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**Breaking Barriers and Creating Inclusiveness:
Lessons of Organizational Transformation
to Advance Women Faculty in Academic
Science and Engineering**

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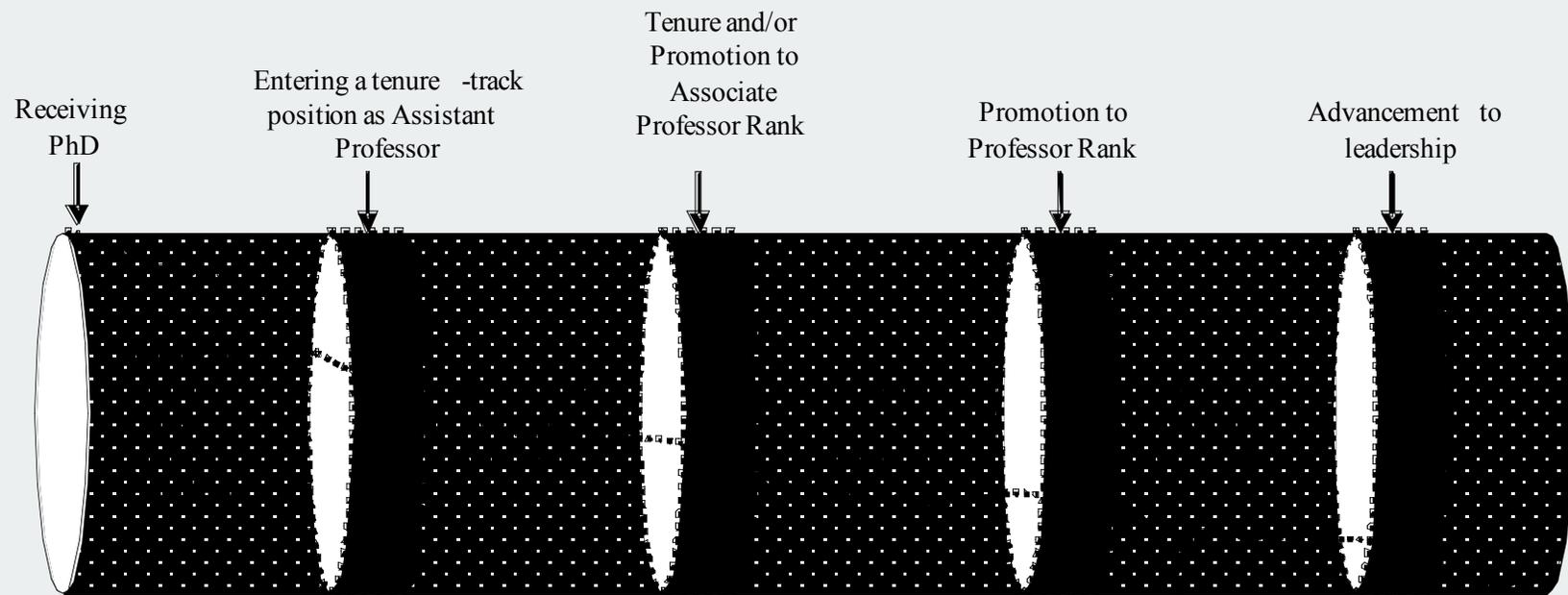
Purpose

- To qualitatively describe the emerging organizational transformation experience of 19 US universities, funded in the first two rounds of NSF's ADVANCE IT program, that have aimed to increase the participation of female faculty in all S&E ranks and in leadership
- To develop a generalized framework for how organizations can enable gender equity through transforming their structures and cultures

Background - Women in Academic S&E

- The lack of women's representation and inclusion, particularly in senior positions, remains a problem for academic S&E (c.f., Valian, 1999; Etzkowitz, Kemelgor & Uzi, 2000; Burke & Mattis, 2007; Stewart, Malley, & LaVaque-Manty, 2007)
- Systematic, historical, and widespread inequities (in representation and inclusion) persist at every stage of the academic pipeline: hiring, tenure, promotion, and leadership (Ginther & Kahn, 2006; National Academies' Report Beyond Bias and Barriers).

Background - The Leaky Pipeline of Women's Representation in Academic S&E



Academic pipeline for women

Women in Academic Science & Engineering

Adapted from Mason et al, 2005

Background - The Experience of Women Faculty in S&E

Women in non-tenure track positions:

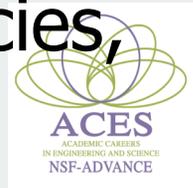
- may rarely be provided opportunities for professional advancement
- may not have their performance regularly reviewed or rewarded
- may rarely find their positions converted to full-time or tenure track and rarely receive priority consideration when they are
- may be shut out of the faculty governance processes by the institutions that appoint them (American Association of University Professors, 1996).

Women in tenure track positions:

- experience isolation, have fewer role models and mentors and have to work harder than their male colleagues to gain credibility and respect (e.g., Liang & Bilimoria, 2007; Rosser, 2004)
- report lower satisfaction with their academic jobs than do male faculty (e.g., Bilimoria et al., 2006; Callister, 2006).

NSF ADVANCE IT

- To stem the leaks and eradicate the barriers described above, in 2001 NSF initiated the ADVANCE Institutional Transformation (IT) program for increasing the participation and contributions of women in the S&E workforce (www.nsf.gov/advance)
- ADVANCE IT awards were instituted to fund innovative programs to result in the “full participation of women in all levels of faculty and academic administration, particularly at the senior academic ranks, through the transformation of institutional practices, policies, climate and culture” (National Science Foundation, 2005)



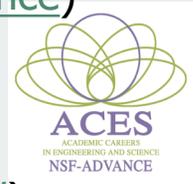
Methods

- We analyzed the websites, annual reports, publications, and research & evaluation reports of 19 universities funded by NSF ADVANCE (Bilimoria, Diana, Joy, Simy & Liang, Xiangfen. (In press). Breaking Barriers and Creating Inclusiveness: Lessons of Organizational Transformation to Advance Women Faculty in Academic Science and Engineering, Human Resources Management.)
- We also drew on interviews with 54 ADVANCE project team leaders and senior faculty at these universities about the nature and outcomes of their efforts (Bilimoria & Valian Presentation at 2006 NSF ADVANCE PI Meeting, Washington, D.C.)



Institutions Studied: 19 NSF ADVANCE IT (1st and 2nd Round) Awardees

- Case Western Reserve University (<http://www.case.edu/admin/aces/>)
- Columbia University's Earth Sciences Institute (<http://www.earthinstitute.columbia.edu/advance/index.html>)
- Georgia Institute of Technology (<http://www.advance.gatech.edu/>)
- Hunter College, City University of New York (<http://www.hunter.cuny.edu/genderequity/>)
- Kansas State University (<http://www.k-state.edu/>)
- New Mexico State University (<http://www.nmsu.edu/~advprog/>)
- University of Alabama at Birmingham (<http://main.uab.edu/>)
- University of California, Irvine (<http://advance.uci.edu/>)
- University of Colorado, Boulder (<http://advance.colorado.edu/>)
- University of Maryland, Baltimore County (<http://www.umbc.edu/advance/index.html>)
- University of Michigan (<http://sitemaker.umich.edu/advance/home>)
- University of Montana (<http://pace.dbs.umt.edu/>)
- University of Puerto Rico, Humacao (<http://cu-www.upr.clu.edu/~advance/>)
- University of Rhode Island (http://linux.wdg.uri.edu/adv_redir/)
- University of Texas, El Paso (<http://academics.utep.edu/Default.aspx?alias=academics.utep.edu/nsfadvance>)
- University of Washington (<http://www.engr.washington.edu/advance/>)
- University of Wisconsin, Madison (<http://wiseli.engr.wisc.edu/>)
- Utah State University (<http://websites.usu.edu/advance/>)
- Virginia Polytechnic Institute & State University (<http://www.advance.vt.edu/>)



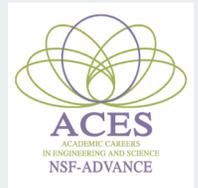
Findings (1) - Transformational Initiatives Undertaken

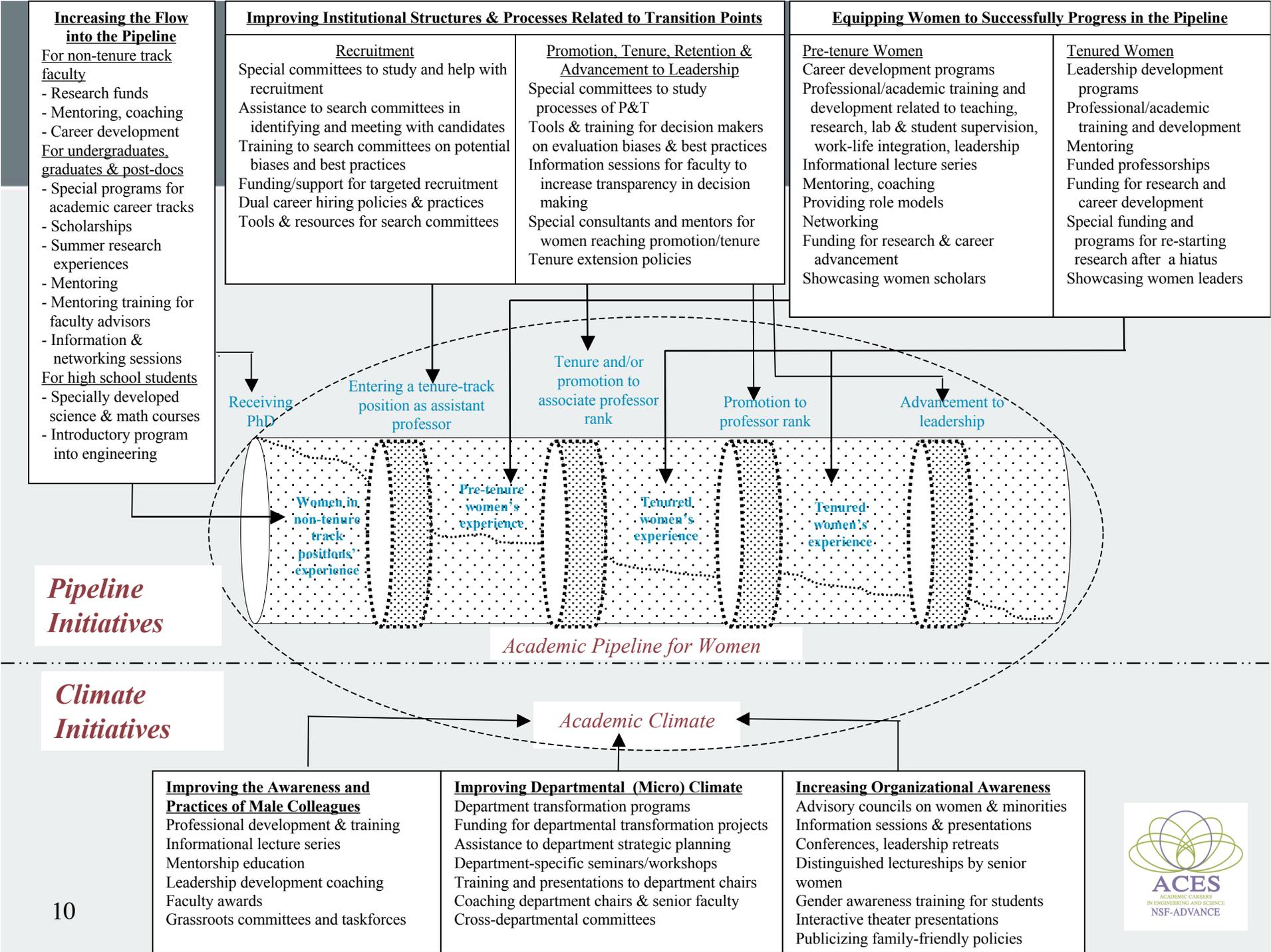
Pipeline Initiatives, aimed at:

- increasing the inflow of women into the pipeline
- improving the institutional structures and processes related to academic career transition points (recruitment, tenure, promotion, leadership)
- better equipping women to successfully progress in the pipeline

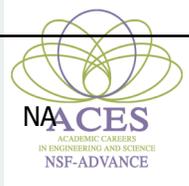
Climate Initiatives, aimed at:

- improving the awareness and practices of male colleagues through education, training, and development
- engaging in efforts to make departments (micro-climates) more collegial, egalitarian, equitable and transparent
- increasing organizational awareness of diversity and inclusion issues





Illustrative Examples of Coaching, Mentoring and Faculty Development Programs

NSF ADVANCE Institution	Activities	Mentoring Process	Assessment & Evaluation
Case Western Reserve University www.case.edu/admin/aces/coaching.htm	Executive coaching; Hotline coaching	A professional executive coach provides performance- and career-related advice to women faculty, chairs, and deans. A coaching hotline was set up to deal with emergent issues.	Executive coaching receives consistently high annual evaluations of coaching effectiveness.
Kansas State University www.k-state.edu/advance/Initiatives/college_veterinary.htm	Parallel Paths began in early 2004 with two seminars and one retreat.	A group-based mentoring program: those who volunteered to be a part of the program were assigned to two groups, called Prides. The Prides have been meeting once a month to explore and discuss a variety of faculty issues.	Major outcomes include mentoring of faculty during monthly meetings, development of teaching awards for the faculty, funding of projects.
New Mexican State University www.nmsu.edu/%7Eadvprog/mentoring.htm	ADVANCE mentoring program for STEM faculty: a peer mentoring program	Junior faculty are paired with senior faculty in different but related departments. Meeting once a month and regular informal social gathering are expected.	NA
University of Texas at EL Paso www.dmc.utep.edu/mentoring/	Faculty mentoring program for women	Based on mutual interest, new women faculty are assigned to two mentors: one from within their college and once from another college. At least one mentor is a woman. Since fall 2004, the mentoring program moved toward team mentoring: two mentors are assigned a small group of new faculty for 18 months	NA
University of Washington www.engr.washington.edu/advance/mentoring/index.html	Mentoring women for academic leadership; Mentoring women graduate students; Mentoring pre-tenure faculty.	For pre-tenure faculty, a group mentoring program occurs at a peer level and across ranks with activities including informal lunches, topical workshops and other opportunities to share resources and information.	NA
University of Wisconsin-Madison http://wiseli.engr.wisc.edu/initiatives/wfmp/wfmp_main.htm	Women Faculty Mentoring Program	Senior women faculty from an outside department but within the same division voluntarily serve as mentors for junior women.	

Initiatives of 19 NSF ADVANCE Institutions

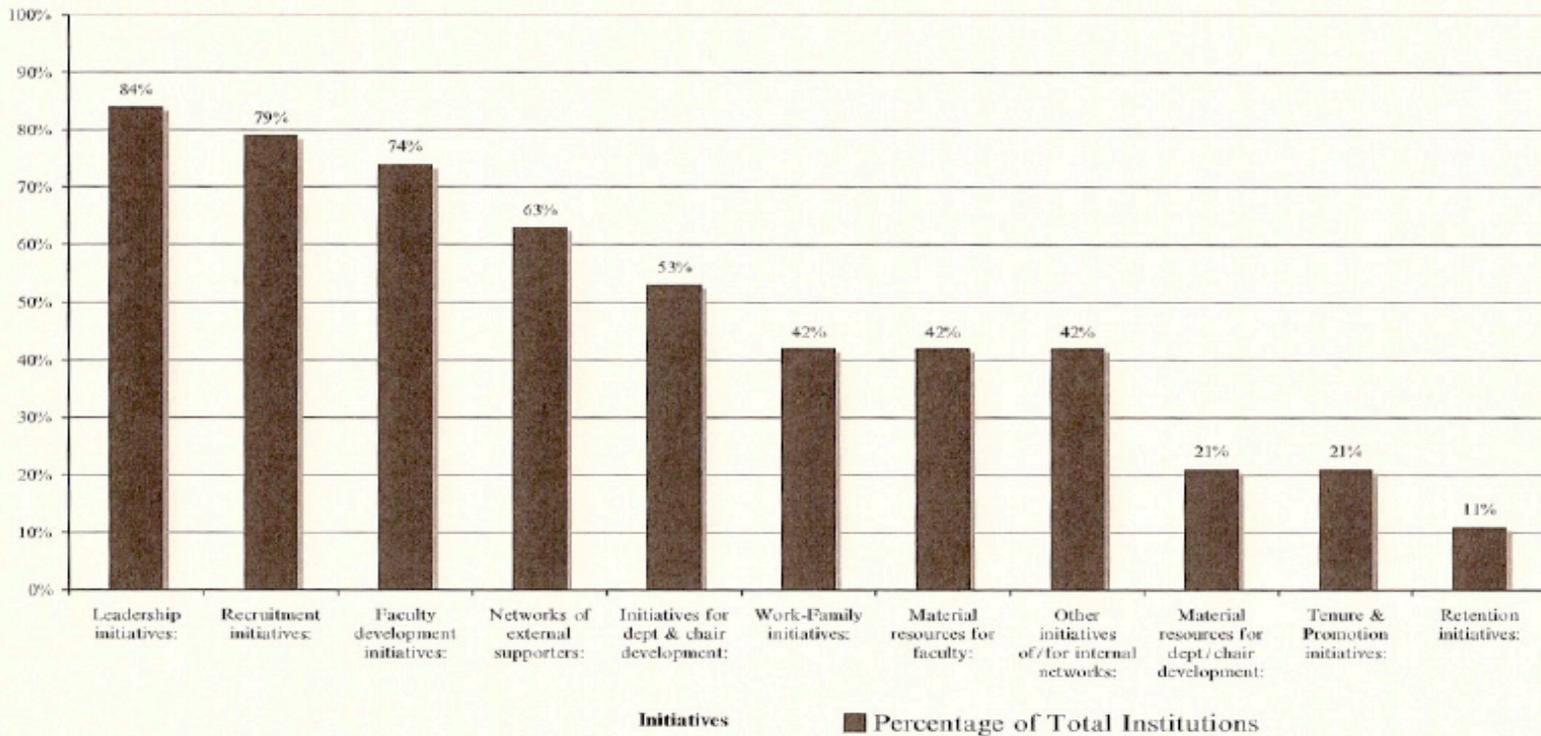


Fig. 1 Percentage of institutions undertaking types of initiatives

Source: Fox, M. F. (2008) Institutional Transformation and the Advancement of Women: The Case of Academic Science and Engineering, in Smart, J. C. (ed.), *Higher Education: Handbook of Theory and Research*, 23: 73-103.



Findings (2) – Institutionalizing the Transformation

- **New Structures, Positions, and Groups**: e.g., new positions such as ombudspersons, equity advisors, endowed chairs, institutional researchers, and provosts/deans for faculty development and diversity; family-friendly structures, such as child care facilities and lactation centers for nursing mothers
- **New and Modified Policies**: e.g., tenure clock extension, dual-career hiring, job sharing, work release policies (such as maternity/paternity leave in case of child birth or adoption; family medical leave in case of sickness of any member of the family, including parents) and family-friendly benefits policies (e.g., domestic partner health benefits)
- **Adoption of Change Initiatives as Regular Organizational Processes**: e.g., institutionalization of special funding programs, leadership development programs, and mentoring programs
- **Tool Kits, Guidelines, and Resources for Improved Practices**: e.g., systematic documentation of best practices in the form of tool kits, guidelines, best practice guides, evaluation forms, training manuals, presentations, and pamphlets (see <http://research.cs.vt.edu/advance/index.htm>)



Illustrative Examples of New Structures, Policies, and Procedures

NSF ADVANCE Institution	New Structures, Policies, and Procedures
Case Western Reserve University www.case.edu/admin/aces/	3 new endowed chairs for women faculty in S&E; new VP of Diversity and Inclusion, new Assistant Dean of Faculty Development and Diversity in the School of Medicine, new Associate Dean of Faculty Development in Case School of Engineering, new faculty diversity specialist position in the Provost's Office; new Associate Director for Women in S&E position in the FSM Center for Women; new research analyst position in the Institutional Research office; creation or revision of university faculty policies including automatic pre-tenure extension and work release policies
New Mexico State University www.nmsu.edu/%7Eadvprog/faculty.htm	Dual career couples: New Mexico State University and the University of Texas at EI Paso support efforts to accommodate the needs of dual career couples. Job sharing arrangement may be established when two people are in the same academic department.
University of Alabama at Birmingham http://main.uab.edu/sites/ADVANCE/87552/	Family-friendly leave policies: family and medical leaves of absence; personal leave of absence, sick leave and emergency absences
University of California, Irvine http://advance.uci.edu/	Family Policies: Career partner program; The UC faculty family friendly edge; UC family friendly policies for faculty and other academic appointees.
University of Rhode Island http://ww2.wdg.uri.edu:81/testsite/index.php?adv_work	Dual career partners: Proposed dual career guidelines; Parental leave policy; Tenure clock extensions; Child care
University of Washington www.engr.washington.edu/advance/policies/index.html	Policy transformation: Recommendations to Chairs for Facilitating Dual Career Hires; Family leave and tenure clock extension; Dual Career Hires; Part-Time Faculty policies
Utah State University http://websites.usu.edu/advance/Document/index.asp?Parent=6257	Dual Career Committee; Dual Career Accommodation Protocol: Inform candidates about dual career opportunities; Request dual career accommodation; Identify possibilities for accommodation; Contact target units; Evaluate and interview the potential candidate; Negotiate a financial package; Write a request letter to the executive vice president and provost; Receive confirmation letter from executive vice president and provost; Make an employment offer.
Virginia Polytechnic Institute and State University www.worklife.vt.edu/	Child care; Stop-the-clock policy: Meetings with department heads aim to develop better understanding of the policy and to encourage more consistent implementation.



Findings (3) - Factors Facilitating Transformation

Internal Factors

- Senior administrative support and involvement
- Widespread collaborative leadership and synergistic partnerships
- Clear vision, flexible path, and milestones
- Visibility of actions and outcomes (small wins strategies)

External

- NSF funding
- Cohort of NSF ADVANCE peer universities (best practice sharing)

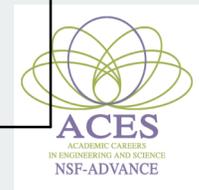
Findings (4) – Research and Evaluation in Support of Transformation

Systematic efforts to:

- Track Key Indicators of Representation, Equity, and Inclusion: e.g., NSF ADVANCE indicators, additional monitoring tools as cohort analyses and flux charts.
- Conduct Faculty Climate Studies: e.g., climate surveys, interview and focus group studies, resource equity studies
- Conduct Benchmarking Studies of leading departments and universities
- Evaluate Programmatic Interventions
- Strengthen the Institutional Research Infrastructure (Improve Internal Collection, Analysis, and Use of Data): e.g., templates for faculty databases, initial resources for database creation and maintenance, just-in-time training tools for more equitable personnel decision making, and presentations of analyses and recommendations to senior administrators

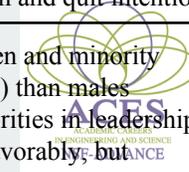
Key Indicators of Women's Representation, Resource Equity, and Inclusion

NSF ADVANCE Indicator	Shows ...
1. Total # and % of women faculty in S&E by rank and department 2. # and % of women faculty in tenure-line positions by rank and department	... the representation of women at various transition points in the pipeline
3. Tenure and promotion outcomes by gender 4. Years in rank by gender	...the extent to which advancement decisions and processes are free from gender bias
5 (a) Time at institution and (b) Attrition by gender	... the leaks in the pipeline
6. # of women in S&E who are in non-tenure-track positions (teaching and research)	... the representation of women in off-track positions
7. # and % of women S&E faculty in administrative positions 8. # of women S&E faculty in endowed/named chairs 9. # and % of women S&E faculty on promotion and tenure committees, and executive committees	... the representation of women in leadership and positions of influence
10. Salary of S&E faculty by gender (controlling for department, rank, years in rank) 11. Space allocation of S&E faculty by gender (with additional controls such as department, etc.) 12. Start-up packages of newly hired S&E faculty by gender (with additional controls such as field, department, rank, etc.)	...if resource allocation is equitable



Illustrative Examples of Climate Surveys and Findings

NSF ADVANCE Institution	Respondents	Measures	Major Findings
Case Western Reserve University (2004) www.case.edu/admin/aces/	39% response rate (508/1303)	Quality of collegueship and support in primary unit, support for work-life integration, effectiveness of chair/dean, mentoring, resource allocation processes, satisfaction	Women faculty feel less valued and included in their primary unit in comparison to men and report lower ratings of effective departmental leadership; junior faculty and women faculty perceive that compensation and non-research supports are less equitably distributed than their senior and male colleagues perceive; women faculty are less satisfied with their overall job experience than are men faculty.
Georgia Institute of Technology (2002-03) www.advance.gatech.edu/measure.html	76% response rate	Teaching and research, work environments, evaluative processes, and work-family arrangements and experiences.	Men are more likely to speak daily about research, more likely to report willingness of faculty to collaborate, and more likely to characterize their home units as “exciting”, “helpful”, and “creative”. The most significant gender difference is “helpfulness.”
University of Colorado, Boulder (2003) advance.colorado.edu/research.html	78% response rate (449/575)	Interpersonal relations, collegiality, chair leadership, mentoring, institutional support, and diversity	Tenure track men have a more favorable rating of interpersonal relations than women; women are more likely than men to believe that diversity is important; tenure track men rate their chairs higher than women.
University of Michigan (2002) sitemaker.umich.edu/advance/reports_publications_and_grant_proposals	38% response rate (536/1398)	Career experiences and satisfactions, productivity, recognition, resources (effort and satisfaction), mentoring, service, stereotyping, discrimination, sexual harassment ...	Men and women scientists & engineers differ in the amount of effort it takes to secure resources such as office space, research space, and lab equipment. Women scientists & engineers were less likely than their male counterparts to rate their departmental climate as supportive, less likely than both men scientists & engineers and women social scientists to rate their departmental climate as tolerant of diversity, and their department gender atmosphere as egalitarian.
Utah State University (2004-05) http://websites.usu.edu/advance/Document/index.asp?Parent=6308	74% response rate (308/416)	Empowerment, access to information, isolation, intention to quit, job satisfaction	Women reported lower levels of job satisfaction, empowerment, and access to information and higher intentions to quit and feelings of isolation. Affective and instrumental department climate mediate the relationship between gender and both job satisfaction and quit intentions
Virginia Polytechnic Institute and State University (2005) www.advance.vt.edu/Measuring_Progress/Faculty_Survey_2005/Faculty_Survey.htm	Total participants: 1209	Faculty recruitment, job satisfaction, policy, administration, leadership, and general climate with regard to diversity	Women and men differ in their perceptions of women and minority leadership and representation. More females (78.3%) than males (48.9%) feel that there are too few women and minorities in leadership positions; overall campus climate was rated fairly favorably, but departmental climates varied significantly.



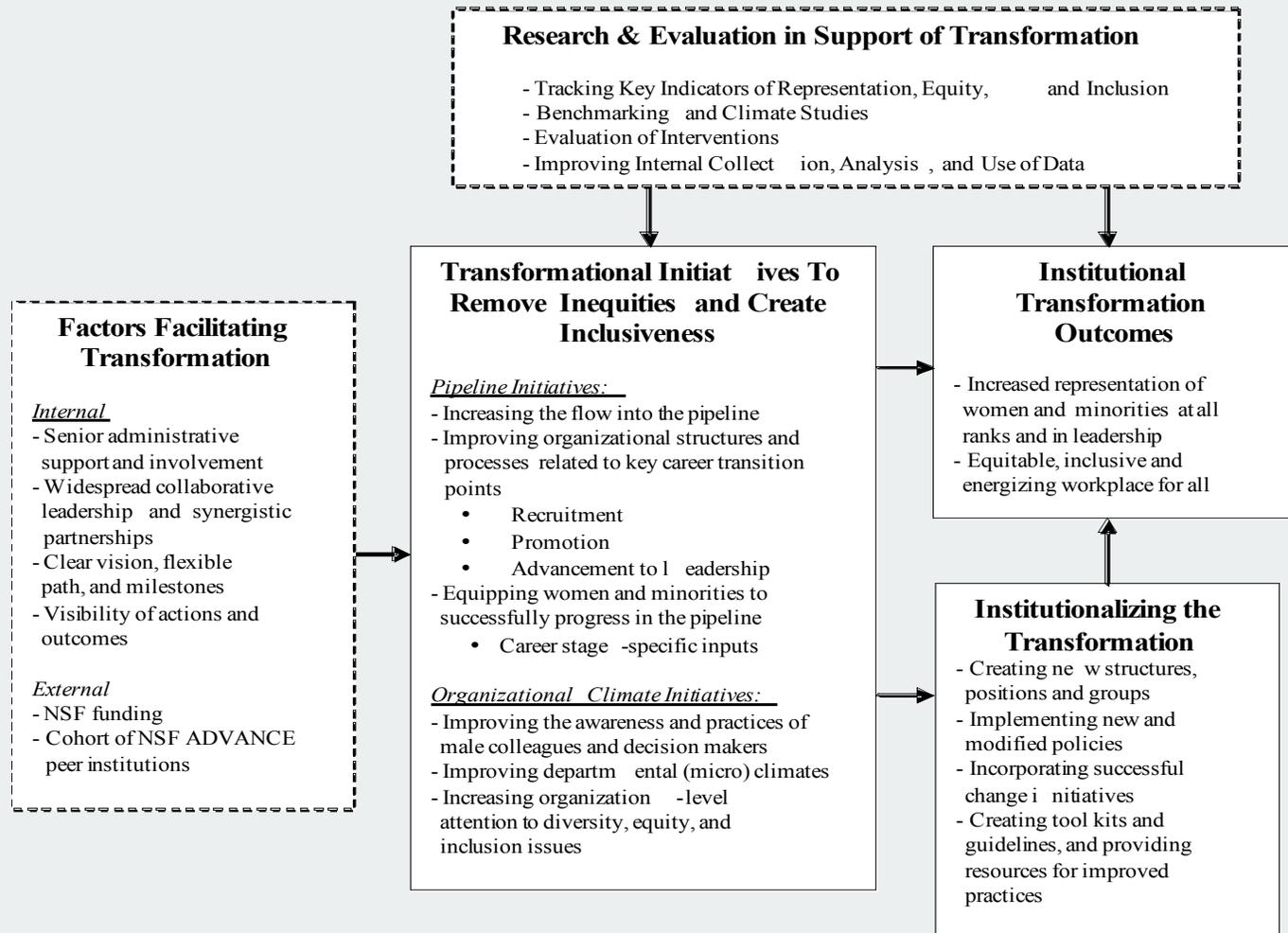
Findings (5) – Transformational Outcomes

Number of Universities Reporting Changes in the Representation of Women in the S&E Tenure Track Pipeline since NSF ADVANCE IT Program Implementation (3-5 years)

<i>% Increase in 3-5 years</i>	Assistant Professors (Junior Rank) (n=13)	Associate Professors (Middle Rank) (n=13)	Professors (Senior Rank) (n=13)	Leadership Roles (n=11)	Total Number of Female Faculty (n=13)
1-9%		2	1	1	1
10-19%		3	3	2	2
20-29%	2	3	4	1	3
30-39%	2	2			3
40-49%	1		2		2
50-59%	2		1	1	
60-69%	1				
70-79%					1
80-100%	1				
>100%	1		1	2	
Total # of universities reporting % increase	10	10	12	7	12
No Change		2	1		
% Decrease	3	1		4	1



A Model of Institutional Transformation for Gender Equity and Inclusion



Conclusions - Enabling Equity Requires Comprehensive Organizational Transformation

- Simplistic or piecemeal solutions cannot eradicate systematic, historical, and widespread gender inequities
- Organizations need to implement wider and deeper change, systematically transforming structures, processes, work practices, and mental models that perpetuate inequity
- In the process of such transformation, the workplace becomes supportive and motivating for *all* its employees, not just women and other minority groups

²¹ Supporting literature: McCracken, 2000; Meyerson & Fletcher, 2000; Thomas & Ely, 1996



Characteristics of Environments That Enable Gender Equity and Inclusion

- Work structures and cultural norms that support positive relations between men and women
- Freedom from stereotyping about women's and men's roles and occupations
- Work conditions (e.g., job titles, work schedules, policies, and physical environment) that include and value both men and women
- A critical mass of women
- Opportunities for reward and advancement based on qualifications, performance and talent, not gender
- Work policies and structures that support work-life integration

Modified from McLean, D. (2003). Workplaces that work: Creating a workplace culture that attracts, retains and promotes women. Report for the Centre of Excellence for Women's Advancement. Ontario: The Conference Board of Canada.
http://www.womensdirectorates.gov.yk.ca/pdf/workplaces_that_work.pdf



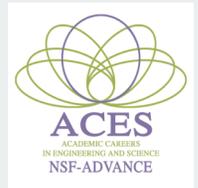
Lessons from NSF ADVANCE IT for Organizations Seeking Gender Equity

- Comprehensive institutional change to promote gender equity and inclusiveness requires simultaneous multi-impact initiatives. Organizations must tackle transformation at multiple levels at the same time. Hence, awareness creation, skill building, empowerment, leadership development, process improvements, policy modifications, and structural changes need to occur simultaneously.
- Create and support a transformation team composed of senior formal and informal leaders to comprehensively tackle the issues of women's under-representation.
- Such a team can help align and deploy the internal and external factors that facilitate transformation, as indicated in the model.
- Organizations should systematically engage in a combination of top-down and grassroots change efforts, targeting the removal of barriers constraining women at specific transition points in the pipeline and improving the macro- and micro climates in which females work. The ADVANCE IT experience highlights that special initiatives and activities encouraging the partnership of men in gender equity changes at all hierarchical levels must be undertaken.
- Gender equity data should be tracked and research findings shared regularly among decision makers. System-wide efforts must be undertaken to develop and institutionalize the data collection and reporting practices that ADVANCE IT efforts have suggested are instrumental for transformation.
- Resources for institutionalizing successful and stable initiatives, as determined by organization-specific research and evaluation, must be generated and prioritized by top management.
- Increase dissemination of information on gender equity resources to employees and the general public by using multiple communications channels



Limitations

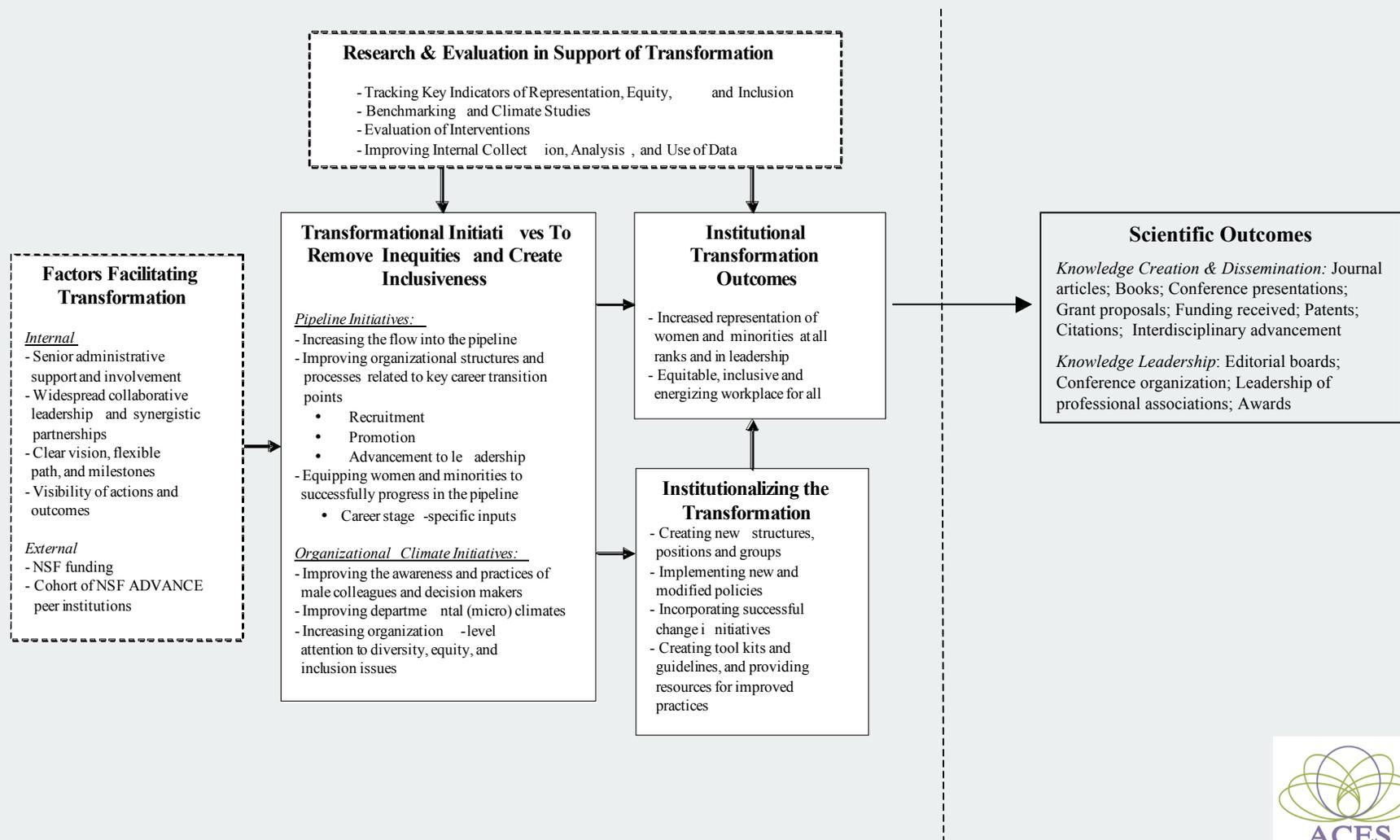
- Data limitations –
 - not all activities and outcomes may have been available on websites and reports.
 - Data were collected in 2006-07; thus the time frame may have been too short to fully assess changes in the inclusion experiences of women S&E faculty, especially in 2nd cohort institutions
 - Since the interventions were conducted, by and large, simultaneously within each ADVANCE institution without careful attention to experimental conditions, manipulations, or controls, our review could not tease out which solutions worked better than others
- Analysis limitations –
 - Variations in time frame for outcomes and variations in the baseline representation of women faculty in S&E among institutions posed difficulties in assessing transformation outcomes



Future Research

- Future empirical research should attempt to identify the specific circumstances and structures needed for effective gender equity solutions within a comprehensive change project
- Future research should more specifically address the role of external facilitating factors (funding agencies, accrediting agencies, peer institutions) in university transformation
- Sustainability of outcomes achieved needs to be studied more carefully by future research
- Future research should examine how gender equity outcomes enhance scientific outcomes

Linking Gender Equity-Related Organizational Transformation to Science



Q & A
Thank you!