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SECTIONB. PROJECT SUMMARY

The Georgia Institute of Technology (Georgia Tech) proposes *an integrated approach to institutional factors* that will support the full participation and advancement of women, and provide a model of best practices, in academic science and engineering. Georgia Tech will build upon previous activities and momentum for the advancement of women. The Georgia Tech ADVANCE team encompasses breadth and depth of leadership, critical for institutional transformation, and includes: the Provost and the Deans, faculty, and campus leaders from four cooperating Colleges - Computing, Engineering, Sciences, and Ivan Allen College-representing the range of science and engineering fields in the NSF classification.

Georgia Tech bases its proposal upon sound research methodology, with an emphasis upon an integrated approach to *organizational features and factors* that shape outcomes for women in science and engineering. We propose to clarify and portray the ways in which resources, processes of evaluation, organizational culture and climate, including leadership, and family policies affect the full participation and advancement of women by field, career-stage, and family/parental status. In doing so, we address critical transitions to senior status, and the meaning of "full participation" in academic science and engineering.

Accordingly, our proposed strategies embody central organizational features/factors, and include: 1) making and marking the advancement of women an organizational priority via leadership and action taken; 2) weaving women into the fabric of institutional structure and decision-making; 3) creating means for equitable distribution of resources; 4) assessing evaluation practices, and defining criteria for advancement that are clear and unbiased by gender; and 5) enhancing family friendly practices.

Our means of implementation incorporate the organizational features/factors of these strategies, complement and extend previous activities, and involve institutional commitments to sustain activities (including necessary resources) beyond the period of the award. They include: 1) creating an inter-college network of termed professorships that promotes goals of ADVANCE; 2) institutionalizing a formal training process for committees involved in tenure and promotion; 3) collecting and using resource-allocation data for equity and development of best practices; 4) holding annual retreats of women faculty, provost, deans, and school chairs to review and refine goals and progress; and 5) strengthening and extending the scope and impact of family-friendly practices.

Georgia Tech commits to this plan and to sustaining it, and supports the project through cost-sharing of 24%. Likewise, Georgia Tech commits to supporting the network of professorships, and its relationship to institutional transformation, beyond the period of the NSF award.

SECTION C. PROJECT DESCRIPTION

ADVANCE Institutional Transformation at Georgia Institute of Technology: Increasing the Participation and Advancement of Women in Academic Science and Engineering

Results from Prior NSF Support (for funding received within past five years)

I. Facilitating Academic Careers in Engineering and Science (FACES) is funded through the NSF Alliances for Graduate Education and the Professoriate (AGEP) program (NSF Award No. HRD-9817632). FACES represents a significant commitment by Georgia Institute of Technology, Morehouse College, and Spelman College to dramatically increase the national production of doctorates awarded to minorities in engineering and the sciences. The program addresses each critical step along the path to an academic career: Undergraduate students who have completed their junior year are provided summer and academic year research experiences as a means of promoting their interest in research and graduate school attendance. These students, as well as other worthy candidates, are then encouraged to enroll in graduate programs using a series of recruitment efforts at national events such as the National Society of Black Engineers Annual Convention, campus visits and tours, and a lecture/workshop series on the merit of graduate school and careers in academia. Admitted graduate students are partially supported on doctoral fellowships throughout their matriculation through graduate school, plus travel funds for presenting research at technical meetings. As of 2000, FACES has resulted in a 33% increase in annual Ph.D. degrees granted to underrepresented students over the number granted in the 1997 baseline year (24 versus 18). Finally, senior doctoral students will compete for career initiation grants that they may use as start-up funds to assist them in establishing their research programs in their initial academic appointments. To date, four individuals have received such grants.

II. Grant, Opportunities for Academic Liaison with Industry (GOALI) (ECS #9633535) is a three-year project, ending in July 1999. This project coupled the PI's (Brown) material development capability and processing research at the University of Illinois (Professor I. Adesida) to develop structures and processes for P-based electronics. TRW (Dr. Dwight Streit) is the industry partner. Key findings and results are related to the topics of advanced HBTs and HEMTs using InP technology. A number of publications and presentations resulted from this effort, including publications in *Journal of Crystal Growth*, *Journal of Applied Physics*, *Applied Physics Letters*, *Solid State Electronics*, *Journal of Electronic Materials*, and many others.

1. Women in Academic Science and Engineering. What is at issue and why

The participation and performance of women in science and engineering is crucial to the nation for at least two reasons: the need for a diverse and talented scientific and technological workforce (Rosser, 2000), and principles of social equity rooted in democratic ideology (Pearson and Fechter, 1994) and the ideal that scientific careers "be open to talent" (Merton, 1973: 272). Further, the full participation of women in academic science and engineering, particularly, is crucial because in the United States, academia is a central site for research and the training of students. Women faculty are consequential in their roles as teachers, advisers, and role models. Compared with men, women faculty in science

and engineering act as primary research advisors for a larger number of female students, have more female students on their research teams, and put more emphasis upon help given to advisees across a span of skills/capacities, both technical and interactional (e.g., making presentations, and participating in laboratory meetings) (Fox, 2001a).

Consequently, the relatively low numbers and proportions of women that persist in academic science and engineering, especially at the most senior ranks, are a focal concern for the nation, and its institutions of higher education. In 1973, women were 4% of full professors across all fields in the NSF classification of science and engineering (this classification comprises physical, mathematical, computer, environmental, life, and engineering, as well as the psychological and social sciences). In 1987, that proportion was 7%; in 1993, 10%; and in 1997, still just 11% (Fox, 1999; CPST, 2000); and these figures are inflated by the numbers of women in psychology within the broad classification. The lower and slower promotion of women compared to men in academic science is a pattern that holds with controls for individuals' publication productivity and prestige of institutional location (Cole, 1979; Long, Allison, and McGinnis, 1993; Sonnert and Holton, 1995).

Women in science and engineering are a selective and qualified group, whose ability, educational credentials, and attainments are as high or higher than male counterparts (see Fox, 1996, 1999; Sonnert, 1999). The problem and solutions are not a simple matter of correcting personal deficits or shortcomings. Rather, the issues are more complex, connected to organizational context - the characteristics of the settings in which scientists and engineers work, as emphasized in the NSF ADVANCE program solicitation.

Organizational context is important in explaining attainments across occupations. But it is especially important in scientific fields, because in sciences; work revolves around the cooperation of people and groups: requires human and material resources; and relies upon facilities, funds, apparatus and teamwork (Fox, 1991). Accordingly, solutions for the advancement, of women in academic science and engineering involve organizational factors and the features of the settings of work-organizational signals, priorities, reward schemes, alliances, climates, and culture (see Fox, 1996, 2000, 2001b). The advancement, of women in academic science and engineering is then an organizational issue, subject to institutional transformation.

1.1. Aims and Objectives

Georgia Institute of Technology (Georgia Tech) proposes and is committed to an *integrated approach to institutional factors* that will support the full participation and advancement of women, and provide a model of best practices, in academic science and engineering. By full participation and advancement, we mean the promotion of women to senior ranks, retention (and satisfaction) of women in senior ranks, and the weaving of women into institutional decisions and impact.

As a leading technological institution, Georgia Tech represents a strategic site for developing institutional ways and means for the full participation and advancement of women, and for practices and policies that can be adopted and adapted more widely, in academic science and engineering. Our aims are these:

1) We propose to clarify and portray the ways in organizational factors (resources, processes of evaluation, culture and climate) affect the full participation and advancement.

of women by field, career-stage, and family/parental status in science and engineering. In doing so, we address issues of "critical transitions" to senior-status, and the meaning of "full participation."

2) We propose strategies that i) make and mark the advancement of women an organizational priority via leadership and action taken; ii) weave women into the fabric of institutional structure and decision-making; iii) create means for equitable distribution of resources; iv) assess evaluation practices, and define criteria for advancement that are clear and unbiased by gender; and v) enhance family-friendly practices and policies.

3) We propose means of implementation that i) create an inter-College network of women faculty holding sponsored professorships; ii) institutionalize programs that present factors contributing to gender equity in evaluation and promotion; iii) disseminate key resource-allocation data (including start-up packages, teaching load, laboratory space) toward best practices for Colleges and Schools; iv) structure action plans for sustained success, through annual retreats with faculty women, deans, and school chairs and v) significantly enhance work-family practices.

4) We propose to evaluate progress toward goal achievement, through assessment of specific indicators and measures as related to goals, including the work of a professional evaluator who is external to the institution.

5) We propose to disseminate findings and best practices through annual reports of the project., made widely available, a conference in the third year of the award for recipients of NSF ADVANCE Institutional Transformation Awards; and publication of articles in journals of scientific and engineering research, as well as journals in higher education, science policy, and gender studies.

1.1.1. Time and Place

The timing is opportune for the proposed plan of institutional transformation. Georgia Tech has achieved a critical momentum that can be accelerated and sustained with an award. The institution is pivoted to build upon previous activities and momentum: the InGear (Integrating Gender Equity and Reform) project, and report, supported by NSF; the College of Engineering Task Force on Opportunities for Women in Science and Engineering; and the Center for the Study of Women, Science, and Technology which provides continuing resources of findings and recommendations. Georgia Tech has a vital and perhaps unique constellation of Colleges, units, and persons positioned for and committed to the advancement, of women in academic science and engineering. Institutional transformation can occur with support of resources accompanying an NSF award (and could not occur at this time without such an award).

1.2. Status of Women in Academic Science and Engineering at Georgia Tech

Georgia Tech has undertaken two extensive self-assessments in recent, years. These self-assessments, the InGEAR Report on the Status of Women at Georgia Tech, 1993-1998 <<http://www.academic.gatech.edu/study>>, and Enhancing the Environment for Success: Report from the Task Force for Opportunities for Women in Engineering <<http://www.coe.gatech.edu/publications>>, established certain baseline data and provided a set of recommendations for action to improve the success of and climate for women

students, faculty, and staff at Georgia Tech. A brief summary of each (see Llewellyn, Usselman, and Brown, 2001) is provided below, with follow-up data and descriptions of specific actions taken as a result of the recommendations contained in the reports. Initial actions in this proposal address key areas of concerns identified in these reports.

In 1995, the National Science Foundation awarded a research grant (HDR# 9453106) to a consortium of five universities in the State of Georgia -Clark Atlanta University, Georgia Institute of Technology, Georgia Southern University, Georgia State University, and The University of Georgia. The project, InGEAR (Integrating Gender Equity and Reform), was led by Georgia Tech and aimed at promoting equal access to quality science and mathematics education for boys and girls across the State. Part of the requirement of the NSF grant was that, each of the participating institutions conduct an extensive institutional self-evaluation of the status of female students and faculty on the campus. The Report on the Status of Women at Georgia Tech was completed in the fall of 1998.

Concurrently, in March 1998, Dr. Jean-Lou Chameau, Dean of the College of Engineering (CoE), appointed a task force comprised of faculty, alumni, and students, to assess the participation of female faculty and students specifically in the College of Engineering. The task force focused on identifying barriers in the academic and research environment, that may inhibit female faculty in their career development. Benchmark information from peer institutions was used as comparison. A set of recommendations for action was developed, and the report was published in July 1998.

Both reports document that considerable progress had been made in increasing the numbers of female faculty in the last decade. However; significant problems remained, particularly in tenure and promotion, the climate perceived by senior women faculty, and the stresses induced by the lack of progressive work-family policies and programs. These issues are addressed below, and provide initial points of focus for the action plans of our proposal.

Georgia Tech had made significant progress in recruiting of junior faculty in engineering, but, lagged benchmark institutions in the numbers and percentages of women faculty at higher ranks (senior women). A comparison was made of the progression of male and female faculty members through tenure and promotion for CoE from 1986-1998 (Task Force Report; Figure 12). The data clearly show a slower progression of women through the ranks. The InGEAR report indicated many female faculty members believed that the promotion and tenure process did not recognize different career trajectories and rates of advancement.

All of the CoE female faculty were interviewed for the Task Force report. In specifying major obstacles to success, four factors were cited as critical: Balancing family and career and lack of work-family support at Georgia Tech; understanding the criteria for success (promotion and tenure); perception that women faculty were regarded as not having the same credentials as men (e.g., among candidates in hiring); and isolation and problems in networking.

Senior and junior women exhibited notable differences in their perspective of the campus climate and barriers to career advancement. While junior faculty women reported considerable stress in attaining progress toward successful promotion, they also felt

optimistic about their future. They viewed success as solely dependent on their ability to attain the required "metrics" of performance. The perspective of senior women was quite different. Here, the women believed they had achieved "success," yet many were less optimistic about their futures and continued career advancement than were the junior women. Overall, senior women viewed inclusion in the centers of "power" as important for access to resources and continued career development. They viewed this as out of their control, and thus a source of frustration.

In 1999, Georgia Tech also made a significant commitment to women and sciences, through establishment and funding of the Center for the Study of Women, Science, & Technology. The Center brings together faculty and students, addressing issues of gender, science, and technology through research and programmatic initiatives. In key characteristics, the Center is interdisciplinary, cooperative in partnerships with students, and collaborative across Georgia Tech Colleges.

1.2.1. 1998-2001 Progress: Demographics and Career Advancement

Figure 1 shows the percentage of female tenure-track faculty in the colleges representing the NSF classifications of science and engineering: the College of Computing, College of Engineering; College of Sciences; and Ivan Allen College.¹ Georgia Tech continues to make marked, but uneven, progress in increasing the representation of women on the faculty. Table 1 shows the percentages of women at, each rank for each College. Improvements have been made, but representation of women at senior ranks continues to be small.²

1.2.2. Family Policies

Prior to 1999, Georgia Tech had no tenure-clock extension policy and no official policy on the handling of teaching and research duties shortly after childbirth (other than the use of sick leave for reasons of childbirth). In the first half of 1999, at the request, of Dean Chameau, a report of the status of work-family policies at Georgia Tech was completed <www.coe.gatech.edu/publications>. Recommendations of specific actions to create/improve policies and programs were made and are currently being implemented. In 2001, the College of Engineering enacted an Active-Service Modified Duties Policy to enable faculty men and women to develop more flexible work duties during the semester following the birth of a child. In addition, Georgia Tech is pursuing a child-care center in partnership with a neighboring community, with a projected opening for 2002.

Underlying this impetus is a recognition of the centrality of organizational factors for sustained improvement in the advancement of women in academic science and engineering. As summarized in the point of departure of the CoE Task Force Report:

¹For Ivan Allen College, the data include those faculty in the economic, behavioral, and social sciences, categories within the NSF classification of S/E; they exclude faculty outside of the NSF classification.

²The data need to be updated for currency, and for exact counts to-date.

Organizational environments and cultures are strongly influenced by leadership. Many of the issues identified by the task force are related to perceptions of reality. Many others are ingrained in the institutional foundation of Georgia Tech. In order for progress to be made, the College of Engineering must have strong leadership on women's issues. Thus, we strongly believe that the Dean in particular and the School Chairs must be the driving force for change.

2. Plan of Activities

2.1. Defining the Problem

Research points to certain organizational factors that shape outcomes for women in academic science and engineering. These include: (1) leadership and organizational climate that signal the importance of gender equity (Fox, 2000, 2001b; Valian, 1998); (2) clear and specified guidelines for evaluation and allocation of rewards (Evens, 1996; Fox, 1991; Long and Fox, 1995; Glazer-Raymo, 1999); (3) collegial and collaborative networks of access and opportunity (Feldt, 1985, 1986; Fox, 1991; Reskin, 1978); and (4) supportive family policies (Raabe, 1997; Rosser and Zieseniss, 2000).

In steps toward institutional transformation, we need to further specify what, is known, and hence, what can be done for the advancement of women, by field and careerstage. Nationally, in some fields (e.g., computer science), access to positions at the junior-level has been problematic for women (Wulf, 2000), while in other fields (e.g., life sciences), promotion to full professor has been a continuing problem (Fox, 2000b). At Georgia Tech, promotion of women to senior ranks has been a persistent problem, and the Task Force on women in engineering points to problems of satisfaction for those women who do attain senior rank (see Section 1.2) -but, assessment, needs to occur across fields, by rank. We are acutely attuned to the pessimistic responses and depressed experiences of senior women, revealed in our internal report, and in recent, assessments elsewhere (e.g., MIT, and NRC/NAS Committee on Status of Women in Science and Engineering).

For these reasons, we aim to specify and portray organizational barriers and facilitators for women, by field (computing, engineering, life sciences, physical sciences, other areas), and career-stage (pre-tenure, associate-level, and full professorial-level), as well as family/parental status (presence/nonpresence, and ages, of children). This will enable the further development of strategies for the advancement of women-and its implications for other institutions. Toward that end, we propose the following research activities.

2.1.1. Surveys at Georgia Tech and at Bench-mark Institutions

In year 1, we will survey all women at Georgia Tech in College of Computing, College of Engineering, College of Sciences, and in Ivan Allen College those who fall within the NSF classifications of behavioral, economic, and social sciences. The data collected will provide quantitative indicators of experience and perceptions of organizational barriers and facilitators. It will serve both as a means of defining the problem and further developing strategies, and as rich base-line data toward assessment of change. At annual retreats (discussed subsequently), a short-version of questionnaire-items will be administered among women, as a means of assessing change.

The survey will seek respondents' reports (experiences and perceptions) by field and career-stage of:

1. Organizational Resources: experiences with allocations of space, relesetime, teaching loads, start-up packages.
2. Processes of Evaluation:
 - a. Ratings (scaled) of perceived importance in decisions regarding promotion and salary of: classroom teaching, personal attributes (character and personally), quality of publications, quantity of publications, grants awarded, undergraduate and graduate student advising, service and outreach, and professional awards.
 - b. Rating of criteria for assessment as being more to less clear and specified.
 - c. Occurrence (and frequency) of meeting with chair, dean, or other supervisor or colleagues to review performance.
3. Aspects of Organizational Climate:
 - a. Ratings (scaled) of organizational opportunities for: interaction with departmental faculty members working in similar area; chances of being promoted; recognition received from faculty in department; recognition received from faculty in other units; recognition received from administration.
 - b. Availability/unavailability of colleagues in major department unit (and in other units of the University) who are able to collaborate; availability/unavailability of colleagues who are willing to collaborate.
 - c. Perceived orientation of department: helping faculty to succeed vs. sifting through faculty; and letting them 'sink or swim.'
 - d. Ratings (scaled) of character of department, along dimensions such as: competitive-cooperative, responsible-irresponsible, uncreative-creative, free-constrained.
4. Information on family and parental status: marital status, and numbers and ages of children.

In addition, in year 2, we will conduct a second survey of experience and perceptions of organizational barriers and facilitators among faculty women in biology/microbiology (life science), computing, engineering, physics (physical science), at eight, benchmark institutions.³ The estimated number of women⁴ is 447. These data will serve as bases for understanding indicators at Georgia Tech in a comparative context. The surveys concentrate upon women faculty (rather than gender comparisons), because of the focal interest in understanding variations among women by field and career-stage (rank).

³ The preliminary selection includes the following institutions: University of California-Berkeley, Carnegie Mellon University, University of Illinois (ChampaignUrbana), MIT, University of Michigan, Purdue University, Stanford University, University of Washington.

⁴ Number estimated on basis of counts of names/persons from websites of departments/colleges of engineering, biology/microbiology, computing, and physics for each of the eight institutions.

For both sets of surveys, we will use a precisely ordered, timed, and administered process of data collection that maximizes quality and quantity of response (Dillman, 2000). We will take steps for confidentiality of respondents by aggregating data for individuals, departments and/or institutions.

2.1.2. Interviews at Georgia Tech

We also aim to portray, qualitatively, the experience of organizational barriers and facilitators at Georgia Tech. We will do so in year 1, by following the survey with (20) interviews of individual women, by career-stage and field⁵ at Georgia Tech. The protocols for these interviews will be informed by aggregate patterns identified in the survey-data for the institution. Combined with the survey data, data collected in the interviews will provide particular information for institutional transformation. (1) They will provide "holistic" cases of ways in which resources, processes of evaluation, and aspects of organizational culture shape participation and advancement among women. (2) They will help characterize what, is meant by more and less "full participation." (3) They will help illustrate the relationship between organizational factors and issues of "critical transition to senior status for women, and satisfaction in those ranks.

2.1.3. Development of Case Studies

In an often-cited study, professional summaries of 10 doctoral-level psychologists were sent to 147 chairpersons of psychology department across the country (Fidell, 1975). The summaries contained different combinations of publication records; teaching: performance, departmental committee service, and comments on sociability and conscientiousness. For each questionnaire sent, female names were randomly assigned to four summaries; the remainder were assigned male names. When chairs were asked to make hypothetical hiring decisions and assign academic rank, based upon the summaries, most chairs recommended the rank of associate professor for the summaries containing male names and the rank of assistant professor for the same summaries identified with a female name.

The relationship between gender and assessment prompts our proposed training program for Institute-, College-, and School (department)-level evaluation committee members (Section 2.3). Thus, in year 1, the preparation of case studies, including variations in cases for fields and sub-fields, with assignment of "male" and "female" names to the cases, represents a research-phase in our activities. The case studies will then be used as a means of implementing equity in promotion and tenure training, as discussed subsequently (Section 2.3).

2.2. Strategies and their Importance

Our strategies embody organizational features and factors found to be central for the participation, performance, and advancement of women in science and engineering (outlined in Section 2.1). Particular strategies embodying these features/factors are these:

⁵The frame for the (20) interviews is: 2 interviews among women at the juniorlevel, and 2 among women at the senior-level, for each of five classifications of fields: engineering, computing, life sciences, physical sciences, and other areas.

1) Make and mark the advancement of women an organizational priority, through leadership and action taken.

Leadership creates centralized attention, and priority given to gender equity (Fox, 2000: 49). Leadership can establish and publicize policies that increase equity (Valian, 1998: 316). By exercising strategic choices, decision makers shape the organization, defining and recasting its aims and aspirations (Eldridge and Crobmie, 1974: 68).

2) Institutionalize and sustain equity, weaving women into the fabric of institutional structure and actions.

Women have long been present in science, although not in highly rewarded or even visible roles (Rayman and Stewart, 1999; Rossiter, 1982, 1995). Presence, in itself, does not constitute "participation." Full participation entails not only promotion, but also sustained access to collegial and collaborative networks, and influence upon institutional decision-making.

3) Create means for equitable distribution of resources (space, equipment, release time, start-up packages).

The scope and complexity of science and use of advanced technology heighten reliance upon facilities, funds, and apparatus, as well as teamwork (Fox: 1991:189).

4) Structure institutional equity through evaluation that is clear and unbiased by gender.

Studies indicate that the more loosely defined and subjective the criteria for evaluation; the more likely that persons of majority-status (racial and gender) characteristics will be perceived as the superior candidates. When criteria for evaluation are more clear and specified, conditions for bias are reduced (Long and Fox, 1995:62-64)

5) Enhance family-friendly policies.

Although research indicates that women in science who are mothers have publication productivity that is as high or higher as those without children (Long and Fox, 1995), these data are based upon women who have survived and hold academic positions. Family demands can take their toll along the way, moving women out of scientific occupations, so that they do not appear among the employed groups of scientists. And for those who remain in the system, work and family represent "greedy" and competing spheres, especially when timed bench-marks for performance make it difficult to impossible to take time off or cut back on work, temporarily (see Grant, Kennelly, and Ward, 2000; Rosser, 2001). This points to the importance of parental leave, flexible scheduling, and childcare arrangements.

2.3. Means of Implementing Strategies

Our means incorporate the central organizational factors of the strategies of the preceding section; complement and extend certain previous activities (discussed in Sections 1.2-1.2.2); and involve institutional commitments to sustain activities (including necessary resources) beyond the period of the award. The particular means of implementation include the following.

1. Create an inter-College network of termed professorships and/or endowed chairs.

In years 1-5, the NSF award will be used to support the educational, research, and ADVANCE activities of four senior women faculty, one in each of the participating Colleges. The supported faculty members will commit to activities that develop and sustain the community and advancement of women faculty in their Colleges, and in turn, across Colleges. The network, created by and through the supported positions, makes and marks the advancement of women as an issue at the center of Georgia Tech.

Activities of supported faculty include: 1) developing a network of women faculty, committed to institutional transformation; 2) advising the Deans of respective Colleges and the Provost, on issues vital for the success of women faculty; and 3) facilitating and organizing annual retreats (discussed in Section 2.5). Recognizing the additional roles to which supported faculty are committing, Georgia Tech will fund a coordinator to support the network. The coordinator will furnish and keep up-to-date a data base of information to be disseminated, and provide logistics, communication, and administrative assistance.

A committee; chaired by Dean Sue Rosser, will select the recipients of support, using criteria of full professorial rank, national and international stature, achievement and impact in research and education, and demonstrated commitment to advancing women in science and engineering.

Georgia Tech commits to sustaining these supported positions beyond the period of the grant by finding support, through donors for professorships or chairs, or by sustaining them through institutional funding. The support will be at the same level as that provided through the NSF award. These professorships will be termed (five-years). They may be renewed or may be used for support of others over time.

2. Institutionalize training in evaluation for promotion and tenure committees.

We propose to institute a formal training process for Institute-, College-, and School-level committees involved in tenure and promotion, with these aims. First, the committees need to fully understand the System and Institute Policies and Procedures, and the importance of their charge. Second, they need to understand the breadth of modes in which faculty can be successful and differences by field. Third, they need to understand the research on evaluation as applied to under-represented groups, and factors of clarity in assessment of candidates. Further, we propose to use case studies to underscore the issues of minority (compared to majority) status and evaluation of candidates (discussed in Section 2.1.3.) Collaboration with Center for Study of Women, Science, and Technology will provide data and research on evaluation and its relationship to minority (compared to majority) characteristics of candidates for promotion and tenure. In year 1, we will develop the program of training, and in year 2, we will begin to implement it.

3. Collect and use resource data for equity and development of best practices.

Institutional Research and Planning (director, Sandra Bramblett) will assess resource data of faculty on a yearly basis (years 1-5). Data collected on salary, pay raises, laboratory space, and start-up packages will be used to compare allocations of all female faculty members with an appropriate sample of male faculty, for each of the Schools in the four participating Colleges. The collection of this relatively objective data will compliment that, obtained in the survey(s) of faculty experiences. Practices on allocation will be disseminated to the Deans and school chairs. Data on resource allocation are part of the yearly evaluation of the progress of the ADVANCE program (Section 2.4, below).

4. Hold annual retreats of women faculty in science and engineering, school chairs, deans, and provost.

Annual retreats (years 1-5) will provide a means to inform ADVANCE participants women faculty, school chairs, deans, and provost-of the results of our evaluation, and to develop means of implementing action for the following year, moving toward goals of institutional transformation. We will address and implement policies of the training of evaluation committees, resource-allocation, weaving of women into institutional decisionmaking, and other practices. We will also gather (annual) information from women in a short questionnaire on perceptions and experiences as follow-ups to the base-line survey and interviews (Sections 2.1.1.-2.1.2). We will include an evaluation of the retreats, themselves.

Georgia Tech will provide funding for the costs of the annual retreats.

5. Strengthen and extend the scope and impact, of family-friendly policies.

Significant progress has been made in the development of work-family support. Throughout the award (years 1-5), we will continue this effort, working with stakeholders, including the University System of Georgia to 1) develop a paid childbearing leave that does not exploit sick-leave; 2) modify the University System policy to allow more flexibility in the use of our tenure-clock extension policy (current leave must be taken, due in part to AAUP guidelines); 3) modify family leave to enhance opportunities for women's and men's leave following birth of child; 4) insure that daycare needs are adequately addressed in a new facility; 5) enhance the telecommuting policy; and 6) add family-care (and lactation) facilities throughout campus. In addition, leave and tenure policies should provide support for a range of family responsibilities, including eldercare.

2.4. Evaluating Impact

To evaluate the goals of ADVANCE-increasing the full participation and advance of women in academic science and engineering-we will use a mixed-method approach. This will permit a rigorous, multi-faceted examination of the extent to which progress and success on specific project objectives are in, evidence.

Evaluative data used to determine the progress of the project and its success will be collected from four sources: 1) survey and interview data, described in Sections 2.1.12.1.2.; 2) interim survey data, collected at annual retreats; 3) institutional files; and 4)

departmental data-files. Institutional and departmental data will be collected both retrospectively from 1997-present, and each year as it becomes available. Progress on specific objectives of our ADVANCE project will be systematically and periodically assessed. These are outlined in Table 2, together with measures derived from the objectives and the data source(s) used to collect evidence of progress and success.

Dr. Beatrix Chu Clewell, director of the Education and Equity Research Program, Urban Institute (Washington, DC) will serve as external evaluator for the project (letter of agreement, included). Dr. Joseph Hoey (Georgia Tech Institutional Research and Planning) will coordinate collection and analysis of data from institutional and departmental files, and analysis of survey-data collected during annual retreats (biosketch included).

2.5. Sharing Best Practices

We will disseminate findings and share best practices in three ways. First, we will prepare and broadly distribute (on-campus and nationally) an annual ADVANCE report, outlining our past activity, forecasting upcoming activities, and relating impact. The cost of the report, will be paid by Georgia Tech. Second, in year 3 of the project, we propose to hold a conference at Georgia Tech for the grantees of ADVANCE awards; with the aims of exchanging best practices, creating collaboration, and supporting the collective impact, among ADVANCE grantees. Georgia Tech will pay the meeting expenses and travel/lodging costs for up to five participants from each of the institutions holding awards. Third, we will disseminate findings through publication in journals of scientific and engineering research, as well as journals in higher education, science policy, and gender studies. Our approach will be publication of articles by interdisciplinary teams; including the student-partners participating in ADVANCE. .

3. Administrative Structure

1) Dr. Jean-Lou Chameau, the Provost-elect⁶ of Georgia Tech will serve as Principal Investigator of ADVANCE. As the institution's chief academic officer, the Provost will target the centrality of ADVANCE, establish and publicize policies, communicate with the project coordinators, Deans, and others, and implement goals. As Dean of College of Engineering, Dr. Chameau initiated activities discussed in Section 1.2.

2) Dr. April Brown (Professor of Electrical and Computer Engineering, and Associate Dean of College of Engineering) and Dr. Mary Frank Fox (Professor of Sociology, Ivan Allen College, and Co-director, Center for Study of Women, Science, & Technology) will serve as Co-Principal Investigators, and coordinators of the project. They will manage activities (defining the problem, developing strategies, implementing them, evaluating impact, disseminating practices) through the Center for the Study of Women, Science, & Technology (WST Center). The WST Center is an inter-College unit, sponsored by the four participating Colleges; is an established bridge across Colleges in programmatic, research, and educational activities, and faculty participation in them; and has as its focus the participation and performance of women in science and engineering.

⁶ The current Provost of Georgia Tech is Dr. Michael Thomas. Dr. Jean-Lou Chameau becomes Provost, June 2001.

Drs. Brown and Fox will report to the Provost on a quarterly basis, and coordinate activities with the other ADVANCE participants (3-5, below). Dr. Brown will be responsible for activities including the time-line and management of the evaluation, the promotion and tenure training, and the annual retreats. Dr. Fox will be responsible for activities comprising research, including that brought to the evaluation and the promotion and tenure training, as well as the conference, preparation of yearly reports, and collaboration in articles reporting findings. Dr. Carol Colatrella, WST Co-director, is an experienced partner in initiatives of gender equity, and will provide ongoing logistics and support of activities, including the annual reports and conference, and supervision of graduate and undergraduate partners, throughout the project. For the undergraduate and graduate students, participation in ADVANCE will constitute training in the study of gender and science. We are resisting creation of new lines and are using the existing Georgia Tech structures and personnel in the initiative proposed (except for the hiring of the coordinator for sponsored faculty professorships, which will be paid by Georgia Tech).

3) The Deans of each of the four participating Colleges are key parties committed to the goals of the ADVANCE proposal (letter of commitment, included). In their roles, they represent, the range of Schools (departments) of science and engineering; and communicate directly with school chairs. A senior woman within each of the (4) Colleges is committed to serving as liaison with their respective Dean and the project. coordinators. Because they are key participants, the biosketches of the Deans and senior women liaisons⁷ are included in the proposal.

4) The inter-College network of termed professorships and their roles are described in the preceding Section 2.3.

5) A diverse advisory board of school chairs and other campus administrators; as well as faculty, will help guide the project, meeting on a bi-annual schedule.

4. Conclusion

We propose an integrated approach to institutional factors that will support the full participation and advancement of women in academic science and engineering-by defining the problem, developing strategies, implementing them, evaluating impact, and disseminating findings. Throughout, we aim to address issues of, and variations by, field, career-stage (rank), and family statuses. We propose to provide a model of best practices, based upon an integrated approach to organizational features and factors-resources, processes of evaluation, organizational culture and climate including leadership, and family policies-that can be adapted and adopted by other institutions.

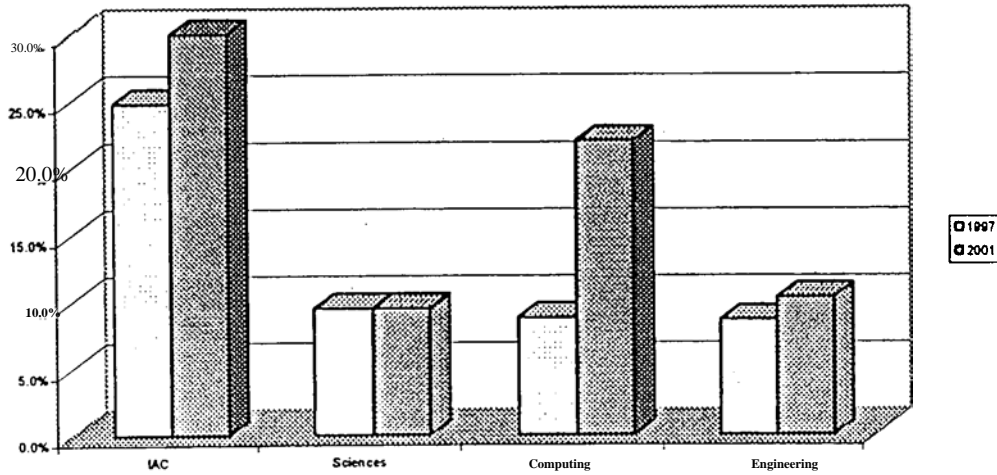
Our means of implementation incorporate organizational features and factors of the strategies, complement and extend previous activities undertaken, and involve institutional commitment (including necessary resources) to sustain activities beyond the

⁷The Deans are Dr. Jean-Lou Chameau (currently, Engineering), Dr. Peter Freeman (Computing), Dr. Sue Rosser (Ivan Allen College), and Dr. Gary Schuster (Sciences). The women serving as liaisons are Dr. April Brown (Engineering), Dr. Carol Colatrella and Dr. Mary Frank Fox (Ivan Allen College), Dr. Mary Jean Harrold (Computing), and Dr. Mei-yin Chou (Sciences).

period of the award.

Georgia Tech commits to this plan and to sustaining it, and supports the project through cost-sharing of 24%. Georgia Tech aims to collaborate with other institutions, including ADVANCE grantees, to heighten the impact of institutional transformation toward the advancement of women in academic science and engineering, nationally.

Figure 1: Percent of GT Tenure Track Faculty who are Women In Science and Engineering, by College 1997, 2000



COLLEGE	% ASSISTANT	% ASSOCIATE	% FULL
COMPUTING	23%	27%	1.4%
ENGINEERING	21%	14%	2.5%
VAN ALLEN	30%	23%	35%
SCIENCES	18%	22%	4%

Table 1. Breakdown of female faculty by rank, 2001

Table 2. Relationship of ADVANCE project goal to objectives, measures of success, and data sources.

Goal: Increase the full participation and advancement of women, particularly senior women, in academic science and engineering at Georgia Tech.

<u>Objective</u>	<u>Measure of Success</u>	<u>Data Source(s)</u>
1) Promotion and retention of senior women will rise	Extent to which women, especially senior women, are promoted and retained	Departmental and institutional data files from 1997 forward
2) Faculty recruitment patterns will reflect more gender equity	Extent to which annual recruitment patterns reflect greater gender equity	Departmental and institutional data files from 1997 forward
3) Senior women will gain greater representation in administrative hierarchy (unit, college, Institute)	Extent of annual growth in representation of women in leadership positions in hierarchy	Departmental and institutional data files from 1997 forward
4) Resource allocation will become more gender-equitable	Extent. of equity for women in start-up packages, laboratory space, teaching loads, and other areas	Annual resource allocation data collected
5) Women and senior women will express satisfaction with resources and working environment within the unit, college, and Institute	Extent to which women self-report satisfaction with resources and working environment, measured annually	Initial surveys and interviews; follow-up surveys at retreats
6) Processes of evaluation will become clearer	Extent of clarity in experience of faculty	Initial surveys and interviews; follow-up surveys at retreats
7) Women's access to colleagues and collaboration will increase	Colleagues who are reported as able and willing to collaborate	Initial surveys and interviews; follow-up surveys at retreats
8) Informal influence and support network of women in unit, college, and Institute will become more extensive	Extent to which reports show growth	Initial surveys and interviews; follow-up surveys at retreats
9) A more family-friendly environment will be created	Extent to which particular policies (e.g., paid child-bearing leave, tenure-clock exclusion, daycare facilities) are adopted	Institute and University System of Georgia code of practices and policies implemented

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