle of a process, and of the range of perspectives inevitably not represented here, we nevertheless describe this program as a "model that works" to accomplish at least some of its goals under some conditions—at least in our eyes, and according to some criteria we will specify. We also try to specify some of the particular contextual factors that make aspects of the program more and less successful, and hope to learn more about these from others' parallel efforts in different institutions.

Moved by participation in a meeting of nine university presidents called by MIT President Charles Vest in January 2001, Michigan President Lee Bollinger created a committee on Gender in Science and Engineering[1] to identify some initiatives the university could undertake to improve the climate for women science and engineering faculty. At an early meeting, the committee identified applying to the National Science

[1] The committee, co-chaired by the President and Provost, included several deans of the largest and one smaller college with science faculty, the associate provost for academic affairs, several women scientists, and the director of the Institute for Research on Women and Gender, now ADVANCE director.

Foundation's new ADVANCE "Institutional Transformation" (IT) program as a potentially-important step. In discussion of an approach to institutional change that might work at Michigan, the committee identified a few key issues: (1) the program should be a partnership between scientists and engineers at the University and social scientists – including experts on gender and organizational change; (2) the program should be strongly evidenced-based, beginning with data about the climate as experienced by women faculty, evidence of salary and space allocation equity, and including analysis of social science research for leads on institutional change; (3) the program should assume that if the issues were "institutional," then change would also have to be institutional—focused not only on individual actors, but also on routine practices (including language used to discuss particular issues) and policies.

The project as proposed to NSF (and funded beginning in January 2002) included these three elements, beginning with a climate study funded by the university before the external support began, and many intervention activities aimed at different constituencies: women science faculty, all science faculty engaged with recruiting, chairs and other administrative leaders responsible for the climate and retention of women faculty, and deans and others who could provide women faculty with opportunities for satisfying and successful leadership. Some activities were aimed at all science and engineering faculty (especially those focused on broad issues of climate, and mentoring) and have been extended to faculty in all fields. Space precludes discussion of the full range of activities undertaken by the ADVANCE project, but they are outlined on the program's website: www.umich.edu/~advproj/. We will focus on a few, describing both

the campus-wide implementation and, where relevant, the direct involvement of the Mathematics Department.

NSF ADVANCE Program

Aimed at "increasing the participation and advancement of women in academic science and engineering careers," NSF's ADVANCE IT program described the problem:

> Despite some progress toward realizing gender-neutral attitudes, policies, and practices in academe, women scientists and engineers continue to be significantly underrepresented in some science and engineering fields and underrepresented in senior positions in science and engineering in general in the Nation's colleges and universities. There is increasing recognition that the lack of women's full participation at the senior level of academe is often a systemic consequence of academic culture. To catalyze change that will transform academic environments in ways that enhance the participation and advancement of women in science and engineering, NSF seeks proposals for institutional transformation.[2]

For the first time defining the academic culture of science and engineering as a key source of the underrepresentation of women, NSF provided both crucial leadership and legitimacy to efforts to think about and alter that culture.

UM's ADVANCE Program

After making a proposal to NSF, the university initiated a survey of the climate for women scientists and engineers on campus. The survey was completed, and its

[2] From the program solicitation (NSF 05-584) posted on the NSF website: http://www.nsf.gov/pubs/2005/nsf05584/nsf05584.htm

results widely disseminated on campus, as a catalyst for discussion of issues that needed to be addressed, by the time Michigan's funding as one of the nine first awardees was announced. These discussions took place within departments, at college and university-level meetings, and in a well-attended "kickoff" of the program in September 2002, in which the new university president, Mary Sue Coleman (also a chemistry faculty member), and NSF Program Officer Alice Hogan participated. [3] UM's goals for the program, announced at that time, were; (1) To improve the institutional climate for tenured and tenure-track women faculty in science and engineering; (2) To improve recruitment, retention and promotion of tenured and tenure-track women faculty in science and engineering; (3) To increase visibility and authority of women scientists and engineers in leadership positions.

These goals were articulated as important in the context of two concrete facts: that women were, at Michigan as in other research institutions, both underrepresented on the science and engineering faculty relative to the proportion of women earning doctorates in the fields and to the proportion of women students in those fields; and that underrepresentation was the greatest at the highest levels (in the ranks of the tenured and full professors). Specifically, for example, though nearly 60% of undergraduate science majors in the natural science division[4] of the liberal arts college at UM were women in 2001 (and 30% of doctoral students), only 24% of the assistant professors, and 5% of the full professors, were. The ADVANCE program argued that this pattern of

[3] It was after one of these presentations in the Mathematics Department, that Mel Hochster, distinguished member of the National Academy of Sciences, agreed to serve on the STRIDE committee of ADVANCE, described below.

[4] The Mathematics Department is in this division; in 2001, there were 5 women in the department of 58 (9%): 2 were assistant, 2 associate, and 1 a full professor. In 2006 there were 8 women in the department of 67; 2 assistant, 1 associate and 5 full professors.

disproportionate participation was problematic for several reasons, quite apart from the possibility of systematic inequity; it suggested that the academic workplace was making poor use of the talent pool in science; that the learning environment for male and female students in those fields included an unintended message about who could and should do science; and provided all students with unrepresentative exposure to models, leaders, and colleagues in preparation for their adult lives in the workplace.

Using Data to Define Goals

In addition to the underrepresentation of women (indicating that recruitment was an important goal), the climate survey suggested that there were other issues that needed to be addressed. First, it confirmed that although male and female science and engineering faculty had very similar career goals and values, and productivity, women were much more likely to have dual-career households and to be single heads of household. Thus, both dual career issues and the tensions between workplace and personal lives were particularly important to women faculty. In addition, women reported high levels of service to the institution, while at the same time receiving less mentoring, more unwanted sexual attention, less job satisfaction and overall a less positive work environment, measured many ways. These findings strongly suggested the need for interventions that might improve departmental climates for women faculty, as well as mentoring.

The Provost's Office at UM had initiated a regular process of university-wide analysis of gender equity in salaries in 1999; the plan was to conduct such analyses every five years. The first analysis did identify salary inequities, and provided a mechanism for addressing them. (The second analysis is currently underway.) ADVANCE built on that

process to conduct annual salary analyses for the three largest colleges with science faculty; deans worked on their own to address inequities uncovered in that way. The existence of inequities suggested the need to address evaluation bias in the system of allocating rewards.

Finally, ADVANCE conducted a campus-wide analysis of the distribution of space by gender. These analyses were time-consuming, requiring considerable verification of institutional data that is hard to interpret (involving shared space, multiple functions, etc.). They did not yield evidence of overall inequity in allocation of square footage, but instead both the importance of other variables than square footage (e.g., safety, suitability, contiguity); and the importance of particular individual inequities.

Prompted by both NSF's programmatic requirements and UM's own disposition to rely on data, ADVANCE set up a program of annual collection and reporting of data, which allowed it to chart progress—and its absence—in moving toward goals of increased recruitment, retention, promotion and leadership of women in science and engineering, as well as equitable salaries, startups and counteroffers. By reporting on these outcomes to the chairs, deans and upper-level administrators—as well as to the faculty themselves in science and engineering—the program could not only help units benchmark their own efforts against institutional patterns, but could address both concerns that the institution was making too little or too rapid progress. But how was progress being made?

Strategies for "Transforming the Institution"

Influencing Recruitment

With underrepresentation of women on the faculty a key issue, it was widely recognized that we needed to improve our success at recruiting women scientists and engineers. Toward this end, the ADVANCE program created a new committee of male and female senior faculty in science and engineering. Recognizing the importance of signaling that they viewed diversity and excellence as compatible and not as competing goals, they named themselves the committee for Science and Technology Recruiting to Increase Diversity and Excellence, or STRIDE[5]. This committee—nine science and engineering senior faculty from the natural science division of the liberal arts college and the engineering and medical schools—was composed of individuals who had no special expertise on gender issues at the outset, but who were committed to an extended process of self- and peer-education.

After an initial summer reviewing the social science research literature on processes of evaluation bias, critical mass, gender schemas, and the accumulation of disadvantage, they developed a lecture presentation outlining a theoretical model for the continued underrepresentation of women in the absence of any intention to discriminate on the part of "bad actors." Convinced themselves, they aimed to persuade their colleagues that the system could continue to reproduce women's underrepresentation indefinitely without intervention. They also outlined in detail strategies for overcoming difficulties in creating an equitable pool, as well as evaluation biases. They have increasingly refined this presentation (and a handbook for search committees) and now offer annual required workshops each fall and spring for chairs of search committees. The materials they developed are available on the ADVANCE website, and are continually updated and revised. They also offer a two half-day workshop each summer

[5] STRIDE's Mathematics member, Mel Hochster, coined this acronym, as well as FASTER (further on).

for colleagues who are interested in supporting these efforts—a program for Friends and Allies of STRIDE or FASTER.[6]

STRIDE's efforts have been generally well-received by the faculty, who mostly appreciate the combination of intellectual explication of the issues, and practical strategies for use in the course of searches. [7] During the two baseline years (2000-2002), UM's three largest colleges successfully recruited 10 women faculty in science and engineering fields, or a total of 15% of new hires in those fields. During the next three, post-STRIDE years (2002-2005), they hired a total of 46 women, or a total of 35% of the new hires. [8] This success—sustained over at least three years—bodes well for a gradual long-term shift in the proportion of women scientists and engineers on the faculty, if it can be sustained, and if these women thrive at UM.

Changing the Climate

ADVANCE recognized from the beginning that climate issues arise most directly in people's face-to-face work communities—most often, the departments. But those issues often derive from policies, practices, language and "'tone" arising at higher levels. ADVANCE worked closely with administrators at all levels to try to identify sources of the negative climate for women scientists and engineers, and to begin to address them.

*Leadership Interventions***.** Some of the issues that could be examined best at the level of high administrators were approached through the Gender in Science and Engineering Committee. The deans of the largest colleges were appointed as chairs of three subcommittees, composed of a broadly-representative group of 21 male and female

[6] Mathematics Department faculty members who have participated in FASTER include Anthony Bloch (current department chair), Dick Canary, Charles Doering, Smadar Karni, and Ralf Spatzier.
[7] This conclusion is based on quantitative and qualitative data collected after the workshops.
[8] During those two years the Mathematics Department hired 1 women out of 7 hires (14%); in the subsequent three years they hired 4 women out of 11 hires (36%).

science and engineering faculty, and charged to address issues of Faculty Recruitment and Leadership, Evaluation and Family-Friendly Policies. [9] The committees made wide-ranging recommendations in many areas, some of which have already been adopted (e.g., a more generous set of policies to support faculty with family care responsibilities), and others are being discussed and debated (e.g., more flexible time to tenure). Areas in which more than one committee made similar recommendations (more flexibility in the time to tenure and the career path generally; institutional support for child care; family-friendly policies; need for more and better mentoring) took on much greater urgency in the campus discussions and development of initiatives.

In addition to these significant formal policy changes, in the course of the subcommittees' discussions a number of rhetorical issues also surfaced. For example, it was much more widely recognized than it had been in the past that language like "trailing spouse" and "two-body problem" tended to stigmatize faculty with partners with employment needs; alternatives like "dual career opportunities" were employed instead. Equally, as deans learned that tenure-clock-stopping was often described in faculty reviews as "time off," they proposed substitute language that more accurately reflected the intent of those policies: "time provided in compensation for time lost to work." Leadership from the "top" in changing the kinds of language used to discuss issues important to women science faculty was crucial to an overall change in campus discourse that contributes substantially to the climate.

Department climate change. Leadership played an important role, too, in the use of a campus resource—our interactive theater program—to address climate issues. The

[9] Dick Canary, of the Mathematics Department, was a member of the Faculty Recruitment and Leadership committee.

ADVANCE program collaborated with the Center for Research on Learning and Teaching's Theater Program to develop interactive theater sketches that could catalyze discussions of important climate issues located within the departments. Theater Program director Jeffrey Steiger developed relatively brief sketches based on ADVANCE data and informants to address three major issues: Faculty Recruitment, Mentoring and Tenure Review. For each sketch he and his actors developed both a formal script depicting the issue, and then an extended process of in-character Q&A with faculty audiences, in which characters' motivations, underlying goals and feelings could be explored. At the conclusion of these two processes audiences were sometimes asked to discuss the issues in concrete terms (identifying best practices) and sometimes asked actually to intervene in the interaction to improve it—providing further material for discussion.

The sketches have been used successfully on campus and off with diverse audiences of administrators and faculty. The first audience on campus for each sketch was the group of all deans and provost's office staff that meets together monthly; once they had participated and endorsed the programs, the sketches were then introduced within the colleges. The first sketch addresses issues of "faculty recruitment," and simultaneously portrays climate issues, depicting an extremely competent, but outvoted, outnumbered and often-interrupted female faculty member losing an argument while having the better case to make. Recognizing that presenting such sketches within departments could create volatile and counter-productive discussions, the dean of the liberal arts college invited groups of faculty to dinner from across departments. This provided him with an opportunity to spend valued relaxing time with the faculty, and to frame the importance of climate issues in welcoming remarks. After dinner, the

performances and facilitated discussions took place with a group of same-rank faculty from diverse departments, and could be closed with the dean's identification of a particularly important "take-away" point. These dinners proved extremely successful—more so than some other presentations without a leader present or under substantial time pressure (e.g., at a department meeting).

Presentations of the sketch about mentoring were made in a similar format at dinners with faculty, but ADVANCE hopes also to present them in the future to groups of junior faculty. The ADVANCE program has developed a companion "Career Advising Handbook" that offers advice to both senior mentors and junior mentees. It seems likely that both men and women could benefit from an opportunity to discuss mentoring or career advising, and that viewing the sketch together might help them articulate the features of the experience that are gendered and those that are not.

Finally, the sketch focused on the tenure review process is being presented to audiences composed of those senior faculty engaged in making tenure decisions. Two of the largest colleges are arranging for the CRLT Players to present the program to all of the faculty participating in the tenure review process at the College level, as well as many who do so at the Department level. The hope is that over a period of a few years exposure to this sketch will be widespread among faculty making these decisions. Several journal articles that demonstrate the impact of (unconscious) evaluation bias in the process of writing and reviewing letters of recommendation, cvs and research products are provided to all participants in these workshops.

We should note that all of these sketches have been used within departments too. In particular cases, department chairs have decided that a sketch would be useful to show

within the department, in order to open up departmental conversation about the topic. While these may have been particularly secure or enlightened chairs, it must be said that the departmental presentations have generally been quite constructive and well-received. Professor Smadar Karni, of the Mathematics Department, arranged a special performance of the Faculty Meeting sketch for women faculty, postdocs and graduate students in the department. Twenty women attended the performance, and of them 12 responded to a post-presentation questionnaire (60%). Overwhelmingly they judged the performance to be effective and addressing important issues. It clearly helped prepare the younger women scholars for the future they may face in other academic departments: “the performance made me reflect on a conversation I overheard, where one professor was arguing against a female candidate but didn't have any concrete basis for his opinions, which were more "gut feelings." Now I wonder if bias was involved.” Audience reactions also sensitized some of the faculty to the lacuna in student and postdoc knowledge: “I was stunned that there were women graduate students in our department who were surprised that this sort of thing happens. I thought this speaks very well for the improvements in the department over the years, and also for the importance of continuing these performances even to groups of women by themselves.”

Department climate change efforts have not been limited to the use of CRLT Players. In fact, from the beginning departments have been encouraged to identify their own climate needs, and to apply for Departmental Transformation Grants to address particular issues within the department. Of the 11 funded projects, some requested funds for departmental climate studies, including recommendations for climate change. Other departments developed programs of internal support for women faculty (for summer

salary or courses off in compensation for disproportionate service loads, or travel funds), and some have brought in outstanding senior women speakers as a way of altering the climate or outstanding junior women speakers for purposes of long-range recruiting. These different experimental efforts have all yielded some positive results; as a result, ADVANCE is in the process of restructuring its support to departments and schools into particular services and programs, aimed, for example, at climate reviews and visiting scholars.

Ameliorating the Climate for Individual Women. The ADVANCE program was well aware that institutional climate change would happen slowly and might actually result, short-term, in more open expression of attitudes or opinions that would be painful and unpleasant for women faculty to hear. For that reason it was important to provide some supportive structures for women scientists and engineers.

The first and most important step was to encourage women scientists and engineers to view one another as resources and potential supports. In an environment of stigmatization and isolation, this is unlikely, so ADVANCE created a Network of Women Scientists and Engineers, which hosts social and professional development events throughout the year, and encourages women scientists to get to know one another. Senior members of the network offered to provide career advising to junior women, and ADVANCE sponsors a website that helps junior faculty identify potential advisors. ADVANCE also fostered the development of some other kinds of networks and connections among women, including a retreat for women in materials sciences and a leadership retreat planned by women in engineering and the liberal arts. One effort in this area was a program called “Women Talking Science and Engineering,” in which women

met in a small group format with an expert on gender in the workplace, read literature on women's difficulties in the workplace generally and in science in particular, and shared ideas about how to address some of the challenges they faced.

These efforts to strengthen women scientists' ties with each other were paralleled by efforts to encourage women to ally with male colleagues in pursuing goals and solving problems. All ADVANCE committees were collaborations between women and men, including the 5-person Steering Committee, STRIDE, FASTER, the Gender in Science and Engineering Committees on Policies, and the Implementation and Evaluation Committees. In more individual consultations with women science faculty ADVANCE Program participants often asked about or suggested avenues for alliance with particular men within departments to improve the climate, or address particular problems.

Finally, each year ADVANCE held at least one competition for Elizabeth Caroline Crosby Awards. These awards of up to $20,000 are for projects aimed at improving the situation for women faculty in science and engineering, but both men and women are eligible to apply. Projects can be aimed at individual women's research needs (research assistance, travel for self and research group to conferences, support for an in-town sabbatical with a collaborator brought in, specialized child care to accommodate field research, evenings and weekends, international travel, etc.), or programs for a department or school (e.g., a speakers series or workshops within and across disciplines).[10] A total of 53 women scientists and engineers have received Crosby awards.

It's a Model, but Does it Work?

[10] In the first six Crosby competitions, Mathematics Department senior faculty member Smadar Karni received a Crosby Award to bring in outstanding women in applied mathematics as speakers to the department and create opportunities for informal interaction among the women faculty with them. In addition, Assistant Professors Anna Gilbert, Trachette Jackson, and Kristen Moore, as well as Professor Smadar Karni received Crosby awards for their research.

UM's ADVANCE Program has been in place for nearly five years now. How can we assess its efficacy? Based on quantitative indicators, we are most confident that ADVANCE has been effective in the area of recruitment, as we have already discussed. Assessing success in altering the climate is harder. ADVANCE did conduct an analysis of a brief repeat survey of the women science and engineering faculty in 2005, and found that there was some modest improvement in the climate (see the full report: http://www.umich.edu/~advproj/climate2005.pdf). Other indicators could be changes in rates of retention and/or promotion of women scientists; in both cases, the proportion of women affected by these processes each year is simply too small to detect differences between 2001 and 2005.[11]

There are some other, less quantitative but possibly important indicators. It seems clear that the deans are appointing both more women to chair departments and more men who are sensitive to gender issues. In the three large colleges, before ADVANCE there had been no women chairs, and currently there are 6 (out of a total of 26). In addition, within the liberal arts college, 5 out of the 8 chair positions have "turned over" in the course of ADVANCE. Of the new appointments, *all* have been individuals who are either members of STRIDE (one) or FASTER.

Perhaps the clearest evidence both that ADVANCE has had an impact, and that its work is unfinished, is the university's announcement this January that when NSF's support ends in December 2006, the program will be institutionalized. UM committed a budget of $800,000 per year for the next five years.

[11] Between 2001 and 2006, no women left the Mathematics Department. Of those present, 1 got tenure and was promoted to associate professor, and 2 were promoted from associate to full professor.