

**Year-End Report for ADVANCE Project**  
**University of Michigan**

**Year 1: December, 2002**

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## SECTION I: PERSONNEL AND FINANCIAL REPORT

### A. Budget explanations by areas and major functions of the ADVANCE project for the reporting year and the next year:

#### *Senior Personnel*

Dr. Abigail J. Stewart, the principal investigator, is responsible for project oversight. In both the first and second project years, 50% of Dr. Stewart's salary is cost shared. In the first project year her work has included the management and oversight of the project implementation advisory and steering committees and the facilitation of departmental initiative implementations. Half of Dr. Stewart's salary will continue to be cost shared in the second project year.

Salary is cost shared at 5% for each of the four co-PIs (the Deans of Engineering, Medicine, LSA and a representative of the Provost's Office), and this cost sharing will continue in the second project year. The co-PIs facilitate project activities within their home schools and campus-wide.

One co-PI (Shirley Neuman, Dean of LSA) left the University of Michigan at the end of the 2001-02 academic year. The current Interim Dean, Terrence McDonald, serves on the ADVANCE Project Steering Committee; therefore, his salary is being cost shared for this project. Because Dr. McDonald's appointment is as Interim Dean, we did not submit a formal request to appoint him as a co-PI. When the permanent Dean of LSA is appointed, we will request co-PI status for that person.

#### *Other Professionals*

Dr. Janet Malley, Deputy Director of the Institute for Research on Women and Gender, has served as project manager for the project and has provided oversight of the quantitative research evaluation effort (data collection, analysis and reporting) of the initiative (survey and inventory) at 30% effort (includes 10% cost share). Dr. Malley will continue this work in the second project year (30% direct cost).

Carol Hollenshead, Director of the Center for the Education of Women (CEW), allocated 20% effort to the ADVANCE project in the first year (includes 10% cost share). She will continue her work on the project at 10% effort (includes 5% cost share) in the second project year. An additional researcher from CEW assisted the project at 50% in the first year (includes 10% cost share) and will continue this work at 25% effort in the second project year.

Dr. Cinda Sue Davis, Director of the Women in Science and Engineering (WISE) program, developed and ran discipline-specific data-based workshops in the first project year and was provided with release time for this work (\$10,000). This work will continue in the second year. A 3% increase is incorporated into the release time expense in the second year.

Dr. Jane Hassinger, Director of the Interdisciplinary Program in Feminist Practice, developed and facilitated the *Women Talking Science* program and was provided with

release time for this work (\$10,000). Dr. Hassinger will continue in this role in the second project year, and a 3% increase is incorporated into the release time.

STRIDE committee members (formerly referred to as faculty gender-equity advisors) assisted the project this year by providing consultation with individual departments on recruitment and hiring and retention practices. Each advisor received \$20,000 in release time for this work, and funds in the amount of \$100,000 were allocated for this purpose in the first year (includes \$60,000 cost share). In the second project year, the advisors will continue to assist the project and a 3% increase is incorporated into the release time compensation.

#### *Graduate Students*

In the first project year, one graduate research assistant (GRA) worked on the project at 50% effort for 8 months (total salary cost shared) by assisting with evaluation data collection and analysis. Such assistance will continue in year two from a 50% GRA for 12 months (\$17,500).

Additional GRA appointments in the first project year include 6 GRAs at 25% effort (one-half of total cost is cost shared) to conduct space and equipment surveys, one GRA at 25% to support the CEW director and researcher, and a GRA at 25% for 8 months to assist the WISE director. In the second project year, one 25% academic year GRA appointment will continue to provide assistance to the WISE director.

A focus group facilitator assisted the PI with focus groups on departmental climate and prepared summaries of the meetings; compensation for this work was provided in the amount of \$2,000. This work will continue in the second year, and a 3% increase is incorporated into the compensation rate.

#### *Undergraduate Students*

In the first project year, undergraduate students assisted with data coding, entry and cleaning of survey and inventory results. Associated expenses were cost shared.

#### *Other Personnel*

Dr. Danielle LaVaque-Manty serves as Program Coordinator for the project (50% effort). Dr. LaVaque-Manty provides staff support for data collection efforts, all project initiatives, advisory, steering and selection committees, and production and dissemination of reports and presentations. Dr. LaVaque-Manty will continue in this role in the second project year.

Lisa Parker, research administrator at the Institute for Research on Women and Gender, allocates 10% of her time to manage the budget for the ADVANCE grant (including all sub-accounts) and process financial and administrative paperwork. She will continue this work in the second year.

Salary funds for transcription of interviews and focus group meetings are allocated at \$9,000 in the first project year and at \$3,100 in the second project year.

### *Fringe Benefits*

Fringe benefit expenses are calculated at 30% for all faculty, professional and administrative staff and at 8% for all students, facilitators and transcribers.

### *Travel/Domestic*

Travel expenses in year one have totaled \$3,800 for advisory meetings and \$2,200 for the University of Michigan Women Scientist Network event speakers. These costs will remain the same for the second project year.

### *Other Direct Costs – Materials and Supplies*

In year one, the expenses for producing and mailing the evaluation surveys were cost shared. Other expenses in the first project year included two computers (\$1,750 each), a transcribing machine (\$750) and 5 tape recorders (\$30 each). In both the first and second project years, funds are allocated for general office supplies (\$2,450 in year one and \$2,100 in year two), duplication (\$600 each year) and telephone costs (\$800 in year one and \$1,200 in year two).

### *Other Direct Costs – Consultant Services*

External consultants provided consultation about and presentations at data based workshops this year and consulted with project personnel and gender equity advisors about best practices. Total consultant costs in year one were \$7,200 and this amount is allocated in for similar services in the second project year.

### *Other Direct Costs – Other*

Funds in the amount of \$24,500 were allocated in year one to the Center for Research on Learning and Teaching's (CRLT) Climate Theater, including \$20,000 to develop two scripts of specific relevance to the ADVANCE project and \$4,500 to fund three performances. In the second project year, funds will be allocated to CRLT for 15 performances of these scripts (\$22,500). In the second year, funds are also allocated to CRLT's Forum Theater (\$1,500) to provide opportunities to help science faculty problem-solve about the challenges women scientists face in the classroom, lab, and with colleagues and students.

In both the first and second project years, funds in the amount of \$17,800 will be used by the UM Women Scientist Network to support 8 events each year, including 4 visiting speakers.

The Elizabeth Crosby Research Fund (formerly the Gender Equity Resource Fund) is budgeted at \$100,000 each year (includes \$10,000 cost share) to provide awards of \$20,000 each to 5 applicants. This fund is used to advance women scientists by supporting faculty in ways best suited to their particular needs (special laboratory equipment, graduate student or post-doctoral support, conference travel, support for a visiting scientist, release time, etc.). Funds are awarded as a result of a call for applications and a selection process. In the first project year, 7 awards were made (\$90,000 direct cost, \$10,000 cost share, and \$40,000 from other funds). It is anticipated

that, in the second project year, awards will be distributed as budgeted. A total of \$3,000 is used each year to compensate selection committee members.

Funds for the Departmental Transformation Initiatives are allocated at \$150,000 in year one and \$145,000 in year two. Funds are distributed among three departments (selected through a review process) to carry out specific activities aimed at producing significant transformation of the climate for women faculty in their departments. Recipients of these funds were selected in the first project year and it is anticipated that these and future funds will be used as budgeted.

#### *Indirect Costs*

Indirect costs are calculated at 51%.

#### *Cost Sharing*

Cost sharing has been committed in the amount of \$417,420 for the first project year and in the amount of \$274,326 for the second project year.

#### **B. Estimated unobligated funds at the end of the first project year:**

We anticipate no unobligated funds at the end of the period for which NSF currently is providing support (January 1, 2002 – December 31, 2002) to Abigail J. Stewart's NSF award SBE 0123571, "ADVANCE Institutional Transformation Award." The budget allocation to be used for this first project year is \$749,988 (\$496,681 direct costs; \$253,307 indirect costs). While a balance of direct cost funding will remain at the end of the first project period, all of these funds have been assigned to specific allocations or have been otherwise committed.

Funding in the amount of \$370,575 (this amount includes indirect costs) will remain available beyond the end of the first project year because this amount is designated for the second project year. NSF provided total funds in the amount of \$1,120,563 to support the 12 month period of January 1, 2002 – December 31, 2002 and indicated that this total amount includes first year funds in the amount of \$749,998 (\$496,681 direct costs; \$253,307 indirect costs), as proposed in the original budget request, and partial second year funds in the amount of \$370,575.

Direct costs in the amount of \$137,182 have been expended as of November 30, 2002 (the most recent monthly account statement available to us). It is anticipated that an additional \$37,218 in direct cost expenses (including on-going expenses such as salary costs as well as outstanding year one expenses that have been charged to this project), will be initiated by December 31, 2002.

In addition, a total of \$322,281 in direct costs has been allocated to various departments and colleges at the University of Michigan in the form of sub-accounts that house funds provided to the Elizabeth Crosby Research Fund (formerly the Gender Equity Resource Fund) award recipients, STRIDE committee members and departmental transformation initiative projects. All sub-accounts are established and active, but the rate of expenditure of funds varies. It is anticipated that a portion of the funds in several of these

sub-accounts will not be expended by December 31, 2002. However, all of these funds have been committed for use by the recipients as proposed in the original budget and it is expected that the funds will be used as planned.

As a result of the expenditures and funding allocations described above, we expect the ADVANCE project to make use of \$496,681 in direct costs, the total direct cost amount awarded, in the first project year.

**Cost sharing status at the end of the first project year:**

The University of Michigan has committed \$417,420 in cost sharing for this initial 12 month project period. A cost sharing report will be provided, via hard copy, to NSF from the University of Michigan's Office of Financial Operations. Financial Operations is unable to produce an accurate cost sharing report for the first year of this project until the close of December business. However, the University will submit this report as soon as possible after December 31, 2002.

**C. Proposed budget for the second project year in accordance with NSF Form 1030:**

**Year Two (NSF - ADVANCE)**

	<b>NSF</b>	<b>UM Cost Share</b>
A. Senior Personnel		
PI - Stewart		64,038
co-PI LSA		14,057
co-PI Engineering		14,469
co-PI Medicine		17,057
co-PI Associate Provost		<u>10,055</u>
TOTAL SENIOR PERSONNEL	<u>0</u>	<u>119,676</u>
B. Other Personnel		
B.		
2 Other Professionals	108,477	68,268
B.		
3 Graduate Students	24,110	
B.		
6 Other	<u>26,790</u>	
TOTAL OTHER PERSONNEL	159,377	<u>68,268</u>
TOTAL SALARIES AND WAGES	159,377	187,944
C. Fringe Benefits	<u>41,827</u>	<u>56,382</u>
TOTAL FRINGE BENEFITS	41,827	56,382
TOTAL SALARIES, WAGES AND FRINGE BENEFITS	201,204	244,326
E. Travel/domestic	<u>6,000</u>	
TOTAL TRAVEL/DOMESTIC	6,000	
G. Other Direct Costs		
G.		
1 Other Dir. Costs - Materials & Supp	3,900	
G.		
3 Consultant Services	7,200	
G.		
6 Other	<u>278,300</u>	<u>30,000</u>
TOTAL OTHER DIRECT COSTS	289,400	30,000
H. TOTAL DIRECT COSTS	496,604	274,326
year 2		
I. Total Indirect Costs	253,268	
Rate: 51%		



J. Total Direct and Indirect Costs	749,872
L. Amount of This Request	<b>749,872</b>
M. Cost Sharing	274,326

**D. Current other support information for key personnel:**

**Stewart, Abigail**

**(Current)**

Principal Investigator: Timothy Johnson  
 Title: *BIRCWH Career Development*  
 Sponsor: NIH/BIRCWH (Building Interdisciplinary Research Careers Women's Health) Career Development Program  
 Amount of Award: \$2,434,083  
 Duration of Award: 09/01/00 – 07/31/05  
 Time Devoted to Project: 3% as advisory board member

Principal Investigator: Abigail Stewart  
 Title: *Narratives and Numbers: Integrating Quantitative and Qualitative Methods in the Study of Gender*  
 Sponsor: University of Michigan/Rackham Graduate School  
 Amount of Award: \$32,000  
 Duration of Award: 09/01/00 – 12/31/03

Principal Investigator: Susan Nolen-Hoeksema  
 Title: *Gender and Mental Health Training Program*  
 Sponsor: NIMH  
 Amount of Award: \$729,820  
 Duration of Award: 07/01/97 – 06/30/02  
 Time Devoted to Project: 3% as advisory mentor

Principal Investigator: Pamela Trotman Reid  
 Title: *Girls Exploring Mathematics Through Social Science (GEMS)*  
 Sponsor: National Science Foundation  
 Amount of Award: \$842,877  
 Duration of Award: 09/01/01 – 08/31/04  
 Time Devoted to Project: 25% of academic year (cost-shared), two months of summer salary

Principal Investigator: Enid Sutherland  
 Title: *Performance of Daphne and Apollo Remade*  
 Sponsor: Ford Foundation/Arts and Culture Program  
 Amount of Award: \$84,300  
 Duration of Award: 07/01/01 – 06/30/04

Principal Investigator: Abigail Stewart  
 Title: *ADVANCE Institutional Transformation Award*  
 Sponsor: National Science Foundation  
 Amount of Award: \$3,748,785  
 Duration of Award: 01/01/02 - 12/31/06

Time Devoted to Project: 50% of academic appointment (cost-shared)

**Director, Stephen  
(Current)**

Principal Investigator: Earl Lewis  
Title: *New Models for Science, Engineering and Mathematics:  
Recruiting and Retention*  
Sponsor: National Science Foundation  
Amount of Award: \$2,500,000  
Duration of Award: 10/01/98 – 09/30/03  
Time Devoted to Project: 3%

Principal Investigator: Abigail Stewart  
Title: *ADVANCE Institutional Transformation Award*  
Sponsor: National Science Foundation  
Amount of Award: \$3,748,785  
Duration of Award: 01/01/02 - 12/31/06  
Time Devoted to Project: 5% of academic appointment (cost-shared)

**Lichter, Alan  
(Current)**

Principal Investigator: Abigail Stewart  
Title: *ADVANCE Institutional Transformation Award*  
Sponsor: National Science Foundation  
Amount of Award: \$3,748,785  
Duration of Award: 01/01/02 - 12/31/06  
Time Devoted to Project: 5% of academic appointment (cost-shared)

**Malley, Janet  
(Current)**

Principal Investigator: Pamela Trotman Reid  
Title: *Girls Exploring Mathematics Through Social Science (GEMS)*  
Sponsor: National Science Foundation  
Amount of Award: \$842,877  
Duration of Award: 09/01/01 – 08/31/04  
Time Devoted to Project: 10% of 12-month appointment (cost-shared)

Principal Investigator: Abigail Stewart  
Title: *ADVANCE Institutional Transformation Award*  
Sponsor: National Science Foundation  
Amount of Award: \$3,748,785  
Duration of Award: 01/01/02 - 12/31/06  
Time Devoted to Project: 10% of 12-month appointment (cost-shared during Year 1-only);  
20% of 12-month appointment (Year 1-directs); 30% of 12-  
month appointment (Year 2-5-directs)

**McDonald, Terrence**

Principal Investigator: Abigail Stewart  
Title: *ADVANCE Institutional Transformation Award*  
Sponsor: National Science Foundation  
Amount of Award: \$3,748,785  
Duration of Award: 01/01/02 - 12/31/06  
Time Devoted to Project: 5% of academic appointment (cost-shared)

**Raymond, Pamela****(Current)**

Principal Investigator: Pamela Raymond  
Title: *New Neurons in the Retina*  
Sponsor: NIH  
Amount of Award: \$1,465,676  
Duration of Award: 07/01/98 – 06/30/03  
Time Devoted to Project: 40%

Principal Investigator: Abigail Stewart  
Title: *ADVANCE Institutional Transformation Award*  
Sponsor: National Science Foundation  
Amount of Award: \$3,748,785  
Duration of Award: 01/01/02 - 12/31/06  
Time Devoted to Project: 5% of academic year appointment (cost-shared)

Principal Investigator: E. Keller  
Co-PI: Pamela Raymond  
Title: *Development of Mature Zebrafish as an Animal Model*  
Sponsor: NIH  
Amount of Award: \$1,250,000  
Duration of Award: 05/01/02 – 04/30/07  
Time Devoted to Project: 5%

Principal Investigator: D. Goldman  
Co-PI: Pamela Raymond  
Title: *A Genetic Screen for Mutations affecting CNS Development and Regeneration*  
Sponsor: State of Michigan  
Proposed Amount of Award: \$750,000

**(Pending)**

Principal Investigator: Pamela Raymond  
Title: *New Neurons in the Retina*  
Sponsor: NIH/NEI  
Proposed Amount of Award: \$1,250,000  
Proposed Duration of Award: 07/01/03 – 06/30/08  
Time Devoted to Project: 50%

## SECTION II: SUMMARY OF PROJECT ACTIVITIES

### A. PARTICIPANTS

#### Project Staff

Abigail Stewart, Primary Investigator, directed the collection of the baseline survey data, coauthored two reports on the survey results, and directs all project interventions. She represents the project to the larger University of Michigan community, offering presentations on the results of research conducted thus far, and consultations regarding ways departments and other units (and individuals) can help to recruit and retain women science and engineering faculty.

Janet Malley manages the baseline research currently in progress, including the climate survey and the space and salary inventories, and she directs the evaluation of the ADVANCE project's ongoing interventions. She coauthored two reports on the survey results. She manages the collection of year-end indicators from ten schools at the university, and has helped some of these units create data collection systems to gather the needed information. In addition, she will direct the final (fifth-year) climate survey designed to evaluate the overall program. She serves as the liaison to project collaborators involved in evaluation, and she supervises the ongoing activities of project evaluation staff.

Julie Stubbs administered the baseline climate survey and analyzed the resulting data in cooperation with Stewart and Malley. She coauthored two reports on climate survey findings, one focused on gender, and the other on race and ethnicity. She conducted focus groups and interviews to collect qualitative data on the climate. She also revised the baseline climate survey for use at UM-Dearborn.

Danielle LaVaque-Manty manages and coordinates the project's intervention activities, including committee meetings, presentations, and intervention activities. She conducted focus groups and interviews for the climate survey and for a climate intervention requested by the department of Ecology and Evolutionary Biology. She designs and produces promotional materials, including the project website, to publicize the project's programs and events. She drafts reports on project activities, and has drafted a handbook on faculty recruitment.

Patty Mullally was temporarily employed to collect data on space allocation for the space inventory.

Heather Brooks was temporarily employed to enter survey responses into the database. She also transcribed some of the focus groups and interviews.

Katie Barry has collected data on space allocation, corrected and verified space data, collected additional data to help in the writing of the climate survey reports and program materials, created faculty databases, and updated and designed portions of the project website. She has collected some of the evaluation indicators needed for the year-end

report, and collects data needed for intervention activities such as STRIDE committee presentations.

Robbin Gonzalez has coded survey responses and entered data into the database and cleaned, recoded, and prepared the data for analysis. She has conducted a faculty interview, transcribed tapes from interviews and focus groups, corrected interview transcripts, created a codebook and data dictionary to aid in the interpretation of survey results, created and maintains a journal to provide a complete written record of the project, and converted a video to be used in faculty training sessions into digital format and edited it.

Laura Reese has entered survey data into the database, transcribed tapes of interviews and focus groups, corrected transcriptions, made updates to the web page, produced power point slides and a variety of graphs and charts for use in Stewart's presentations of climate survey results, and created graphs, figures and formatting for the first climate survey report for publication on the website, and hard-copy distribution.

Adrienne Malley coded survey data, helped with the verification of space data, and converted data stored in Excel databases into SPSS.

Joanna Parnes does printing, copying, library searches, web research, and bibliographic annotation.

Carolina Pennoni entered survey data into the database.

Matthew Bietz created a PDF version of the climate survey instrument so that we could make the survey document available online.

Louise August helped prepare the survey before it was administered.

Lucille Schmidt is working on the analysis of both the space and the salary data.

Lisa Parker keeps financial records, writes budget reports, and manages ongoing account activities for the ADVANCE grant.

Patricia Smith reviews ADVANCE account activities and, along with Lisa Parker, negotiates with administrators in units cooperating with the Institute for Research on Women and Gender when difficulties arise in administering the grant.

Lynne Schaberg helped revise a climate survey for the Chemistry department and will administer it during the winter semester, 2003. She has drafted applications for IRB approval of the chemistry survey and of interviews and focus groups ADVANCE is conducting on behalf of the Ecology and Evolutionary Biology department. She has created an archive of ADVANCE documents, and has collected evaluation indicators for the year-end report.

## **Partners**

Jean Waltman and Carol Hollenshead from the Center for the Education of Women (CEW) developed a report on best practices for retaining women faculty, which has been distributed to all chairs and directors in the College of Literature, Science, and the Arts, and which is available on the ADVANCE Project website. They will conduct the qualitative evaluation of the Departmental Transformation Initiative.

Jeffrey Steiger and other staff at the Center for Research on Learning and Teaching (CRLT), directed by Connie Cook, developed an interactive theater sketch based on problems and dynamics recorded in project interviews and focus groups. The sketch has been performed for 4 test audiences and for the Network of Women Scientists and Engineers.

Jane Hassinger, director of the Interdisciplinary Program in Feminist Practice, conducted two Women Talking Science and Engineering (WTS&E) seminars for women science and engineering faculty during the summer of 2002 and held a follow-up dinner for participants in November, 2002. She will hold further seminars in 2003.

Cinda-Sue Davis, director of Women in Science and Engineering (WISE), has provided help locating data and resources for the project's research. Davis and her colleague Pat Shure, a lecturer in the Department of Mathematics, helped the Chemistry department collect data it needed to write its Departmental Transformation Grant proposal. They will provide Data-based Workshops for Disciplines to departments or other groups that want information about the distribution of women in their fields.

## **Other collaborators or contacts**

*The Provost's Committee on Mentoring* invited Abigail Stewart to present the climate survey findings to their group and to discuss the mentoring needs of women science and engineering faculty. The group's chair, Suellyn Scarnecchia, subsequently met with Abigail Stewart and Danielle LaVaque-Manty to discuss ways in which the Committee on Mentoring could be of use to ADVANCE. In addition, the Provost's Office is considering a pilot test of a computer-assisted mentoring program that might be made particularly available to science departments.

The UM's *Science, Technology, and Society Program* (STS) holds a yearly series of talks on issues of interest to those who study the history and sociology of science. In collaboration with ADVANCE, and with a financial contribution from the Institute for Research on Women and Gender (IRWG), eight of the talks in this year's STS series focus on questions of gender and science. The first three of these talks were held during the fall term, and all were well attended. STS, ADVANCE, the Program in Women's Studies, the Department of History, the Medical School, and the Institute for Research on Women and Gender are all helping to publicize the series.

*The University of Michigan's Academic Women's Caucus* (AWC) hosted a presentation of the climate survey findings and subsequently met with Abigail Stewart to discuss ways in

which it might create programs that foster better mentoring of junior women faculty in science and engineering.

*The Women's Advisory Committee of the College of Engineering* has shared some of the substantial body of data it has collected on the employment and attrition of women faculty in engineering at the UM with ADVANCE.

*The Committee on the Economic Status of the Faculty* met with Abigail Stewart to share ideas about how to interpret and monitor data on salary equity among the faculty.

*Professor Lynn Walter* of the Geological Sciences department invited ADVANCE to collaborate with her in bringing Allison Macfarlane to the UM to talk about the role of women in academic geology. Macfarlane gave her talk in October, 2002.

## **B. ACTIVITIES AND FINDINGS**

### **Research and education activities**

*The Survey of Academic Climate and Activities* was conducted in fall, 2001. The study compared women scientists and engineers with two other groups: men scientists and engineers and women social scientists. The survey findings have been presented to 24 on-campus audiences: eight departments, ten administrative groups, and six other audiences, including large groups of women science and engineering faculty and the faculty of a social science research institute. The first report based on these findings was released on September 26, 2002, at a kickoff event featuring a talk by incoming University of Michigan President Mary Sue Coleman and attended by nearly three-hundred people. It is available on the project website.

While the primary climate report outlines differences in the academic climate for men and women science and engineering faculty, we have also produced a second climate report on findings regarding race and ethnicity. This draft report has been circulated for comments and is currently under revision. It will be released during the winter term, 2003.

*A space analysis* also began in fall, 2001. After gathering preliminary data from UM databases, Janet Malley and other ADVANCE staff members matched their information to floor plans collected from the university. They then met with departmental administrators in person to ask for further information and corrections. In several cases, they contacted faculty directly to ask about the size, nature, and location of offices and laboratories. Analyzing the resulting data has proven to be difficult, due to the small number of female faculty relative to the numbers of male faculty. Members of the ADVANCE Evaluation Advisory Committee, along with other consultants, have suggested several approaches to working with the data.

*A salary analysis* is also underway. The University of Michigan completed a university-wide salary equity study in 2001. Member of the ADVANCE staff are working with university administrators to refine the analysis for science and engineering departments.



As noted above, Abigail Stewart has presented the *climate survey results* to 24 on-campus audiences: eight academic departments, ten groups of chairs, deans, and other administrators, four groups of women faculty, faculty at the Institute for Social Research, and the large general audience that attended the kickoff event on September 26, 2002. She has held follow-up discussions with individual chairs, search committees, and groups of faculty interested in crafting applications for the Departmental Transformation Grant. ADVANCE staff have also held follow-up discussions with three groups of instructional track science and engineering faculty women who wished to offer policy recommendations to the university's provost.

### **Major findings resulting from these activities**

*Climate survey findings regarding gender* show that in many areas pertaining to career patterns and satisfactions, and in terms of the relationship between climate and satisfaction, women and men science and engineering faculty at UM are similar. However, they differ in household composition, with the women scientists and engineers more likely than the men to be members either of two-career households or solo households, which makes professional/personal issues more important for them. In this respect, the women are similar to women social scientists.

Women scientists and engineers experience a more negative work environment than men in these fields or women social scientists do. The particular deficits for women include less robust counter-offers, higher service demands, inadequate mentoring, and chilly departmental climates. They report high levels of gender discrimination and sexual harassment. In most (but not all) of these respects, things are worse for women scientists and engineers than women social scientists.

- While men scientists and engineers reported an average of nearly 5 male mentors in their department, women reported an average of just over 2 male mentors in their departments, a significantly lower number.
- Women scientists and engineers reported an average of over 3 *areas* of no mentoring, compared to less than 1 for men scientists engineers and 1-2 for women social scientists at the same rank.
- Fewer than half of women scientists and engineers reported any mentoring of any kind in five of the eight mentoring areas: networking, department politics, obtaining resources, advocating for me, balancing work and family.

Over 41% of the women scientists and engineers, but only 4% of the men, reported experiences of gender related discrimination in the past five years at UM in at least one of the following areas: hiring, promotion, salary, space/equipment or other resources, access to administrative staff, graduate student or resident/fellow assignments. Women social scientists at UM reported levels of gender discrimination nearly as high, slightly over 35%. In each of three areas (salary, promotion and resources), over 15% of women scientists and engineers reported having experienced gender discrimination at UM within this five-year period.

About 20% of women scientists and engineers reported having experienced unwanted and uninvited sexual attention at UM during the past five years, compared to about 13% of women social scientists and just over 5% of men scientists and engineers. Over 38% of women scientists and engineers, 29% of women social scientists and 21% of men scientists and engineers reported that others have informed them of instances of unwanted and uninvited sexual attention.

*Climate survey findings regarding race and ethnicity* show few differences in professional experience, household characteristics, and career experiences and satisfactions between faculty of color and white faculty in the sciences and engineering. They reported significant differences, however, in perceptions of the work environment. Scientists and engineers of color experience a less positive climate than their European-American colleagues. One in four instructional track science and engineering faculty of color reported experiencing racial discrimination at UM within the past five years; among research and clinical scientists and engineers of color the rate was 40%. Furthermore, compared to white science and engineering faculty, scientists and engineers of color reported higher levels of tokenism, and a higher frequency of racial and religious stereotyping. Both tokenism and typecasting are referred to as covert racism in the literature, and linked to feelings of marginalization reported by faculty of color on university campuses (Johnsrud & Sadao, 1998).

There is evidence that among faculty of color at UM, female scientists and engineers on the instructional track, and across tracks, fared less well than male scientists and engineers or female social scientists, and research/clinical faculty encountered a more hostile environment than faculty on the instructional track. In this way, the gender and track findings discussed here largely parallel those observed among UM science and engineering faculty as a whole.

### **Opportunities for training and development**

*Women Talking Science and Engineering (WTS&E)* is a seminar offered by Jane Hassinger, director of the Interdisciplinary Program in Feminist Practice. Participants spend twenty hours discussing their own work lives, readings selected by Hassinger, and strategies for success in dealing with the difficulties confronted by women science and engineering faculty. The six participants in the first seminar, held in May 2002, included both instructional track and research track faculty who came from the Medical School, the School of Nursing, the School of Public Health, and the Institute of Gerontology. The ten participants who attended the second seminar, held in August, 2002, came from the College of Engineering, the School of Dentistry, the College of Pharmacy, the School of Nursing, and the School of Medicine. Several of the participants in each seminar requested the opportunity to meet again for future discussions. A dinner for past seminar participants was held on November 18, 2002, and was attended by twelve women.

*The Committee for Science and Technology Recruiting to Improve Excellence and Diversity (STRIDE)* is composed of eight outstanding full professors in science and engineering fields. There are five men and three women on this committee, representing the College of Literature, Science and the Arts, the College of Engineering, and the

School of Medicine. These faculty members have undergone three half-day training sessions to review research on how to improve the recruitment of women and minority faculty in science and engineering. They developed their own plan for approaching departments and search committees during the coming academic year and revised the recruitment handbook drafted by ADVANCE staff. They met with the deans of LSA, Engineering, and Medicine (all of whom are members of the ADVANCE steering committee) in August 2002, to discuss hiring priorities and practices for the coming academic year. Since then, they have given their presentation to 3 groups of departmental chairs and program directors, in LSA, Engineering, and Medicine and to 13 full departments or search committees. STRIDE has been invited to give its presentation to a group of university administrators during the winter semester, 2003.

*A Negotiation Workshop* conducted by Barbara Butterfield, Chief Human Resource Officer for Academic and Staff Human Resources and Affirmative Action at the University of Michigan, and Jane Tucker, Senior Manager, SAP - Administration Systems Management Group at Duke University, was offered to the Network of Women Scientists and Engineers during the fall term. twenty women participated in the workshop. Another workshop will be held during the winter term, 2003.

### **Outreach activities**

*The University of Michigan's Dearborn campus* has asked our staff for help in adapting our climate survey for their faculty, administering the survey, and analyzing the resulting data. UM-Dearborn's chancellor has approved the project and Janet Malley drafted a budget to help them with their funding application. Janet Malley and Julie Stubbs revised the ADVANCE climate survey to accommodate UM-Dearborn's different faculty demographics, and Lynne Schaberg has administered the survey. Malley and Schaberg will analyze the data during the winter term, 2003.

A group of faculty and students in the Medical School called *Moms in Medicine* asked ADVANCE for help in circulating a petition for more childcare facilities. We were able to circulate the petition through an email network we have created for instructional track women science and engineering faculty and another email network the Provost's office created for women faculty on the research track. Abigail Stewart met with the Moms in Medicine group to talk about the findings from the climate survey and to help the group strategize about ways of improving the childcare situation on the medical campus.

*Women faculty on the Primary Research track (PRS)* have expressed a strong interest in the ADVANCE project's programs and network. With the help of Professor Pamela Raymond (Co-PI and steering committee member), ADVANCE has been able to offer the PRS women faculty a presentation of the climate survey results and an opportunity to transmit their views about the findings to Provost Paul Courant. The Provost's Office has also created an email network for the PRS faculty.

*The Institute for Social Research*, a large social science research institute at the University of Michigan, invited Abigail Stewart to give a presentation on the climate

survey results to a group of faculty. Three faculty members from the Institute for Social Research offered commentaries on the climate survey and its findings at this event.

*The Barbour Scholarship*, which funds a year of study for Asian women working toward doctorates at the University of Michigan, held its first fall luncheon in November, 2002, in order to begin thinking of ways to promote networking among its students when they return to their home countries. Danielle LaVaque-Manty gave a presentation on ADVANCE and the Network of Women Scientists and Engineers at this event.

Danielle LaVaque-Manty went to a conference on *Retaining Women in Early Academic SMET Careers* at Iowa State University in October to give a presentation on the project's Departmental Transformation Grant and STRIDE committee. ADVANCE has received several inquiries about how STRIDE works from other institutions.

### **C. PUBLICATIONS AND PRODUCTS**

The *Report of the Findings from the University of Michigan 2001 Survey of Academic Climate and Activities for Women Scientists and Engineers* became available on the project's website on September 26, 2002. Three hundred copies of a public summary were also distributed at the kickoff event on September 26.

A report called *Assessing the Academic Work Environment for Faculty of Color in Science and Engineering: UM Survey of Academic Climate and Activities* is under revision and will be released during the winter semester of 2003.

A *Faculty Recruitment Handbook*, developed by ADVANCE staff in cooperation with the STRIDE committee, became available on the ADVANCE website in September, 2002. Hard copies have been distributed to chairs and directors in the College of Engineering, School of Medicine, and the College of Letters, Science, and the Arts. They have been distributed to search committees or to the entire faculty in each of the 12 departments to which the STRIDE committee has given its presentation. Forty-five copies of the handbook were recently distributed to the University of Michigan Press, to aid in the Press's efforts to diversify its staff.

The ADVANCE staff and STRIDE committee have created a *recruitment training presentation* offered by STRIDE in its efforts to educate chairs and search committees about better recruitment practices. Clips from a video of Virginia Valian's presentation on the advancement of women in science, offered at Rice University in March, 2001, have been integrated into the presentation. Copies of the presentation have been requested by 3 other institutions.

*NSF ADVANCE at the University of Michigan* launched a website describing our project and programs on March 11, 2002. The website also offers annotated bibliographies on women in science and engineering. A copy of the survey instrument used to conduct the climate study in fall, 2001 is available on the site, along with the complete climate survey

report, a handout on best practices for retaining women faculty, and a faculty recruitment handbook. The site can be found at <http://www.umich.edu/~advproj>

The *Network of Women Scientists and Engineers*, composed of all instructional track, tenured and tenure track women faculty in science and engineering at the University of Michigan, has two email groups that are maintained by ADVANCE staff. One, used strictly for announcing Network events, includes nearly all 260 of these faculty members. Another, used for ongoing online discussions, includes 36 active participants.

ADVANCE has created several *flyers and handouts* to advertise its programs. (Versions of each of these are also available on the web page.) These publicity materials have been distributed at each presentation of climate survey findings and each event for the Network of Women Scientists and Engineers. There are handouts for each of the following:

- Women Talking Science and Engineering
- Elizabeth Caroline Crosby Fund
- Departmental Transformation Grant
- Interactive Climate Theater
- Data-based Workshops for Disciplines
- Campus Climate Initiatives
- ADVANCE Committee Membership Roster
- STRIDE Committee

#### **D. CONTRIBUTIONS**

The *baseline research* we have conducted should enable us to determine how much difference our interventions have made at the conclusion of the five-year intervention period. The innovative design of our climate survey, comparing women science and engineering faculty not only to men science and engineering faculty, but also to women social science faculty, has allowed our researchers to distinguish issues particular to women in science and engineering from those that are common to all women in academe, or to all scientists and engineers. Copies of the survey have been requested by several groups and individuals in and outside the university (e.g., other ADVANCE recipients, the UM-Dearborn campus, individual UM units and departments) for further data collection purposes.

The *report on the results of the climate survey* has been distributed widely on campus and elsewhere. Findings from the report were cited in *Science Magazine* on October 11, 2002 and have been covered in the *Ann Arbor News*.

The *Elizabeth Caroline Crosby Fund* has already awarded grants to seven women faculty members in science and engineering at the UM. Two of these women had non-traditional proposals that were unlikely to be funded by other grant sources, one needing help to redress a sudden change in career track (from research track to instructional, tenure track) that was not accompanied by the appropriate resetting of her tenure clock, and the other

wishing to increase the visibility of women working in the field of materials science and engineering. All seven recipients hope to improve their chances for tenure or promotion through the research funded by their Crosby grants. Over the next few years, it should be possible to tell whether Crosby Fund awards do in fact contribute to the retention and promotion of women science and engineering faculty.

We received twelve proposals for *Departmental Transformation Grants* from a total of 15 participating departments. Three proposals received the awards. One grant of \$165,000 will be shared by the Departments of Chemical Engineering and Materials Science and Engineering, which offered an innovative joint proposal that included an element of team mentorship in order to help generate critical mass for the women in these two departments. A smaller, \$70,000 grant will help the Department of Electrical Engineering improve its recruiting practices. A \$235,000 grant was awarded to the Department of Chemistry, to implement a comprehensive proposal that included research on the departmental climate, and innovative recruitment plans. Separate funds have also been used to make small awards to departments from the College of Literature, Science, and the Arts that applied for a Departmental Transformation Grant that did not receive one. In each case, College funds were allocated to address the part of the proposal that seemed best directed at initiating a transformation process. The hope is that departments that make progress over the next year will be able successfully to propose how to use further funds to advance the process.

The *Network of Women Scientists and Engineers* has held 6 events to date, offering women science and engineering faculty the opportunity not only to meet each other in a setting outside their particular departments, but also to make policy recommendations to the Office of the Provost. Many of the women participating in Network events have been grateful for the opportunity to meet one another. They participate actively in an online discussion group maintained for them by the ADVANCE staff, and they regularly bring information and issues to the attention of the project PI, Abby Stewart.

#### *Integration of ADVANCE issues into the administrative system*

- This has been fostered by Abigail Stewart's recent appointment to the position of Associate Dean for Academic Affairs in the College of Letters, Sciences, and Arts. Stewart is able to facilitate recruitment, hiring and retention efforts directly in this role. In addition, she is sometimes able to encourage or support efforts to institutionalize helpful practices. For example, the college is creating a database on startup and retention packages that will enable it to detect monitor any systematic inequities in these allocations in the future.
- The College of Literature, Science, and the Arts has awarded small grants to each of the 7 LSA departments that did not receive a full ADVANCE grant, in order to allow each department to implement at least one of its proposed ideas.
- In response to the STRIDE committee's request, and thanks to Professor and co-PI Pamela Raymond's participation in STRIDE, the Provost's office has agreed to regularize the distribution of information packets containing policies regarding

dual career and maternity policies to all candidates who come to the UM for job interviews. In addition, the College of Literature, Science, and the Arts has already produced an information packet of its own. (The fact that a great many women faculty who currently work for the UM do not know what the university policies actually are has been made clear through survey responses, comments from chairs of departments, focus group interactions, and complaints from members of the Network of Women Scientists and Engineers.)

- Pamela Raymond's presence on the Steering Committee has ensured integration of ADVANCE issues in many Provost's office contexts. When she left her position as Associate Provost (but not the Steering Committee), she was offered a continuing title as Senior Counselor to the Provost that has permitted her to continue to serve as a crucial liaison to central administration. The fact that Pamela Raymond is a woman scientist in the Medical School has also ensured that this project has visibility and credibility within the basic science departments of that School.

## SECTION III: REPORT ON BASELINE INDICATORS

### A. OVERVIEW

As requested by NSF, information on various outcome measures was collected for all science and engineering faculty at the University of Michigan and is included in this report. This first year of data collection is considered the baseline assessment; we selected March, 2001 (or more generally academic year 2000-01)--prior to the start of the NSF project--as the effective date of data collection. Primary data collection efforts focused on faculty in the College of Engineering, the 7 science departments in the College of Literature, Science & the Arts (astronomy, biology, chemistry, geological sciences, mathematics, physics and statistics) and the 6 basic science departments in the Medical School (biological chemistry, cell & developmental biology, human genetics, microbiology & immunology, pharmacology, and physiology), since they are the academic homes of most science and engineering faculty on campus. We have the most complete information from these schools. In addition, information was obtained about the science and engineering faculty affiliated with seven smaller schools: Dentistry, Information, Kinesiology, Natural Resources & Environment, Nursing, Pharmacy, and Public Health. These faculty were identified as scientists based on their field of highest degree; schools were asked to confirm our identifications.

All demographic data were compiled and are presented in the following tables in raw, unanalyzed form. Some information is unavailable or has not yet been obtained; instances of missing data are noted in the tables. We continue to check and update the information, and can provide more complete data at a future date.

It is important to note that these data, as reported, are not particularly informative or meaningful in this raw, unanalyzed form. More careful analyses with appropriate controls are necessary to understand the data better. For example, we could report results of regression analyses, including important agreed-upon controls (such as rank, years of service, field) to assess gender differences within and across schools in the different areas identified by the outcome measures. Alternatively, we could supply NSF with a raw data file (using the individual faculty member as the unit of analysis and including all outcome variables as well as important control variables) that would allow for similar analyses across NSF-ADVANCE projects.

### B. DATA SUMMARIES

#### Description

Basic demographic and corollary information was obtained for all science and engineering faculty in the 10 schools for academic year 2000-01, including the following:<sup>1</sup>

- number and percent of women and men S&E faculty in each department/unit by track (tenure, research, clinical) and rank;

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<sup>1</sup> These data, broken down by department/unit, were reported to the NSF. To minimize identification of individual faculty members, we only include data by school in this report.



- average years at UM and average years in rank for women and men S&E faculty in each department/unit by track and rank;
- number and percent of women and men S&E faculty in administrative positions;
- number and percent of women and men S&E faculty in named/ endowed chairs;
- number and percent of women and men S&E faculty serving on department and college promotion and tenure committees (Engineering, LSA and Medicine faculty only);
- average FTE salary of women and men S&E faculty in each department/unit by track and rank (Engineering, LSA and Medicine faculty only);
- average space allocation to women and men S&E faculty in each department by track and rank (Engineering, LSA and Medicine faculty only);<sup>2</sup>
- average funding as principal investigator for women and men S&E faculty in each department by track and rank (Engineering, LSA and Medicine faculty only). *This was not required by NSF but was used to assess research space allocation.*; <sup>2</sup>
- start-up packages for new tenure track faculty (Engineering and LSA faculty only).<sup>2</sup>

Because these data are considered baseline, we did not compile information on attrition and tenure/promotion outcomes, but will do so in subsequent years. However, we could obtain this data if needed. The data tables are included at the end of this report.

### **C. PRELIMINARY ANALYSES: SPACE & SALARY**

During academic year 2000-01 a significant effort was made by this NSF-ADVANCE staff to determine if there were gender inequities in the allocation of research space to science & engineering faculty on the UM campus in Engineering, LSA and Medicine. Following is a summary of these analyses. In addition, in 1999 the University conducted an analysis of salaries for tenure track faculty campus-wide (excluding Medicine) also to assess potential gender inequities; these data have been reanalyzed, looking specifically as the science and engineering faculty salaries for this time period. A copy of that report is included as an addendum to this report (following fastlane instructions, is it being sent by mail). We hope both of these reports are helpful in identifying some of the complexities associated with efforts to analyze this kind of data statistically and will

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<sup>2</sup> Data for space, funding and start-up, were reported to the NSF. For reasons of confidentiality for individual faculty members, we do not include these data in this report.

contribute to the on-going discussions concerning methods of evaluation among NSF-ADVANCE project members.

### **Space Allocation Data Collection**

The primary goal of this data collection effort was to obtain baseline information as of March 1, 2001 on the amount of office and research space (in square footage) allocated to all faculty on the instructional, primary research, and clinical tracks in the 7 science departments in the College of Literature, Science and the Arts (LSA) (astronomy, biology [later divided into two departments: ecology and evolutionary biology and molecular, cell and developmental biology], chemistry, geology, mathematics, physics and statistics), 6 basic science departments in the Medical School (MED) (biological chemistry, cell and developmental biology, human genetics, microbiology and immunology, pharmacology, and physiology), and all 13 departments in the College of Engineering (COE). The goal was to use these data to identify any gender difference in the allocation of space, taking account of individual differences such as rank and level of external funding.

***Space Allocation Data Collection Procedure:*** Given the large scope of the project, we took as a starting point information already available through university administrative offices. During the summer of 2001 three types of administrative information were obtained:

- **university's space survey database.** The space survey includes all space in the university by building and room number. Each room is assigned to a department. It is labeled with its square footage and is coded according to its use (e.g., office, research/lab, classroom). While the practice varies across units, some departments also identify the individuals assigned to their rooms. Project staff used this information to identify all space allocated to each of the departments under review, including square footage for each room, as of March, 2001, when the last survey was completed.
- **floor plans.** Building floor plans for all relevant buildings were obtained from the University's facilities office, and, using information from the space survey, department space was plotted on to these plans. Any information about room occupants obtained from the university space database was transferred to the plans.
- **faculty rosters.** Administrative offices in the three schools provided name and rank of all instructional, primary research track and clinical track faculty, by department, also as of March, 2001.

These data were summarized according to department. Beginning in October, 2001 project staff met individually with department representatives (usually the key administrator and often including the chair or associate chair as well) to review and correct information we had collected on faculty membership and space allocation for that department. We also requested that a senior female faculty member in the department be present at the meeting; for various reasons (e.g., there wasn't one in the department or, if

there was, she was too busy to join the meeting), this often did not happen. In these meetings, we asked department representatives to identify space specifically occupied by faculty (both office and research/lab space) and any other space assigned to them and used for their research (e.g., where their graduate students and/or post-docs were housed). This sometimes meant walking through the department to review the space and make assessments about allocations. In cases where space was shared by two or more faculty, we asked administrators to estimate the percentage of the room used by each faculty member. We also asked administrators to identify the department's core research space (such as cold rooms, dark rooms, etc.) that are available for everyone's use. Research space considered a core resource by the department was coded separately and not allocated to individual faculty. Efforts were made to understand space assignments and use of all space allocated to each department.

Data were compiled for individual faculty members within each department. In cases of faculty with joint appointments, and space allocated by multiple departments, space information was pooled across departments and attributed to individual faculty.

Once Advance staff finalized the information by department, it was sent to the departments for verification and correction. This sometimes required a second meeting with department administrators to clarify space allocations and/or seek out additional information. This work was completed in the spring, 2002.

***Problems Encountered:*** Working closely with individual department administrators helped ensure that we compiled the most accurate information possible on space allocation to individual faculty members. However, this process also revealed important differences across departments that have important implications for the data.

- **Assigning “Ownership”:** Departments clearly think differently about what space is “assigned” to an individual faculty member and what space is reserved as departmentally owned. For example, several departments house all graduate students together in large offices with individual carrels. The students generally do not use this space for research activities and, consequently, these offices are not considered part of any individual faculty member's research space. In other departments, graduate students are clearly assigned to faculty and space allocated to graduate students is considered part of the faculty members' space allocations. Similarly, some department chairs considered what might have been core department research space as belonging to the few individuals who were actually using the space at that time; in other departments core space was never assigned to individuals regardless of actual use. In all instances, we let the individual department's policies and practices concerning space guide the assignment of space to faculty within that department. This means that similar circumstances in space usage may have been coded differently in different departments.
- **Non-University Research Space:** Other potential problems were revealed in these meetings, particularly in trying to learn about faculty research space outside the University campus. Generally, department administrators only know about space

assignments for space allocated to their departments. However, it was not uncommon for faculty to have access to research space outside the department. If that space was in another department we were often able to track it down. However, some faculty have access to research space beyond the University. For example, some Medical School faculty have access to space at other medical facilities like the Veteran's Administration Hospital. Other faculty have access to field camps locally and nationally to conduct research. While we attempted to locate all space allocated to faculty in and outside of the University, this was not always possible. Moreover, acres of field research space could not reasonably be converted to square footage.

- **Quality of Space:** One important variable that has serious implications for an individual's ability to carry out a research program beyond the amount of space available is the quality of that space and research equipment. While a systematic assessment of the quality of space was clearly far beyond our capacity to collect, we did receive significant anecdotal evidence that it is an important factor that needs to be considered. For example, some faculty described lab space that was newly renovated to their specifications when they came to the university and has not presented any problems. Other faculty reported problems such as old equipment, leaking ceilings, space that was isolated from departmental support staff or core equipment, and non contiguous research space making some research impossible (i.e., because dangerous materials could not be transported from one lab space to another).
- **Informal Space Sharing:** It was not unusual in our discussions with administrators to learn that while space had been officially assigned in one way, it was actually being used quite differently by the faculty. Where we knew about informal sharing, space was allocated as it was being used in our data set. However, it is clear that having space formally assigned to you is quite different than having access to space that "belongs" to a generous colleague. Moreover, it is likely that we did not learn of all instances of informal space sharing.

### **Grant Funding Data Collection**

Information on external grant funding was obtained through the University's Division of Research Development and Administration (DRDA) database. Information was obtained about total dollar amount of each current externally funded project (both as PI and co-PI) for every faculty member in the relevant departments, as of March 1, 2001. A total amount of external funding was calculated (separately for PI and co-PI) for each faculty member. We compared the information we obtained through this data source with department information in three test departments (one from each school). Generally we found the information we obtained through DRDA to be consistent with the department data we examined.

### **Data Analysis**

SPSS data files were created for each school (Engineering, LSA, Medicine) with the individual faculty member as the unit of analysis. Information for each faculty member included: department affiliation, track & rank, total square footage of space assigned, level of external funding (as PI, as co-PI and total), number of years at UM, number of

years in current position, age and gender. A fourth data file was created combining information from the three individual schools (and including a school variable).

Prior to reporting on statistical analysis of these data it is important to note some serious limitations of these data. Of particular concern are two problems that challenge the validity and reliability of our findings.

- Different needs for space:** One problem that was raised with us several times by department administrators is that, even within disciplines, need for research space can vary dramatically; a theorist, for example, generally requires much less physical space to conduct research than an empiricist who works with large equipment. We tried to address this problem by creating a comparison sample of similar researchers. As a test case we asked women scientists in Engineering to identify two male colleagues who do research similar to them (have similar needs) and who are at the same rank/stage in their careers. Unfortunately, only 17 (of the 36) women were willing and able to identify even one person and most of them were skeptical of the comparisons they did identify. Given the difficulty in identifying and obtaining this information, and the likelihood that there were systematic differences between the minority of women who did provide comparison cases and the majority who did not, we did not pursue these analyses.
- Sample Sizes:** Another important complication is that the sample size for female faculty in each school is much smaller than that for men; with such a small sample of women, the usual comparisons of means (t-tests, regressions) that we conducted are problematic. Professor Richard Gonzalez of the Psychology Department, and a member of our Evaluation Advisory Committee, agreed to do some preliminary analyses with a limited set of variables (total amount of external funding, total square footage, gender, and age) for data on one school (Engineering), to try to evaluate the possibility that some alternative analytic approaches would be fruitful. The results of his analysis are included below.

*Descriptive Statistics:* Analyses were conducted with data from all faculty on the instructional tenure track (N=660). The gender breakdown by school is as follows:

<b>N OF FACULTY:</b>	<u>Males</u>	<u>Females</u>	<u>Total</u>
Engineering	265	31	296
LSA	224	28	252
Medicine <sup>3</sup>	<u>86</u>	<u>26</u>	<u>112</u>
Total	575	85	660

Preliminary analyses (t-tests) comparing mean square footage between men and women within and across schools demonstrated no gender differences. Table 14 at the end of this report provides mean values of square footage within department by rank and gender. Means, medians and ranges of square footage by school and gender are as follows:

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<sup>3</sup> These figures reflect faculty from the six “basic science” departments in Medicine only.

**SQUARE FOOTAGE:**

	<u>MEAN</u>		<u>MEDIAN</u>		<u>ST. DEV</u>		<u>RANGE</u>	
	Males	Females	Males	Females	Males	Females	Males	Females
Engineering	1,029	1,011	442	1,002	1,323	683	0-8,364	89-2,564
LSA	1,252	1,124	755	858	1,377	1008	0-8,803	113-4,680
Medicine	1,407	1,407	1,326	1,329	782	505	0-4,049	0-2,400

Again, the large differences in samples sizes between the men and women should be noted. In addition, while mean square footage is consistent between the two groups within schools, the ranges are much narrower for the women in all three instances. This difference in variability is problematic and challenges the reliability of these findings as well as the regression analyses reported below. These issues are addressed in more detail in the analyses conducted by Professor Gonzalez with the data from Engineering and reported later in this section.

*Regressions:* Because both rank and level of external funding are important factors affecting amount of research space a faculty member may have, regressions were calculated separately by school to assess the effect of gender on total square footage, controlling for rank (assistant, associate, full) and level of external funding as a Principal Investigator (total dollar amount; similar analyses were run substituting total external funding—funding as Principal Investigator and funding as Co-Principal Investigator--with similar results). Table 15 at the end of this report provides mean values of external funding with department by rank and gender. Means, medians and ranges of external funding by school and gender are as follows:

**GRANT FUNDING (in thousands):**

	<u>MEAN</u>		<u>MEDIAN</u>		<u>ST. DEV.</u>		<u>RANGE</u>	
	Males	Females	Males	Females	Males	Females	Males	Females
Engineering	1,366	833	474	415	3,118	1,309	0-30,050	0-6,786
LSA	716	480	238	96	1,713	827	0-17,431	0-3,966
Medicine	2,582	2,407	1,761	2,113	3,387	1,693	0-24,290	0-6,580

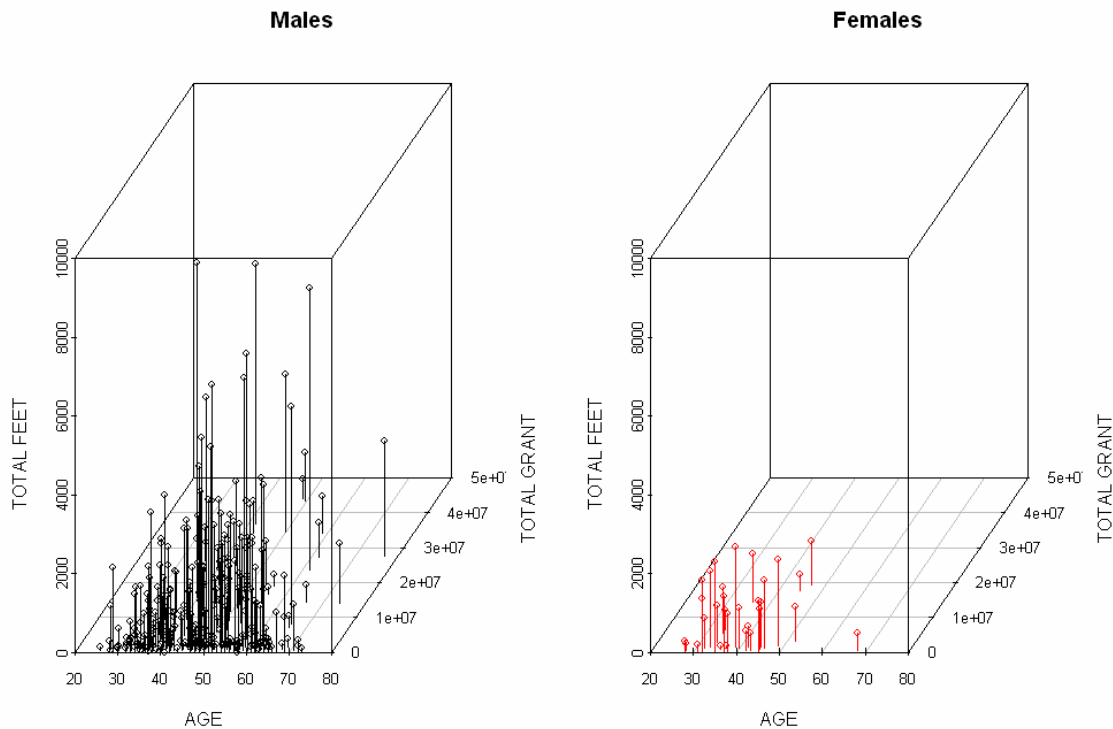
Since need for space can vary depending upon disciplines, department dummy variables were included in these regressions. A similar regression using the all school data file was calculated, including dummy variables for school instead of department. The models for all four regressions were significant and both rank and level of external funding were significantly positively associated with total square footage of space in all cases, but gender was not. Further analyses tested the interaction of gender on rank; these also were not significant.

The model (with school, rank and funding as predictors) was repeated separately for the two gender groups (without gender as a variable) using the combined schools data file; these analyses were not done within school as the number of women in each of these samples is so small. Again, in both cases the overall model was statistically significant. However, rank and level of external funding were statistically significant predictors only

with the sample of men, suggesting that these two variables may play a less critical role in the allocation of space for women.

*Multivariate and Distributional Descriptive Statistics:* Professor Gonzalez attempted to visualize these data in multiple dimensions simultaneously using modern visualization software that permits rotation and brushing. The reason for examining the data more completely is that the usual descriptive statistics such as the mean and standard deviation, while useful summary measures, may not provide a complete picture of whether the distributions differ between men and women. There may be systematic differences between men and women that are not easily recognized by summary measures.

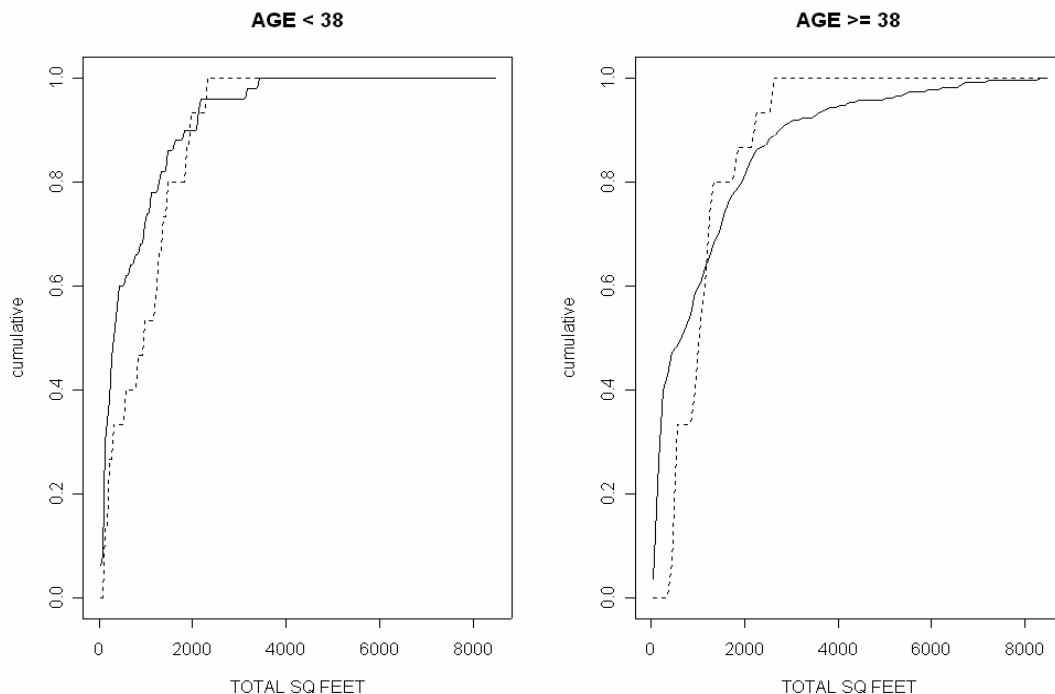
Focusing only on the engineering data, Gonzalez performed 3d plots looking at several combinations of variables. For example, he produced 3d plots separately for men and women of total square feet, age of the faculty member, and total grant dollars. These 3d plots suggest that the data for the women are essentially a subset of the data for the men in the following sense: for younger faculty the space data for the men and the women are almost identical, but for older faculty there is a divergence, with men having more space than women. This suggests that age will be an important variable to control in subsequent analyses. Obviously, age correlates with other important variables such as rank and level of external funding.



Gonzalez then examined the cumulative distribution for total square feet. The cumulative plot by itself showed very little difference between men and women. It appears that the lower 20% of women have more square footage than the lower 20% of the men, and the upper 90% of women have less square footage than the upper 90% of men. To understand whether or not the distribution for women (based on an N of 30) was likely to

have arisen from a distribution characterized by the 283 males he ran a small simulation. Using a population distribution very similar to the one for the sample of males, he generated a few datasets consisting of two groups with sample sizes of 280 and 30. He found that the discrepancy between the distributions for the two groups in the simulations was similar to that in the observed data. Therefore, we can't rule out sampling variability as an explanation for the discrepancy between the male and female distributions.

However, a small gender difference emerges when the same cumulative plots were computed controlling for age. As a first pass through the data, Gonzalez computed the same cumulative plots separately for faculty below the median age and faculty at or above the median age (38 years). In the figures below, the dotted line represents women faculty and the solid line represents men. The cumulative plots suggest that it is the older males in the upper 50% that have a higher cumulative curve than the females (the curve for males is northwest of the curve for females) but for younger faculty there does not appear to a gender difference pattern. Admittedly, the differences are small and may not be different from discrepancies due to sampling variability alone. We are in the process of examining more focused tests. Note that the cumulative curve for the older women resembles the curve both younger men and younger women—it is the older men that appear to have a different cumulative curve for total square feet.

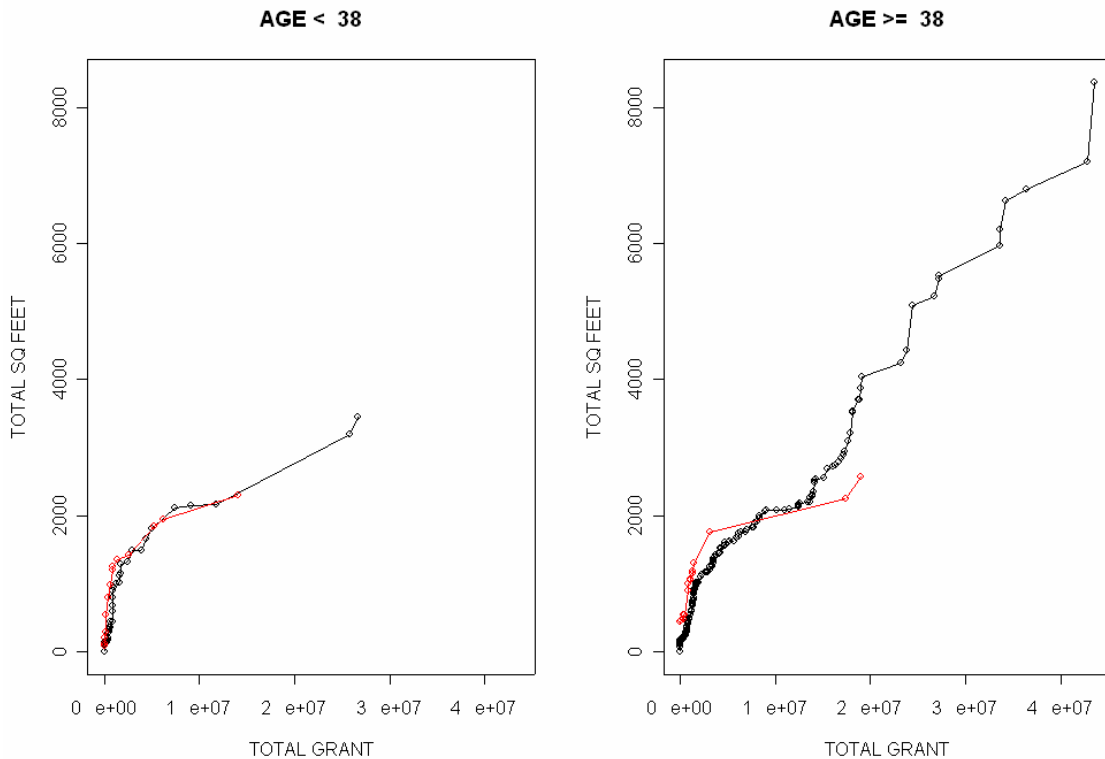


Analogous plots were calculated for the total external grant funding variable. The distributions for males and females are comparable at the low end, but at the upper 25% they begin to diverge. The top males have more grant funds than the top females. When we examine the same variable by the two age groups, we find that again the difference appears to be attributable to the top 25% of the older group. Note that for faculty below the median age, males and females have comparable total grant funds. Overall, the



cumulative plots of the engineering faculty data show that for the younger faculty there do not appear to be any gender differences on space and external funding, but for older faculty a gender difference is present. Further, the older women resemble their younger male and female colleagues more than they resemble their own male cohorts.

QQ Plots: Cumulative plots examine one variable at time. QQ plots are a way to compare the cumulative distributions of two variables to each other. In this case the two variables are total square feet and total external funding. The logic is to observe how the cumulative distribution of one variable (e.g., the 40th percentile, the 50th percentile, etc) corresponds to the analogous percentiles on the other variable. Intuitively, linearity of the plot suggests the distribution of the two variables coincide (with slope and intercept corresponding to scaling). The interpretation of the results with these data, ignoring sampling variability, is that up to about 10 million dollars in total external grant funding, females have slightly more square footage than males. There is a relatively large region (roughly 5 million dollars in total external grant funding) where additional grant dollars do not translate into additional square footage. After about 15 million dollars in total grant funding, the square footage begins to increase again for the males; for women the sample is small, but those two women have less square footage than their male counterparts. There appears to be a “threshold” of sorts by which after one exceeds about 15 million in total grant money, the slope relating the percentiles of the two variables becomes steeper. Moreover, the rise in steepness can be attributed to the older male faculty in the sample. This was demonstrated by computing the qq plot separately for the two age groups (using the median split). Older males produced a different pattern starting at roughly 15 million dollars in total grants than the younger males and all females. In other words, for the older men an extra dollar in grant support (beyond 15 million in total grant money) translated into more square footage than the same dollar brought in by the few women (and the younger men and women) who were at the same level of total grant support.



These multivariate visualization tools are at the cutting end of multivariate statistics. Gonzalez will be exploring additional analytic techniques that not only will help visualize the data but will also allow hypothesis testing (something that, except for a small scale simulation, has not yet been performed on these data). Additional analyses using all the variables available (such as rank and department) will also be conducted. Similar analyses will be conducted with data from LSA and Medicine.

### **Salary Data Analysis**

In September 2001, the University of Michigan released the *University of Michigan Gender Salary Study*, based on an econometric analysis of salaries for tenured and tenure-track faculty at the Ann Arbor campus, but not including the Medical School. This statistical analysis used multiple regression models to predict salaries based on several factors known to affect pay, and including gender as a variable. When aggregated across all faculty, the analysis found no statistically significant gender effect when all controls were used (which may have over-controlled for variables correlated with gender), and a small but significant effect (on average, women are paid about 3% less than men) when rank and years in rank were omitted as control variables. The report suggested that the actual residual difference due to gender was between 1% and 3%.

At the request of the NSF ADVANCE project, parallel analyses on a subset of the original dataset, including only the science and engineering faculty, was conducted by the authors of the original study (Mary E. Corcoran, Professor of Political Science, Women's Studies, Social Work and Public Policy, Paul N. Courant, Professor of Economics and Public Policy, and Provost and Executive Vice President for Academic Affairs, and

Pamela A. Raymond, Professor of Cell and Developmental Biology, Senior Counselor to the Provost) and an addendum to the initial report was written. Because this report, *University of Michigan Gender Salary Study Addendum to the 2001 Report: Data Analysis on the Subset of Science and Engineering Faculty*, was not prepared by project staff, it is not included here. However, the subject matter of the report is central to the work of this project. Therefore, the findings are summarized below and a full copy of the report is attached to this report as an addendum.

The authors found that when the regression model with all controls was used, the analysis showed a small (3%), but not statistically significant gender effect. When rank and years in rank were omitted, the residual due to gender was significant: on average women science and engineering faculty were paid about 5% less than men. Following the logic of the previous study, these results suggest that the actual residual difference due to gender in the 1999 salary rates of scientist and engineering faculty at the University of Michigan was between 3% and 5%. A complete copy of that report was mailed separately as an addendum.

#### **D. BASELINE INDICATOR TABLES FOR 2000-01<sup>4</sup>**

Table 1: Tenure, Research and Clinical Track Faculty by Rank, Gender & School

Table 2: Faculty Length of Service/Time in Rank by Rank, Gender, & School

Table 3: Engineering: Named Chairs, Tenure/Promotion Committees, and Administrative Positions by Gender

Table 4: LSA: Named Chairs, Tenure/Promotion Committees, and Administrative Positions by Gender

Table 5: Medicine: Named Chairs, Tenure/Promotion Committees, and Administrative Positions by Gender

Table 6: Mean Salary—Engineering, LSA, Medicine by Rank, Gender & School

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<sup>4</sup> These data tables were corrected in December 2003; these corrected tables replace the earlier tables in this report. To minimize identification of individual faculty members, data are reported by College. Data reported by department were submitted to the NSF.

NOTES:

Please see p. 23ff. for discussion of limitations of data presented in these tables.

Engineering data based on faculty in all departments.

LSA data represents faculty in the 7 science departments as of 2000-01 (astronomy, biology, chemistry, geological sciences, mathematics, physics, and statistics).

Medical data represents faculty in the 6 basic science departments (biological chemistry, cell & development biology, human genetics, microbiology & immunology, pharmacy and physiology). Information on start up packages is still being collected for these faculty.

For all tables, empty cells indicate no faculty in that category.

**Table 1: Tenure, Research and Clinical Track Faculty (AY2001)  
All Departments**

**Tenure Track Faculty**

	FULL PROFESSOR						ASSOCIATE PROFESSOR						ASSISTANT PROFESSOR						TOTAL							
	males			females			males			females			males			females			males			females				
	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE
<b>ALL ENGINEERING</b>	168	145.43	96%	8	6.70	4%	56	51.38	83%	12	10.45	17%	37	36.95	79%	11	10.10	21%	261	233.76	90%	31	27.25	10%		
<b>LSA (Natural Science)</b>	159	138.11	95%	8	8.00	5%	35	32.53	78%	11	9.22	22%	29	27.50	77%	9	8.00	23%	223	198.14	89%	28	25.22	11%		
<b>MEDICINE (Basic Science)</b>	51	39.14	81%	11	8.92	19%	12	8.08	54%	7	6.91	46%	14	12.40	60%	9	8.10	40%	77	59.62	71%	27	23.93	29%		
<b>6 SCHOOLS</b>	65	58.00	87%	10	8.90	13%	48	41.90	77%	14	12.52	23%	18	18.00	53%	19	15.75	47%	131	117.90	76%	43	37.17	24%		
<b>TOTAL</b>	443	380.68	92%	37	32.52	8%	151	133.89	77%	44	39.10	23%	98	94.85	69%	48	41.95	31%	692	609.42	84%	129	113.57	16%		

**Research Track**

	RESEARCH SCIENTISTS**						ASSOC RESEARCH SCIENTISTS**						ASST RESEARCH SCIENTISTS						TOTAL							
	males			females			males			females			males			females			males			females				
	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE
<b>ALL ENGINEERING</b>	11	7.54	100%	0	0.00	0%	10	8.85	100%				32	30.20	88%	5	4.10	12%	53	46.59	93%	4	3.60	7%		
<b>LSA (Natural Science)</b>	2	2.00	67%	2	1.00	33%	9	5.64	100%	--	--	--	13	11.39	79%	4	3.00	21%	24	19.03	83%	6	4.00	17%		
<b>MEDICINE (Basic Science)</b>	1	0.50	33%	1	1.00	67%	2	1.60	100%	--	--	--	9	8.90	78%	4	2.50	22%	12	11.00	76%	5	3.50	24%		
<b>6 SCHOOLS</b>	--	--	--	2	1.25	100%	3	2.90	100%	--	--	--	11	7.92	65%	5	4.25	35%	14	10.82	66%	7	5.50	34%		
<b>TOTAL</b>	14	10.04	76%	5	3.25	24%	24	18.99	100%	0	0.00	0%	65	58.41	81%	18	13.85	19%	103	87.44	84%	22	16.60	16%		

**Clinical Track**

	CLINICAL PROFESSOR						CLINICAL ASSOC PROFESSOR						CLINICAL ASST PROFESSOR						TOTALS								
	males			females			males			females			males			females			males			females					
	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%	N	FTE	%
<b>ALL ENGINEERING</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>LSA (Natural Science)</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>MEDICINE (Basic Science)</b>	--	--	--	--	--	--	--	--	--	1	1.00	100%	--	--	--	--	--	--	--	--	--	1	1.00	100%	--	--	--
<b>6 SCHOOLS</b>	4	3.50	100%	--	--	--	10	9.50	64%	7	5.30	36%	13	11.70	42%	17	16.33	58%	27	24.70	53%	24	21.63	47%			
<b>TOTAL</b>	4	3.50	100%	0	0.00	0%	10	9.50	60%	8	6.30	40%	13	11.70	42%	17	16.33	58%	27	24.70	52%	25	22.63	48%			

Note: Ns do not include faculty with 0 FTE appointments in the department; Percentages based on FTE.

\*\*Senior Research Scientists and Research Scientists are reported as a single category, "Research Scientists";

Senior Associate Research Scientists and Associate Research Scientists are reported as a single category, "Assoc Research Scientists"

**Table 2: Length of Service for Tenure, Research and Clinical Track Faculty (AY2001)**

**Average Time (in Years ) in Rank**

**Tenure Track Faculty**

	PROFESSORS		ASSOC PROFS		ASST PROFS	
	males	females	males	females	males	females
ALL ENGINEERING	12.30	4.53	5.84	4.61	2.43	3.02
LSA (Natural Science)	14.82	5.40	6.88	3.70	3.26	1.76
MEDICINE (Basic Science)	16.20	9.33	3.22	5.07	3.52	5.02
6 SCHOOLS	17.59	10.82	11.04	7.04	5.80	5.86

**Research Track Faculty**

	RESEARCH SCI**		ASSOC RES SCI**		ASST RES SCI	
	males	females	males	females	males	females
ALL ENGINEERING	6.69	--	4.76	--	3.13	2.74
LSA (Natural Science)	6.00	15.50	4.65	--	4.79	6.95
MEDICINE (Basic Science)	3.50	3.50	3.00	--	4.13	5.83
6 SCHOOLS	--	0.41	2.30	--	4.04	4.22

**Clinical Track Faculty**

	CLINC PROF		CLINC ASSOC PROF		CLINC ASST PROF	
	males	females	males	females	males	females
ALL ENGINEERING	--	--	--	--	--	--
LSA (Natural Science)	--	--	--	--	--	--
MEDICINE (Basic Science)	--	--	--	0.90	--	--
6 SCHOOLS	5.87	--	6.79	5.75	8.04	6.26

**Average Time (in Years) at UM**

	PROFESSORS		ASSOC PROFS		ASST PROFS	
	males	females	males	females	males	females
ALL ENGINEERING	20.09	8.45	11.22	8.10	2.97	2.64
LSA (Natural Science)	23.33	14.97	11.68	7.52	3.57	1.83
MEDICINE (Basic Science)	25.18	20.84	9.54	15.44	4.01	6.09
6 SCHOOLS	26.45	26.25	15.35	13.23	6.29	6.59

	RESEARCH SCI		ASSOC RES SCI		ASST RES SCI	
	males	females	males	females	males	females
ALL ENGINEERING	14.85	--	9.36	--	6.01	7.76
LSA (Natural Science)	22.02	27.63	10.56	--	9.75	9.70
MEDICINE (Basic Science)	10.83	25.50	9.99	--	20.80	10.07
6 SCHOOLS	--	0.41	5.50	--	7.66	5.64

	CLINC PROF		CLINC ASSOC PROF		CLINC ASST PROF	
	males	females	males	females	males	females
ALL ENGINEERING	--	--	--	--	--	--
LSA (Natural Science)	--	--	--	--	--	--
MEDICINE (Basic Science)	--	--	--	10.33	--	--
6 SCHOOLS	22.16	--	14.68	16.24	9.79	10.29

\*\*Senior Research Scientists and Research Scientists are reported as a single category, "Research Sci";  
Senior Associate Research Scientists and Associate Research Scientists are reported as a single category, "Assoc Res Sci"

**Table 3: ENGINEERING Tenure Track Faculty (AY2001)  
Named Chairs, Tenure/Promotion Committees and Administrative Positions by Gender**

<b>Named Chairs*</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Distinguished University Professor	2	1	0	0
Collegiate	2	1	1	12.5
Endowed	22	13	0	0
Thurnau (for teaching)	4	2	0	0
<b>Total</b>	<b>30</b>	<b>8</b>	<b>1</b>	<b>12.5</b>

<b>Tenure/Promotion Committees**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
College Level	4	0.2	1	5
Department Level	51	23	1	5
<b>Total</b>	<b>55</b>	<b>25</b>	<b>2</b>	<b>10.5</b>

<b>Administrative Positions**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Department	25	11	1	5
College	4	2	1	5
University	6	3	0	0
<b>Total</b>	<b>35</b>	<b>16</b>	<b>2</b>	<b>10.5</b>

\*Calculated as a proportion of full professors within gender.

\*\*Calculated as a proportion of full and associate professors within gender.



**Table 4: LS&A Natural Science Departments Tenure Track Faculty (AY2001)  
Named Chairs, Tenure/Promotion Committees and Administrative Positions by Gender**

<b>Named Chairs*</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Distinguished University Professor	2	1	0	0
Collegiate	16	10	0	0
Endowed	8	5	0	0
Thurnau (for teaching)	1	1	0	0
<b>Total</b>	<b>27</b>	<b>17</b>	<b>0</b>	<b>0</b>

<b>Tenure/Promotion Committees**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
College Level	5	2.6	1	5
Department Level	51	26	3	15
<b>Total</b>	<b>56</b>	<b>29</b>	<b>4</b>	<b>20</b>

<b>Administrative Positions**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Department	24	12	2	10
College	3	1.5	0	0
University	3	1.6	0	0
<b>Total</b>	<b>30</b>	<b>15.5</b>	<b>2</b>	<b>10</b>

\*Calculated as a proportion of full professors within gender.

\*\*Calculated as a proportion of full and associate professors within gender.

**Table 5: MEDICINE Basic Science Tenure Track Faculty (AY2001)  
Named Chairs, Tenure/Promotion Committees, and Administrative Positions by Gender**

<b>Named Chairs*</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Distinguished University Professor	2	4	1	10
Collegiate <sup>+</sup>	1	2	0	0
Endowed <sup>+</sup>	2	4	0	0
Thurnau (for teaching)	0	0	0	0
<b>Total</b>	<b>5</b>	<b>11</b>	<b>1</b>	<b>10</b>

<sup>+</sup>does not include microbiology/immunology

<b>Tenure/Promotion Committees**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
College Level (only basic science depts.) <sup>+</sup>	0	0	2	12
Department Level <sup>+</sup>	25	43	9	21
<b>Total<sup>+</sup></b>	<b>25</b>	<b>43</b>	<b>11</b>	<b>26</b>

<sup>+</sup>does not include microbiology/immunology

<b>Administrative Positions**</b>	<b>males</b>	<b>%of male FTEs</b>	<b>females</b>	<b>% of female FTEs</b>
Department	7	12	0	0
College	2	3	0	0
University	0	0	1	6
<b>Total</b>	<b>9</b>	<b>15.5</b>	<b>1</b>	<b>6</b>

\*Calculated as a proportion of full professors within gender.

\*\*Calculated as a proportion of full and associate professors within gender.

**Table 6: Mean Salary\* for Tenure, Research and Clinical Track Faculty (AY2001)**

**Tenure Track Faculty**

	PROFESSOR		ASSOC PROF		ASST PROF	
	males	females	males	females	males	females
<b>ENGINEERING</b>	\$ 119,993	\$ 111,856	\$ 85,698	\$ 87,410	\$ 70,341	\$ 68,638
<b>LS&amp;A Natural Science</b>	\$ 94,018	\$ 77,627	\$ 67,832	\$ 71,152	\$ 57,133	\$ 53,056
<b>MEDICINE Basic Science</b>	\$ 97,225	\$ 89,806	\$ 70,588	\$ 66,616	\$ 60,980	\$ 59,037
<b>6 SCHOOLS Scientists</b>	\$ 105,285	\$ 96,948	\$ 77,928	\$ 76,001	\$ 61,118	\$ 53,495

**Research Track Faculty**

	RESEARCH SCI**		ASSOC RES SCI**		ASST RES SCI	
	males	females	males	females	males	females
<b>ENGINEERING</b>	\$ 94,421	--	\$ 65,444	--	\$ 53,162	\$ 45,123
<b>LS&amp;A Natural Science</b>	\$ 61,424	\$ 59,070	\$ 42,401	--	\$ 42,928	\$ 37,529
<b>MEDICINE Basic Science</b>	\$ 98,182	\$ 68,232	\$ 61,409	--	\$ 38,552	\$ 46,032
<b>6 SCHOOLS Scientists</b>	--	\$ 61,364	\$ 70,047	--	\$ 51,551	\$ 53,502

**Clinical Track Faculty**

	CLIN PROF		ASSOC CLIN PROF		ASST CLIN PROF	
	males	females	males	females	males	females
<b>ENGINEERING</b>	--	--	--	--	--	--
<b>LS&amp;A Natural Science</b>	--	--	--	--	--	--
<b>MEDICINE Basic Science</b>	--	--	--	\$ 72,327	--	--
<b>6 SCHOOLS Scientists</b>	\$ 98,730	--	\$ 83,526	\$ 72,972	\$ 66,290	\$ 61,801

\*Salary based on 9-month academic year; salaries paid on 12 month year were multiplied by 9/11th.

\*\*Senior Research Scientists and Research Scientists are reported as a single category, "Research Sci";

Senior Associate Research Scientists and Associate Research Scientists are reported as a single category, "Assoc Res Sci"

**Addendum to Year-End Report for  
University of Michigan ADVANCE Project**

**University of Michigan Gender Salary Study  
Addendum to the 2001 Report**

**Data Analysis on the Subset of Science and Engineering Faculty**

**Mary E. Corcoran, Professor of Political Science, Women's Studies,  
Social Work and Public Policy**

**Paul N. Courant, Professor of Economics and Public Policy,  
Provost and Executive Vice President for Academic Affairs**

**Pamela A. Raymond, Professor of Cell and Developmental Biology,  
Senior Counselor to the Provost**

**December 2002**

## Executive Summary

The under-representation of women in the science and engineering faculty is a long-standing problem to which many academic institutions have recently devoted increased attention. In October 2001, the University of Michigan was one of eight institutions awarded a grant from the National Science Foundation through the new ADVANCE Institutional Transformation program to ensure the fuller participation of women faculty in science and engineering. As part of this initiative, baseline data on several variables that might influence the careers of women faculty at the University of Michigan are being collected, and one of these is faculty salary.

In September 2001, the University of Michigan released a Gender Salary Study, based on an econometric analysis of salaries for tenured and tenure-track faculty at the Ann Arbor campus. This statistical analysis used multiple regression models to predict salaries based on several factors known to affect pay, and including gender as a variable. When aggregated across all faculty, the analysis found no statistically significant gender effect when all controls were used (which may have over-controlled for variables correlated with gender), and a small but significant effect (on average, women are paid about 3% less than men) when rank and years and rank were omitted as control variables. The report suggested that the actual residual difference due to gender was between 1% and 3%.

This addendum reports the results of a parallel analysis on a subset of the original dataset, including only the science and engineering faculty. When the regression model with all controls was used, the analysis found a small (3%), but not statistically significant gender effect. When rank and years in rank were omitted, the residual due to gender was significant: on average women science and engineering faculty are paid about 5% less than men. Following the logic of the previous study, these results suggest that the actual residual difference due to gender in the 1999 salary rates of scientist and engineering faculty at the University of Michigan was between 3% and 5%.

## **Introduction**

This report is a summary of the findings of a statistical analysis of salaries of science and engineering faculty, tenured or in the tenure-track, at the Ann Arbor campus of the University of Michigan. The analysis largely followed the methodology of the original study, released in 2001, and the data used represent a subset from the earlier study.

The analysis of science and engineering faculty salaries was sponsored by the Office of the Provost and Executive Vice President for Academic Affairs, by the NSF ADVANCE project, and by the Institute for Research on Women and Gender. It was conducted by the authors of the original report (Professors Mary Corcoran, Paul Courant, and Pamela Raymond) in consultation with Abigail Stewart, Agnes Inglis Professor of Psychology and Women's Studies, Associate Dean for Academic Affairs in the College of Literature, Science and the Arts, Project Director for ADVANCE, and with the expert assistance of Laura Klem, formerly Senior Research Associate at the Institute for Social Research, Janet Malley, Associate Director of the Institute for Research on Women and Gender, and Patricia Wolff, Senior Research Associate at the Office of Budget and Planning.

## **Procedure**

This study examined the salaries of science and engineering faculty based on academic year 1999 appointment data, which were collected for all tenure and tenure-track faculty at the University of Michigan (excluding those with primary appointments in the Medical School) and analyzed for the 2001 Gender Salary Report. The statistical analysis used the technique of multiple regression, in which the following factors were used to predict nine-month salary equivalents: gender, race and ethnicity, highest degree, year received highest degree, years at Michigan, school or college, departmental unit affiliation, whether an administrative appointment was held, whether a medical school appointment was held, number of appointments, current rank, years in rank, and the interaction of rank by years-in-rank. The regression models used here were equivalent to Models (1) and (2) used in the comprehensive report released in 2001, except for the following changes: the market ratio predictor was deleted<sup>5</sup> and a small change was made in assignment of departments to unit categories to accommodate the reduced number of cases in some units. Detailed information on the assignment of department unit affiliation categories is provided in Appendix Table 1A.

The data subset used for this analysis included all cases from the previous University of Michigan Gender Salary Study who had paid appointments in science and engineering departments or who were identified as scientists or engineers by their field of degree. The total number of cases in this subset was 674, of which 546 were men and 128 (~19%) were women, from 48 departments in 12 schools and colleges (College of Literature, Science and Arts, College of Engineering, School of Dentistry, School of Public Health, School of Pharmacy, School of

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<sup>5</sup> The market ratio variable was excluded because: 1) in the previous regression analysis, which included all faculty, the department unit category variable captured more than 95% of the variance in market ratio, and 2) for the subset of science and engineering faculty in this analysis, the influence of market pressures on salary produces much less variance across disciplines than when comparing faculty across all academic disciplines.

Nursing, School of Natural Resources & Environment, Division of Kinesiology, Gerald R. Ford School of Public Policy, School of Business Administration, School of Education, School of Information).

### **Results of the Analysis**

The results of the multiple regression analysis using the modified Model (2) with the subset of the science and engineering faculty revealed a wage disadvantage for women of 2.9%, which was not statistically significant.<sup>6</sup> The gender composition of all of the unit affiliation Categories is predominately male, except Category 26 (School of Nursing, and the departments of Dental Hygiene and Health Behavior and Health Education), which is 96% women (Appendix Table 1A). A regression using modified Model (2), but omitting Category 26, reported an average 3.7% pay disadvantage for women, which nearly reached the 95% confidence level of significance.<sup>7</sup> In comparison, using the complete data set of 1705 University of Michigan faculty (excluding Medical School) regression Model (2) revealed a wage differential between men and women of only ~1%, which was not significant.

Because controlling for rank and years in rank may mask gender differences in rate of promotion and other factors that influence rank, a regression model omitting these predictors was also used in the University of Michigan Gender Salary Study. For the subset of science and engineering faculty, the modified Model (1), which omits these predictors, reported a wage disadvantage for women of 4.9%, which was statistically significant.<sup>8</sup> Without Category 26, the wage differential increased to 5.2%, which was also statistically significant.<sup>9</sup>

In conclusion, this statistical analysis of the 1999 salary rates of tenured and tenure-track science and engineering faculty at the University of Michigan revealed a wage discrepancy for women of between 3% and 5%, compared to the previously reported values of 1% to 3% for the faculty (except Medical School) as a whole.

### **Further Steps**

In response to the results produced by the 2001 University of Michigan Gender Salary Study, a second-stage analysis involving assessments of faculty performance was carried out at the level of the schools and colleges, and individual gender equity salary adjustments were subsequently made. Of the 128 women science and engineering faculty included in this addendum report, 41 received a wage adjustment, ranging from \$1,000 to \$9,700 in base salary rate for academic year 2001-02.

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<sup>6</sup> Gender coefficient = -.029, adjusted  $R^2 = .71$ ,  $p = .123$

<sup>7</sup> Gender coefficient = -.037, adjusted  $R^2 = .70$ ,  $p = .057$

<sup>8</sup> Gender coefficient = -.049,  $R^2 = .54$ ,  $p = .044$

<sup>9</sup> Gender coefficient = -.052,  $R^2 = .52$ ,  $p = .032$

As stated in the earlier report, the University of Michigan is committed to replicating this regression analysis on a periodic and continuing basis. A similar analysis of salary rates for Medical School faculty is nearing completion. Analyses for science and engineering faculty are part of the University's commitment to the ADVANCE project reporting to the National Science Foundation.



## Appendix

**Table 1A. Department Unit Affiliation Categories<sup>10</sup>**

Department/School or College	Category	N	% of Sample	% Women
Anthropology	1	30	4	38
Ford School of Public Policy				
School of Business Administration				
Psychology				
School of Education				
Division of Kinesiology				
School of Information				
School of Natural Resources & Environment				
Chemistry	2	34.5	5	6
Geological Sciences	5	25	4	18
Mathematics	7	67	10	12
Statistics				
Biological Statistics				
Astronomy	8	69.5	10	9
Physics				
Atmospheric, Oceanic & Space Sciences				
Biology	13	50.5	7	15
Engineering (9 departments)	14	122.17	18	11
Electrical Engineering and Computer Science	15	70.5	10	4
Mechanical Engineering	16	42	6	14
Dentistry (13 departments)	20	57.33	9	15
Dental Hygiene	26	45	7	96
School of Nursing				
Health Behavior & Health Education				
College of Pharmacy	27	25	4	32
Health Management & Policy	28	35.5	5	20
Environmental-Industrial Health				
Epidemiology				
<b>Total</b>		<b>674</b>	<b>100</b>	

<sup>10</sup> Category 1 is the only one that differs from the 2001 Gender Salary Report. It collects into one category individuals whose highest degree is in science or engineering, but whose faculty appointments are in various departments and schools in which social science is the predominant discipline. The number of cases in each of these individual departments and schools ranges from 0.5 (partial appointment) to 13.5.