



Committee on the Status of Women Faculty at Caltech

Final Report

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Executive Summary

In October 1999, the Chair of the California Institute of Technology (Caltech) Faculty Board appointed an *ad hoc* committee to examine issues of gender inequity and related concerns for professorial faculty at the Institute. The Committee on the Status of Women Faculty at Caltech (CSWFC) was charged to report back to the Faculty Board with findings and recommendations. The charge also emphasized that the Committee should seek to identify adverse conditions that affect not only women faculty but also men, and should make recommendations that would enable the Institute to maintain and improve its high standards for teaching and research. Consequently, in gathering information for this Report, the CSWFC sought input from both female and male faculty members.

The Report presented here builds on a 1998 study by Dr. Alice Huang, "Report on Women at Caltech," which analyzed the campus climate for women. It was also motivated by the publication in 1999 of the findings of a Committee on Women Faculty in the School of Science at the Massachusetts Institute of Technology. These findings indicated patterns of gender bias at MIT. It was clearly important to determine whether similar patterns existed at Caltech so that these might be eradicated. The charge to the CSWFC is given in Section 1 of this Report. Section 2 includes relevant background information about Caltech.

Since the number of women professors at Caltech is small (29 in 1999–2000 when the survey was carried out), the Committee decided to meet with each one of them and solicit their opinions about the Institute. For these interviews, the CSWFC suggested a variety of discussion topics, including some which had been major causes for concern at MIT, such as salaries, space allocations, the distribution of resources for research, and involvement in departmental and Institutional decision-making. A similar-size group of male professors, each the peer of a female faculty member, was also interviewed. Written notes were taken at all interviews and responses were also condensed into a form that could be tabulated. Our findings are based on both sets of results. Section 3 explains how the Committee went about gathering information.

Perhaps the most striking result of this survey comes from the tabulated responses. Female faculty are markedly more dissatisfied than their male peers with many aspects of Caltech. A strong sense of dissatisfaction is also discernible in the women's interview notes. Surprisingly, given the tabulated responses, the men and women interviewed often voiced similar complaints. Nevertheless, male faculty then tended to pronounce themselves not unhappy with their overall situation at the Institute. Why should this be? The Committee finds that the proportion of women on the professorial faculty at Caltech is very low, 11%. Furthermore, women can legitimately claim to have no voice in the Institute's higher administration, and there is at least anecdotal evidence of a past climate of gender bias in the workplace. Taken together, these findings suggest that it is quite reasonable for female faculty to attribute at least some adverse professional experiences to unequal treatment of men and women.

The Committee found it difficult to come to firm conclusions with regard to possible gender inequities in salaries and in office and laboratory space allocations. In the interviews, similar numbers of male and female faculty expressed dissatisfaction with their space allocations. The CSWFC worked hard to produce an objective assessment of the situation but different practices in the Institute's six Divisions, and the small number of women involved, made it impossible to divine any overall pattern. The paucity of women also hampered statistical analyses of faculty salaries. The results of the analyses show that, on average, female faculty are paid less than male faculty. This is consistent with the findings of nation-wide surveys of the salary patterns for academic scientists. However, because of the small sample of women and the limitations of the analyses, it can be argued that the results are statistically not significant. The analyses of faculty salaries are described in Section 4.

There are areas in which the CSWFC perceived that changes in current Caltech practices would be desirable. Since there are no women in senior academic administrative positions, it is vital that women are well represented on committees that have long-range impact on the Institute. Many of the faculty who were interviewed thought that mentoring of junior faculty should be actively encouraged. The process by which tenure is awarded could also be made clearer to the candidates. Finally, family-friendly policies with regard to maternity/paternity leave and the tenure clock, and expanded on-site childcare are important considerations in attracting and retaining both male and female faculty. Findings are presented in Section 5.

The Committee believes that, to achieve its full potential, Caltech needs to hire more women faculty, be more proactive in nurturing its junior faculty, and make itself friendlier to the working family. We agree with the sentiments expressed by Caltech President, David Baltimore, in his March 2001 statement on diversity, "we must be willing to modify our traditional assumptions to create a more welcoming environment. We will do this while keeping in mind our fundamental goal of academic excellence, recognizing that intellectual achievement is Caltech's premier contribution to the world."

The CSWFC's recommendations are summarized below and described in detail in Section 6.

- The proportion of women on the professorial faculty should be increased significantly. We suggest an initial Institute-wide goal, to be achieved over ten years, of 25% women.
- The Institute salary structure should be monitored regularly, perhaps including analyses such as those described here, to ensure equity between male and female professors.
- Every effort should be made to follow the standard procedures leading to tenure decisions. The procedures should be conveyed to the candidates in writing.
- Each Division should establish and implement appropriate mentoring programs for junior faculty.
- Programs that improve the working environment for all faculty and help retain women faculty should be aggressively pursued.
- We suggest that the Institute initiate a fund-raising campaign focused on women in science and engineering. Campaign funds would be used for programs designed to recruit and retain women faculty and keep up-and-coming women students in the pipeline.
- We urge that progress on implementing these recommendations be assessed at 3-year intervals by a high level committee, preferably involving women Trustees.

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1.0 Introduction

In 1998, Dr. Alice Huang's "Report on Women at Caltech" provided an analysis of the campus climate, the culture for students, and the situation for Caltech female faculty. The report was presented to the Faculty Board in 1999. Among other findings, it noted that the fraction of women among the professorial faculty had reached only 10% in 1995 and was still at that level in 1998. Based on the findings, the report recommended tracking the patterns in salary and time to promotion for women faculty. It also suggested that the tenure process be made more transparent, that the number of women at all ranks should be increased, and that women should have greater visibility in the Institute's senior administration.

The findings and recommendations of the Massachusetts Institute of Technology (MIT) Committee on Women Faculty in the School of Science were also released in 1999. This committee, which had been established in 1995, noted patterns of gender discrimination in the allocation of salaries, laboratory and office space, departmental resources, and teaching assignments. The report found that senior women felt particularly marginalized and excluded from positions where they might have had an impact on their departments or the university. There was considerable national publicity when MIT acknowledged the existence of gender-based inequities, and similar studies were soon being undertaken at universities across the United States. In April 1999, the entire female faculty at Caltech submitted a letter to President Baltimore requesting that such a study be undertaken here. On 27 April 1999, the Caltech Faculty Board approved a motion that their Chair appoint an *ad hoc* committee of "diverse faculty" to examine issues of gender inequity and related concerns at Caltech and to report back to the Board with findings and recommendations. It was agreed that the committee should restrict its attention to the professorial faculty. The Committee on the Status of Women Faculty at Caltech, CSWFC, was formed in October 1999. The charge to the committee follows.

- **Charge to the Committee on the Status of Women Faculty at Caltech:**

The committee will look into the area of gender inequity and related concerns, keeping in mind that many issues are field-specific and that there may be differences among Caltech's Divisions. The committee should focus on institutional sources of inequity and how they might be remedied. The committee should also be on the lookout for adverse conditions that affect not only women, but all faculty, and make recommendations. In addition, it should identify those positive aspects of the Institute that should be preserved or nurtured.

An important goal of this committee will be to assure a working environment for all faculty that enables the Institute to maintain and improve its high standards for teaching and research. Whenever possible, the committee should make concrete recommendations so that there can be no argument later as to whether they have been implemented or not.

As a guide to the committee, several issues were raised including:

- Are women's salaries the same as those of comparable men in their fields?
- Are the Institute's search procedures identifying qualified women candidates?
- Are women recruited as vigorously as men are?
- Do they receive comparable startup funds from the Institute?
- Are women promoted according to the same criteria as men?
- Are tenure requirements appropriate?
- Are women given equal access to the administration and to fund-raising as men?
- Do they have comparable access to graduate and postdoctoral fellowships?
- Are the laboratory and other facilities of women faculty comparable to those of men?
- Are women given the same opportunity to participate on committees and in administration as men?
- Are they taking advantage of these opportunities?
- Do women have the same access to Institute public relations as men?
- Are women as happy as men?

The faculty has indicated that these matters are important and should be dealt with expeditiously. While this is a faculty committee that reports to the Faculty Board, we trust the Institute Administration, realizing the value of all its faculty members, will be receptive to the recommendations of the CSWFC.

2.0 Relevant Background Information on Caltech

Caltech is organized into six Divisions, Biology (BIO), Chemistry and Chemical Engineering (CCE), Engineering and Applied Science (EAS), Geology and Planetary Science (GPS), Humanities and Social Sciences (HSS), and Physics, Mathematics and Astronomy (PMA). The Divisions are further organized into sub-disciplines or departments, each managed by its own Executive Officer (EO). Currently, two women faculty serve as EOs. In the past, two other women have been EOs.

The Chairs of the Divisions, together with the President and Provost, form the Institute Academic Council, IACC. There is also an Institute Administrative Council, IAC, composed of the President, the Provost, the Division Chairs, the Chair of the Faculty, and a few other senior administrators. Although there have been two female Vice Chairs of the Faculty, no woman has served on the IAC or IACC until fall 2001, when a female professor was elected Chair of the Faculty. A schematic of Caltech's academic organizational structure, color coded to indicate males and females, is presented in Appendix A, Chart A1.

- **Faculty Demographics**

Caltech's current professorial faculty stands at 284 members. Of these, 31 are women, representing approximately 11% of the total. Excluding the Humanities faculty, but not those in Social Sciences, the total number of professorial faculty is 263 of which 25, or 9.5%, are female. As illustrated in Appendix A, Chart A2, percentages of women in individual Divisions are 5% in EAS, 6% in GPS, 8% in PMA, 14% in CCE, 18% in BIO, and 21% in HSS.

Disregarding gender, 1% of the faculty are African American, 8% are Asian, and 1% are Hispanic.

In the fall of 1999, when this study was begun, there were 29 women among the professorial faculty. Of these, 14 held the rank of full professor with tenure, 9 were associate professors (8 tenured) and the remaining 6 were assistant professors. At present, 52% of the women and 79% of the men on the faculty hold the rank of full professor.

- Endowed Professorships

Thanks to the generosity of private donors, Caltech has established a number of endowed professorships. These are regarded as an honor and may carry with them professional and personal advantages. Across the Institute, 36% of full professors hold endowed chairs. However, the fraction varies by gender: 38% of male full professors and 19% of female full professors have “named” chairs. It also varies by Division. In BIO, for example, more than 50% of the full professors have named chairs. Prior to 1997, only one woman, a professor of history, had been awarded an endowed professorship at Caltech. Currently, three female professors, two in CCE and one in BIO, have endowed chairs. Two of these have been appointed since 1999.

- Salary Criteria

The general criteria for both starting salaries and annual raises at Caltech are the level of a faculty member’s accomplishments and his or her value to the Institute, as judged by the appropriate Division Chair, the Provost, and the IACC. More specifically, important factors include impact of research, academic distinction, promise for future achievements, contributions to the Institute and its needs in teaching and research, and the realities of the “market place” in particular areas. The Provost and relevant Division Chair determine starting salaries, while annual raises are proposed by the Division Chairs and set by them in consultation with the Provost. Each year a special meeting of the IACC is devoted to the review of the annual raises and salaries of all professorial faculty. The Division Chairs, and CSWFC members who had served on the IACC, assured the Committee that the Caltech administration tries to maintain an equitable salary structure within the Divisions and across the Institute.

- Space Allocation

The Provost, in consultation with individual Division Chairs, determines the total space available to each Caltech Division. At the Division level, practices regarding the allocation of laboratory and office space vary widely. Some Chairs delegate the bulk of the decision-making regarding space to the EOs, while others have appointed committees to monitor or administer space allocation.

3.0 Information Gathering

- Surveying the Faculty

The modest number of female professorial faculty made it feasible for the committee to undertake individual interviews with all 27 who were at Caltech in the 1999 - 2000 academic year, when this study began. Two of the four women who joined the faculty later that year were also interviewed. In addition, interviews with an equal number of male peers were conducted in order to respond to the charge to consider the situations of male faculty. Potential male peers were identified initially by the women faculty themselves. The CSWFC then reviewed the suggestions and established the final slate. Two male professors seemed the appropriate equivalents for more than one woman, so that the total sample of men numbered only 24. We note with gratitude that all faculty who were asked readily agreed to being interviewed and that everyone was sincere and cooperative.

A series of talking points to guide the interviews was drawn up and is shown in Appendix B, Table B1. Topics included issues raised in the MIT report and others that derived from our awareness of concerns among Caltech faculty. Two CSWFC members, one male and one female, conducted each interview and provided a written summary of their findings.

In addition, we made an effort to tabulate responses in terms of satisfaction. An example of the response form is presented in Appendix B, Table B2. For simplicity, we combined the tabulated responses on individual “talking points” under broad headings in the graphic representation of these results (Appendices C, D, and E). Thus “**Visibility within the Institute**” encompassed responses regarding the role of women in Institute administration, the award of endowed chairs, faculty interaction with the Trustees, and service on key Institute committees. “**Career Advancement**” covered responses on tenure experience, mentoring, promotion rates, and nominations for honors and awards within and outside the Institute. We also combined the responses “**very satisfied**” and “**satisfied**” into one category, “**satisfied**,” while “**dissatisfied**” also encompasses “**very dissatisfied**.” Responses “**somewhat satisfied**” and “**somewhat dissatisfied**” became “**reservations**,” and “**not a concern**” includes “**not applicable**.”

Throughout the information gathering process, and in analyzing the data acquired, it has been of prime importance to the committee and the Institute to maintain the privacy of individual faculty members. All those interviewed were assured of confidentiality before they met with the CSWFC members and no individual should be identifiable in this Report. The results of all interviews are, and will remain, confidential to the Committee.

- Follow-up Discussions with Division Chairs

A number of questions arose from the faculty responses. Since a significant fraction involved attitudes and practices that seemed to vary from Division to Division, the whole Committee subsequently met with each of the current Division Chairs. Talking points were provided to each Chair in advance of the meetings. These talking points are listed in Appendix B, Table B3.

- Salaries

Caltech's general principles for determining salaries are described above. Taking into account the complicating factors of disciplinary differences, and the qualitative nature of the judgments involved in setting salaries and raises, important questions for the committee were:

- 1) Does gender affect professorial faculty salaries in a discernable way?
- 2) Can any gender effects be found in statistical analyses of salary data?

The salaries of Caltech faculty are usually kept confidential, but Provost Steven Koonin provided CSWFC member and former Provost, Paul Jennings, full access to salary data. Professor Jennings carried out several statistical analyses of professorial faculty salaries. The basic aim was to examine salary as a function of some measure of academic age, and to see whether gender differences could be identified. Results were presented to the committee in forms that preserved confidentiality (e.g., data points tagged by gender but not by individual or Division). More detailed plots of basic data and of the results of the analyses were examined by CSWFC chair, Anneila Sargent, in a meeting with the Provost and Professor Jennings in December 2000. Professor Jennings has retained the results of the analyses until the completion of this report. During that period, Professor Sargent has had the opportunity to re-examine the results as needed.

Professor Jennings carried out the statistical analyses of faculty salaries for 1999 only, the academic year in which our survey began. The faculty sample did not include present and former Provosts or Presidents, nor the Division Chairs and Vice-Presidents in office at that time (all male). For each member of the sample, data included Division, academic rank, gender, chronological age, year of Ph.D., and year of tenure (or expected tenure), as well as salary. Any "administrative increments" to the salaries were removed, as were other transient increments. In the first analysis, the sample was truncated at 40 years beyond the Ph.D., since no women are in this category. The final sample consisted of 239 professors, 210 men and 29 women.

- Laboratory and Office Space

An important finding of the MIT Report was that the space assigned to their women faculty was often of a lower standard and smaller in total area than that allocated to male professors. The CSWFC sought to examine this question at Caltech by amassing Institute-wide data on individual faculty space allocations. One committee member from each Division took the responsibility of determining the quality and quantity of laboratory and office space assigned to each faculty member in that Division. The CSWFC representatives worked with Division Administrators to acquire "official" estimates of area. They also tried to apply Division-specific standards of quality, involving dates of last "rehab" or expansion, since perceptions of quality varied between Divisions.

4.0 Salary and Space Analyses

- Salaries

For the salary analyses, the data were sorted by Division, with the Humanities and Social Sciences Division divided into two groups – Humanities and Social Sciences. Salaries for each of the seven resulting groups were plotted as a function of years from Ph.D. and fit by a quadratic curve. Quadratic curves, concave downward, described the general trend of the data better than linear equations, particularly for the larger groups/Divisions. Different coefficients in the regression formulae reflected significant differences among the groups. For each group, the residuals (actual salary minus regression-line salary) were calculated and normalized by the standard deviation of the residuals. The regression process ensured that the means of the residuals were zero. For each of the seven groups, plots were made of these normalized residuals as a function of years from Ph.D., with data points identified by gender. In addition, the normalized residuals of all the groups were combined to form a set of 239 points with a mean of zero and a standard deviation of unity. This set of residuals, and the subsets for men and women, were then ordered to allow the construction of histograms and cumulative frequency distributions for examination and comparison.

To determine if the salaries of women, as measured by their normalized residuals from the fitted curves, were different from those of the sample as a whole, the mean and standard deviation of the normalized residuals of the 29 women were compared to those that would result for random samples of 29 drawn from the larger set with a mean of zero and a standard deviation of unity. The following statistical theorem was used: "If x is normally distributed with mean μ and standard deviation σ , and a random sample of n is drawn, the sample mean will be normally distributed with mean μ and standard deviation σ/\sqrt{n} ." Hence, the means of random samples of 29 from a set with a mean of zero and a standard deviation of unity should follow a normal distribution with a mean of zero and standard deviation of 0.186. For the 29 women, the mean was -0.385 , i.e., -2.08 times the standard deviation of the mean of random samples of this size. The properties of the normal distribution are such that 95.4% of the means of random samples of 29 would lie between $+2$ and -2 standard deviations from the expected value of zero.

The above analysis was repeated using years from tenure as the independent variable and then again, using chronological age as the independent variable. For untenured faculty, the year by which the tenure decision must be made was used as the year of tenure. For faculty hired with tenure, years from tenure was approximated by the year of Ph.D., plus nine years. The data set was not truncated for these latter two analyses. All the results were quite similar. When years from tenure was the independent variable, the mean of the normalized residuals of the 29 women was again -2.08 times the standard deviation of the mean of random samples of this size. In the analysis using chronological age, the corresponding number was -1.93 . The quality of fit of the quadratic curve to the salary data can be measured by a "coefficient of determination" which approaches unity as the data fall closer and closer to the curve. By this measure, years from Ph.D. gave the best fit for 5 of the 7 groups, while years from tenure gave the best fit for 2 of the groups. However, the differences in the determination coefficients for the three choices of independent variable were typically small.

In all three analyses, the standard deviation of the residuals for the 29 women was lower than that for the parent population. Results from the first analysis are fairly typical, with a standard deviation of the residuals for the women of 0.745, compared to unity for the parent population. This indicates a narrower frequency distribution for the women compared to the faculty as a whole. The same tendency is seen in the histograms.

The committee was interested to determine whether the salary patterns for 1999 were different from those that pertained in the past. For this purpose, a five-year "longitudinal" study was carried out to examine the increase in salaries of the professorial faculty between 1994 and 1999. Due primarily to the fact that several women in our sample were hired after 1994, this data set included only 20 women. Likewise, due to faculty departures or new arrivals, the total sample reduced to 214. Again, professorial faculty in senior administrative positions were not included and administrative and transient salary supplements were removed. The sample was sorted into seven groups as before, and means and standard deviations of the increases were calculated for each group. Distributions of normalized raises with means of zero and standard deviations of unity for each group were then combined. Means of random samples of 20 from this group of 214 would show a mean of zero and a standard deviation of 0.224. For the 20 women, the mean was +0.064 (+0.29 σ) and the standard deviation was 0.846 (compared to unity). Means of random samples of 194 from this group of 214 would also show a mean of zero but a standard deviation of 0.07. For the 194 men, the mean was -0.007 (-0.1 σ) with standard deviation 1.014 (again compared to unity). These deviations of the means from zero are small and not statistically significant. As in the analysis of 1999 salaries, the frequency distribution for women is narrower than that of the men.

In summary, the statistical studies show that:

- 1) the mean of the normalized residuals for the women's salaries is less than zero and the value of the mean (-0.385) is -2.08 times the standard deviation expected for a random population of 29 out of a total sample of 239.
- 2) the distribution of the women's salaries is narrower than that of the men.
- 3) for both male and female faculty, the means of the normalized salary raises between 1994 and 1999 are not significantly different from zero, implying that salary patterns did not change between 1994 and 1999.

These results can be interpreted in several ways.

- 1) We are dealing with a random process and there is no gender relation to any of the controlled variables (age, discipline) or to the uncontrolled variable (level of accomplishment and value to the Institute). About one time in twenty, a two-sigma difference will result in the selected statistic for a random sample of this size.

- 2) The statistical studies are too limited since the number of female faculty is very small and key factors in determining salaries, accomplishment and value to the Institute, were not included. Arguably, the two-sigma result would reduce to the noise level if a quantitative measure of these factors were introduced. However, we note that some national studies indicate that judgements about accomplishment and value, being largely subjective, could be affected by gender bias.
- 3) The negative two-sigma result is too large to ascribe to chance. If there were no systematic difference between male and female faculty members in terms of accomplishment and value to the Institute, there would be only about a one in forty chance of the discrepancy being a random result. The implication is that the observed salary difference reflects gender bias. This interpretation is consistent with recent national statistics which indicate that the salary of a woman researcher in the life sciences is typically 77% that of her male counterpart.

Again, we caution that the statistical analysis is limited by the small sample size for the women faculty. We also emphasize that no information on the magnitude of the putative salary discrepancy could be inferred from the analysis provided to the Committee. Finally, we note that no statistical analysis can address present or historical salary inequities in the case of an individual.

- Space

Detailed information regarding laboratory and office space was obtained for most Divisions but proved difficult to interpret in the broader context of Institute-wide practices. Part of the difficulty results from the different cultures of the Divisions. For HSS, laboratory space is not relevant. At least one Division Chair preferred to provide only normalized data. In GPS and PMA, graduate students and postdoctoral fellows occupy “communal” space, whereas in BIO, CCE, and EAS, faculty members often count such space as part of their specific allocations. Moreover, some CCE and BIO faculty have laboratory space in the Beckman Institute in addition to their main laboratories in a CCE or BIO building. Perhaps most daunting was the fact that CSWFC members and faculty members who were interviewed sometimes disagreed with the Divisional assessments of the quality and extent of their space allocations.

Since the low proportion of women faculty would make space assignments easily identifiable in some divisions, the CSWFC had hoped to assemble reliable Institute-wide information on space allocations and present it in a standard format. As described above, this proved to be impossible and we provide no data here. However, with this Report, we are making available to the Chair of the Faculty Board the information we gathered regarding space allocations. At the Board’s discretion, this may be passed on the Administration.

5.0 Findings

The committee is aware that our findings are based on a sample that is small. On the other hand, the response rate was a remarkable 100%. We believe that this lends considerable weight to the conclusions we draw.

- There are no women among Caltech's higher academic administration. This is a major cause for dissatisfaction among the female faculty.

The differences in the tabulated responses from male and female faculty dramatically illustrate their different attitudes in this regard. As illustrated in Appendix C, Figure C1, no men were dissatisfied with this feature of the Administration, and only 14% had reservations. By contrast, 37% of women were dissatisfied and 22% had reservations.

- The low proportion of women in the professorial ranks is perceived as a problem for the Institute.

In the interviews, 25% of the women and 33% of the men explicitly criticized the low proportion of female faculty. It is notable that a number of these women were otherwise reasonably pleased with their current situation at Caltech. Finally, the Division Chairs themselves were unanimous in deploring the low numbers.

- In the interviews, women faculty described many examples of perceived gender bias in the workplace. A number of the men who were interviewed volunteered the opinion that their female colleagues experienced some level of discrimination, occasionally recalling an incident already described by a female professor.

More than 50% of the female faculty stated that they had experienced gender bias at some point during their careers at Caltech. Some women perceived the experience as a temporary setback. For others, there appeared to be a long-term sense of not "belonging." Over 50% of the male faculty who were interviewed held the view that Caltech is "tougher for women," and some men's perceptions validated the women's sense of unease. Responses included "the style is gender-biased," "it's male-centric," and "there are higher hurdles for women." However, both men and women were inclined to believe the atmosphere was improving.

- In view of the above findings, it is not unreasonable for women at Caltech to assume that an adverse experience is the result of gender bias.

Women can legitimately claim not to have a voice in the higher administration. Our data indicate a historical climate that makes gender bias credible. The fraction of professorial faculty who are female is so low that it is plausible to assume that assessments of ability may not be gender-neutral.

- For women faculty, satisfaction with the working environment is more strongly influenced by the attitudes and policies of individual Division Chairs than for men.

No man indicated that a change of Division Chair had impacted the quality of his experience at Caltech to the same degree as described by the women. Approximately 60% of the female faculty specifically linked improvements in their professional situations to the appointment of a new Chair. More than 30% of the women interviewed recounted adverse interactions with their Chairs and implied that negative responses were due to gender bias. Male faculty who commented on similar interactions (20%) reacted less strongly and attributed a negative response to a number of different causes.

- Statistical analyses of Caltech's 1999 faculty salaries show that, on average, women faculty are paid less than men. A longitudinal study indicates that this pattern in faculty salaries has not changed significantly since 1994. Both the statistical analyses and longitudinal study demonstrate that the distribution of women's salaries is much narrower than that of the men.

Because of the small number of women in the sample, and the fact that the effect of key variables, level of accomplishment and value to the Institute, could not be included in the analyses, it is not possible to interpret our results definitively. All other attributes being equal, the negative two-sigma result could be regarded as too large to ascribe to chance. Taken together with the results of national studies of faculty salary patterns, this strongly suggests that ongoing monitoring of the salaries of female faculty is warranted.

The longitudinal study (1994–1999) indicates that the same salary pattern has existed at Caltech for the last 5 years. Prior to 1994 there were too few women on the faculty for us to undertake a meaningful analysis. However, some women faculty believe that salary discrepancies were larger in the past. A number of the men interviewed also expressed the view that their salaries were lower than they might have been elsewhere. In fact, the tabulated data show that 50% of male full professors and 60% of female full professors are dissatisfied or have reservations about their salaries (see Appendix E, Graph E1).

- At present, we can find little conclusive evidence of systematic differences in the space allocations for men and women. However, some current dissatisfaction may stem from earlier perceived inequities.

In the interviews, about 30% of the women faculty and a smaller fraction of the men expressed some reservations about the quantity or quality of the laboratory space allocated to them. By and large, the women who commented negatively about space allocations were among those who had been at Caltech the longest, while there was no such correlation for male faculty. Nevertheless, the tabulated data (Appendix E, Graph E2) suggest that dissatisfaction with laboratory and office space increases with seniority for both men and women. Approximately, 45% of the female and 35% of the male professors had "reservations" or were "dissatisfied" with their laboratory and office space. These were all full

professors. When the Committee pursued the question in meetings with the Division Chairs, it became obvious that space is a precious commodity at the Institute. In Divisions where faculty committees monitor space allocation, there seems to be a better understanding and more acceptance of the situation.

- Many women faculty see themselves as having little impact within the Institute.

A sense of isolation among their peers was explicitly noted by 25% of the women interviewed. The tabulated data confirm that a large proportion of women believe that they have low visibility. Responses regarding the role of women in the Institute’s academic administration, the awarding of endowed chairs, faculty interactions with Trustees, and service on key Institute committees, are presented in Appendix C, Figures C1, C2, C3, and C4. The combination of these responses was characterized as a measure of “visibility” within the Institute and leads to the pie chart shown below. As far as visibility is concerned, 62% of the women faculty are dissatisfied or have reservations, compared with 20% of the men.

VISIBILITY WITHIN INSTITUTE

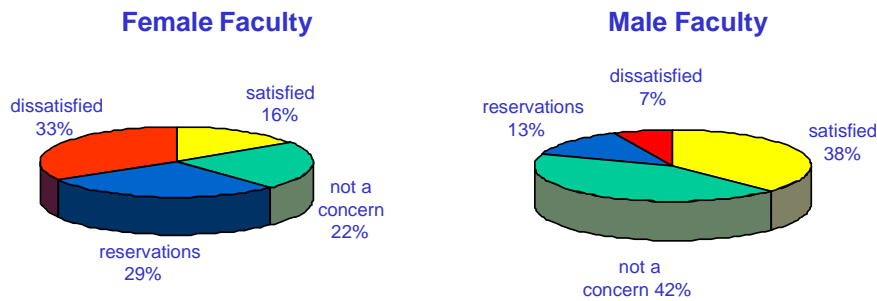


Figure 1

- The tenure experience, the quality of mentoring, and other features of academic career progression cause higher dissatisfaction among women than men.

The tabulated responses on issues involving tenure experience, mentoring of junior faculty, promotion rate, and nominations for awards are presented in Appendix D, Figures D1, D2, D3, and D4. These responses were combined to form a measure of “career advancement” and the results are shown in the pie chart below. Although 46% of women faculty are ranked as satisfied or not concerned, this is much lower than the 73% of “satisfied” or “not concerned” men. Most notable is the factor of more than 4 difference between the fractions of men and women who are dissatisfied.

CAREER ADVANCEMENT

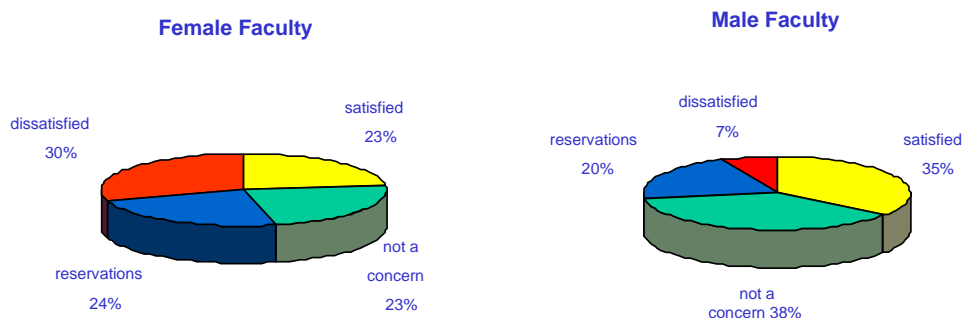


Figure 2

- The tenure process at Caltech appears to be disproportionately distressing for female faculty compared to their male counterparts.

From the pie charts in Appendix D, Figure D1, it appears that 52% of the women faculty are dissatisfied or have reservations about the tenure process, compared to 19% of the men. Similar results were found in the interviews. Since most women professors in the “not a concern” category did not in fact go through the tenure process at Caltech, as many as 70% of women who have successfully attained tenure at the Institute have at least reservations about the process. In the interviews both female and male faculty noted that the tenure process could seem “opaque.” It appeared that lack of communication between tenure candidates and their Divisions regarding tenure standards and procedures could add to the tensions of an already stressful time for young faculty members.

- Both male and female faculty agree that there is a need for greater mentoring of junior faculty.

As can be seen in Appendix D, Figure D2, 66% of women faculty and 50% of men are in some way dissatisfied with the mentoring at Caltech. The depth of this sentiment was also evident in the interviews. Some of the tenured professors interviewed stated that they made personal efforts to mentor junior colleagues but would prefer to see some kind of mentoring program in place. Interviewees from Divisions with mentoring programs had high praise for these.

- Both male and female faculty agree that there should be clearer and wider dissemination of information regarding Institute and Divisional resources and opportunities.

Complaints about a lack of transparency in a number of the Institute's policies and procedures punctuated many of the interviews. In particular, faculty members wanted to be made more aware of opportunities in the Institute and in the Divisions for supplemental funding for research or for support of additional postdoctoral fellows and graduate students. Approximately one third of both the female and male faculty members who were interviewed remarked upon the difficulties of understanding how Caltech "worked."

The interviews also provided commendations for aspects of Caltech, particularly the research environment. In formulating their recommendations, the intent of the CSWFC was to help the Institute Administration ensure that this environment is complemented by a workplace that enables every faculty member to achieve their full research and teaching potential.

6.0 Recommendations

The charge to the CSWFC from the Faculty Board states that an important goal is "to assure a working environment for all faculty that enables the Institute to maintain and improve its high standards for teaching and research." The Committee was requested to "make concrete recommendations so that there can be no argument later as to whether they have been implemented or not." We list below 7 broad recommendations in areas where changes to current Institute practice seem to be called for. Suggestions as to how the recommendations might be implemented follow. With one exception, the recommendations are based on the findings of the previous section. The exception arises because the Committee is aware that it may be difficult for the Institute to respond to all of the recommendations immediately. As a result, we urge that a means of tracking progress be put in place. We recommend that:

- the proportion of women on the professorial faculty be increased significantly.
- the Institute salary structure be monitored regularly to ensure equity between male and female professors; present or past inequities in salaries or raises should be remedied.
- every effort be made to follow the standard procedures leading to tenure decisions. The procedures should be conveyed to the candidates in writing.
- each Division establish and implement appropriate mentoring programs for junior faculty.
- programs that improve the working environment for all faculty and help retain women faculty should be aggressively pursued.
- the Institute initiate a fund-raising campaign focused on women in science and engineering.
- the progress on implementing these recommendations be monitored regularly, perhaps every 3 years.

In essence, to achieve its full potential, Caltech needs to hire more women faculty, be more proactive in nurturing its junior faculty, and make itself friendlier to the working family.

Increasing the Proportion of Women on the Professorial Faculty

The committee urges that the Institute construct and implement a clear program to increase the proportion of women on the professorial faculty and to attract women faculty to higher academic administrative levels. Taking into account the distribution and character of fields at Caltech, an initial Institute-wide goal of 25% women, to be achieved in a decade, seems reasonable. Divisions should be encouraged to establish individual recruitment plans and goals that would combine to produce the overall 25% figure. It would be reassuring to the Committee if the Administration could announce not only that it is undertaking such a plan but that appropriate financial resources have been assigned to help the plan succeed.

There are a variety of ways in which women candidates for professorial positions might be identified:

The Committee recommends that each year the administration allocate one “free” professorial faculty position to the best female candidate that the Divisions can produce, consistent with the fields of study of the Institute. The emphasis should be on junior faculty, but senior faculty should not be excluded from consideration. Institutions that have adopted this kind of competition report that, once identified, these premier female candidates are frequently hired as regular faculty even when they fail to win the free slot.

It would also help to reinstate the policy of making additional faculty slots available if a Division can present an outstanding senior woman candidate. In recent years, this policy has been limited to minority candidates. The proportion of senior women on Caltech’s faculty seems to warrant this change. Currently, only 52% of the female faculty are full professors, compared to 79% of the male faculty. However, the fractions vary by Division. In HSS, for example, only 25% of the women faculty are full professors.

Programs should be initiated to attract a greater number of outstanding women scholars to Caltech, both as visitors and as professorial faculty. The numbers of visiting female scientists and engineers, including lecturers, visiting professors and seminar speakers should be increased. Visitor programs provide an excellent opportunity to identify potential professorial faculty candidates, and a number of women scholars have noted that they found Caltech more attractive after they had spent some time on campus. Institute post-doctoral fellowships for women would also help bring in a cadre of up-and-coming women scientists.

The Committee further encourages the practice of having a woman on all search and staffing committees, recognizing that in some Divisions this will not always be possible without overburdening the current female faculty. In those cases, women might be asked to serve for reduced periods.

Salary Issues

The committee recommends that the Institute specifically monitor the salaries of women and under-represented minorities relative to those of the faculty as a whole.

At the annual IACC meeting at which professorial salaries are reviewed, the Provost could add an extra hour to discuss specifically the salaries of women and members of under-

represented minorities. In addition, perhaps every 3 years, a committee involving the Provost and one or two Trustees could carry out analyses similar to those undertaken for this committee by Professor Jennings. These procedures will allow the President, the Provost and the Division Chairs to evaluate and remedy, if necessary, both individual salaries and the overall situation.

Tenure procedures

At present the Institute requires each Division to have written tenure procedures. The committee is concerned that a significant number of faculty still regard the tenure process as unclear, leaving open the door for perceptions of bias.

The Committee recommends that the Institute-wide tenure process described in the Faculty Handbook include general criteria and standards for promotion that apply in every Division. Establishing Institute-wide standards should not pose a problem, since our interviews with the Division Chairs indicated that most applied the same general standards when determining if tenure should be awarded. Each tenure candidate should be made aware of the procedures and standards in writing. In addition, Division Chairs should ensure that the Division-specific tenure policies are also made known to candidates in writing, along with anticipated times to reach decisions. Updating the candidate, at appropriate intervals, on progress towards the tenure decision is recommended.

In keeping with our suggestions regarding focused monitoring of the salaries of women faculty relative to men, we recommend that the Institute pay particular attention to the promotion rates for women and minorities and take steps to redress any inequities that may be noted.

Under current Caltech policy, faculty members must request a tenure clock extension for the birth or adoption of a child. In order to remove the potential stigma attached to such a request, we recommend that the Institute automatically extend the tenure clock by one year for both male and female faculty to accommodate the birth or adoption of a child.

Mentoring

Junior faculty usually profit from the counsel of a supportive senior colleague. This kind of mentoring is important for all junior faculty in order to help them establish successful research programs and understand how Caltech works. It is particularly important for junior women, especially in groups where there are very few female faculty. A significant number of both female and male faculty members who were interviewed advocated increased mentoring of junior faculty.

If it is not already Division practice, Division chairs should establish and implement mentoring programs for all junior faculty. The appointment of a single mentor is one possibility. Alternatively, a committee could be set up to track progress and continuously advise a tenure candidate in the years leading to the decision. The committee recognizes that some Divisions prefer not to have such formal mechanisms but urges that some sort of clear process be put in place.

Improving the Current Environment

The Committee believes that by implementing the above recommendations, the Institute will make considerable headway in improving the working environment for all professorial faculty. However, the levels of dissatisfaction noted in our survey indicate that a variety of other changes are also needed. Both male and female faculty expressed concerns about most of the issues below. An aggressive effort to implement the following recommendations would have a beneficial effect on Caltech's ability to attract and retain outstanding scholars, both male and female.

In the long term, efforts should be made to increase the fraction of women in Caltech's upper level administration. In the meantime, the Provost and Division Chairs should work to ensure that women are well represented as members or chairs of committees that have long-range impact on the Institute. This is particularly important at present when there are so few women in senior academic administrative positions. We recognize that in some instances this goal will have to be weighed against possible over-burdening of women faculty with committee duties.

There was general concern among the Committee that negative stereotyping of Caltech deters potential female faculty and students from considering a position at the Institute. To alleviate this, we urge that outreach publications describing the Institute and/or individual Divisions be reviewed for both text and images containing overt or subtle messages that might discourage women from applying.

The Committee strongly recommends that the Caltech Administration take steps to ensure that the resources available at both Institute and Division levels are made known to professorial faculty. The Committee's interviews with faculty, meetings with Division Chairs, and personal experience, indicate that this is an area where lack of transparency can lead to feelings that obfuscation and bias are present.

We recognize that it is appropriate for Division Chairs to strive to implement their individual visions for their divisions and are therefore reluctant to recommend that they arbitrarily delegate all decision-making to faculty committees. Nevertheless, by extension from the previous recommendation, it is important that their decisions, once taken, are made known to the faculty in the Division. For example, general announcements of awards to individual faculty members would alert others to the availability of these resources. The Committee notes that in Divisions where committees allocate some resources, for example postdoctoral fellowships, the faculty perceive the process to be fair.

The Committee encourages Division Chairs to increase their efforts to meet personally with each of their professorial faculty on a regular basis. In larger Divisions where this may be unduly burdensome, we recommend that such efforts be particularly directed at untenured faculty.

The paucity of women holding endowed chairs reflects in part the low proportion of women among the senior professorial faculty. Nevertheless, the Committee recommends that each

Division strive to achieve equity in the proportions of men and women professors holding endowed chairs.

The maternity/paternity leave provisions in the faculty handbook should be administered more proactively. Currently, faculty members must request this leave. We recommend that the Administration routinely award the standard leave to accommodate the birth or adoption of a child, unless the professor involved specifically requests a shorter period.

The Committee encourages the Institute to look into increasing the possibilities for *in situ* day care for faculty children. Increased support for the Children's Center, for example, could help provide infant care for more children and add to the variety and convenience of summer programs and after-school care. We believe this would not only improve the productivity of current faculty but also be attractive to both male and female candidates for professorial positions.

A Focused Campaign to Recruit and Retain Women Faculty

The Committee recommends that the Institute initiate a fund raising campaign focused on women in science and engineering. We emphasize that our recommended increase in the proportion of female faculty should not be tied to this fundraising campaign. The campaign could seek money from donors to (a) fund slots for female faculty, including start-up costs for new laboratories if appropriate, (b) provide re-entry support for faculty switching to new fields or re-entering research after a maternity break, (c) establish additional endowed chairs for women scientists and engineers, (d) support efforts by female post-docs, grad students and undergraduates to create networking groups, (e) expand the Caltech Children's Center programs, and (f) promote child-care scholarships for post-docs and graduate students to encourage younger women to remain in the pipeline. Such a campaign could enhance Caltech's public image by heightening its visibility as an institution dedicated to ensuring diversity.

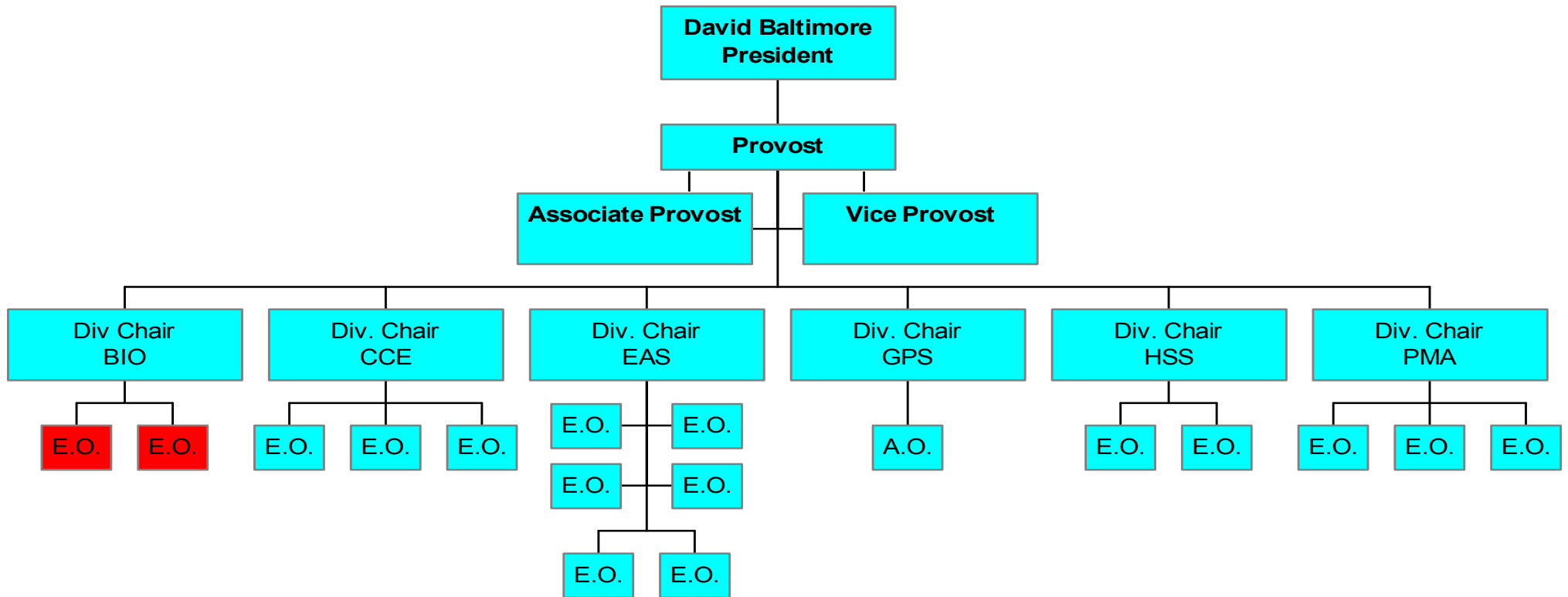
Monitoring progress

The Committee was unanimous in its opinion that there should be some means of tracking progress on the implementation of our recommendations. We believe that the issues raised in this Report require the focused attention of a dedicated group and recommend that a Committee on the Status of Women Faculty become either a standing committee or be reconvened every 2-3 years. There are advocates for both courses of action on the Committee.

In addition, we strongly encourage the Administration to monitor overall progress by way of a high level committee, involving women Trustees. This committee should look not only at salary issues, as mentioned in the Recommendations, but also at the other key issues affecting women faculty that are identified in this report.

APPENDIX A1

Caltech Academic Organizational Chart

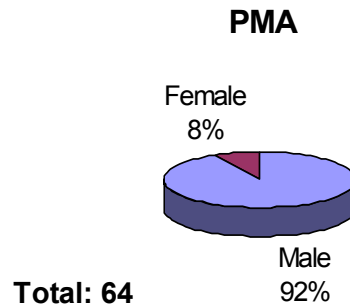
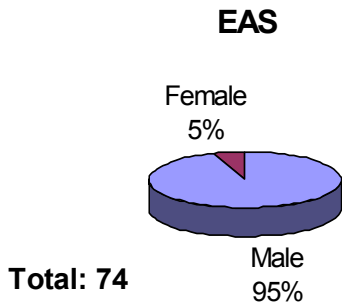
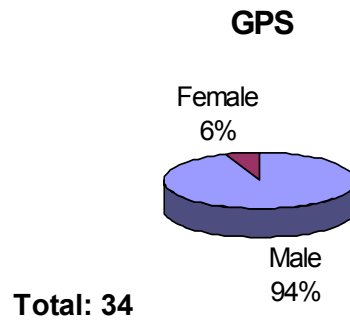
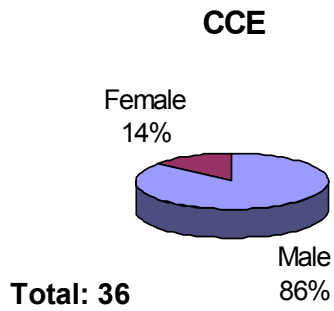
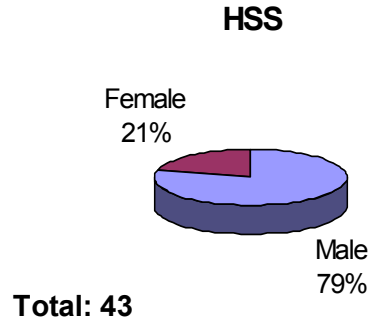
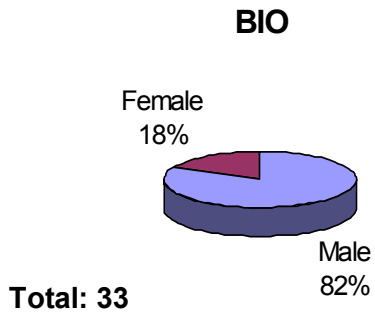


■ Women ■ Men

Source: October 2001

APPENDIX A2

Professorial Faculty by Division



As of October 2001

APPENDIX B: Gathering Information

Table B1: Talking Points for Faculty Interviews

1. **LEVEL OF EFFORT IN RECRUITING**

Startup packages (including level of entry)

Housing subsidies (loans, partial equity...)

Childcare/Schools issues

2. **SUPPORT WITHIN INSTITUTE**

Salary

Lab and office space (including rehabs)

Support for group research activities

Access to research funds controlled by Caltech

3. **VISIBILITY WITHIN INSTITUTE**

At EO's/Div Chairs/Admin levels

Endowed chairs (taking into account age distribution)

Service on, or chair of, key committees, Faculty Board

Participation in Trustee Functions

Interaction with Development Office

Female invited speakers for colloquia/seminars

4. **SUPPORT WITHIN YOUR DIVISION**

Access to Division Chairs

Response by Caltech to external job offers

Rapidity of promotion (does a particular "style" increase the likelihood of success at Caltech?)

Tenure experience

Teaching loads

Sabbaticals

5) **MENTORSHIP AND SUPPORT FROM COLLEAGUES**

Mentorship (during tenure, concerning progress etc.)

Nomination for awards, NAS, NAE, etc

Table B2: Format for Tabulated Results

**Committee on Status of Women Faculty at Caltech
RESPONSE SHEET**

	Satisfied			Dissatisfied			Not a	Not
	very	yes	somewhat	somewhat	yes	very	concern	applicable
	A1	A2	A3	B3	B2	B1	N/C	N/A
	Level of effort in recruiting							
startup packages								
housing subsidies								
childcare/schools								
	Support within Institute							
Salary								
lab & office space								
support for group research								
access/CIT research funds								
	Visibility within Institute							
EO's/Div Chairs/Admin								
endowed chairs								
key committees/serve/chair								
attend/speak Trustee functions								
interact w.Development								
female invited speakers								
	Support in Your Division							
access to Div Chairs								
access/Division funds								
CIT response outside offers								
promotion rate								
tenure experience								
teaching loads								
Sabbaticals								
	Mentorship/support							
during tenure/re: progress								
nominations:awards/NAC/NAE								

Table B3: Talking points for Division Chairs

Questions for Division Chairs:

Faculty Hiring and Recruiting

- 1) Is the lack of diversity among faculty at Caltech a concern for you? If so, is your Division now making efforts to attract and hire women and minorities?
- 2) Could the hiring of a female or minority candidate be viewed as a greater risk because it might be perceived as a “de facto” tenure decision?
- 3) In your Division, what attributes feed into the perception of “excellence” in a faculty member?
- 4) It has been suggested that more flexible “family leave” policies would prove advantageous, especially for young faculty. Would it be difficult to accommodate such policies in your Division?

Advancement of Junior Faculty

- 5) Are there mentoring programs for junior faculty in your Division? Do you think there should be?
- 6) How are junior faculty members informed of and/or nominated for development funding opportunities?
- 7) Is there a standard and well-documented process for preparing the tenure case and making tenure decisions in your Division? Do you perceive the existing tenure procedure to be satisfactory?

Allocation of Resources

- 8) How is the faculty informed about funding opportunities or opportunities for resources such as housing subsidies?
- 9) How are decisions regarding allocation of funds, space, renovations, and teaching loads made in your Division? How is the faculty informed of these decisions?
- 10) How important are external offers in the allocation of resources?

Miscellaneous

- 11) With what frequency do you have a personal meeting with each member of your Division? What determines this frequency?
- 12) Would you support making faculty salaries public? Would you object to having a designated woman present (not necessarily a woman Division Chair) when salaries are discussed?

APPENDIX C: Faculty Responses regarding the Visibility of Women within the Institute

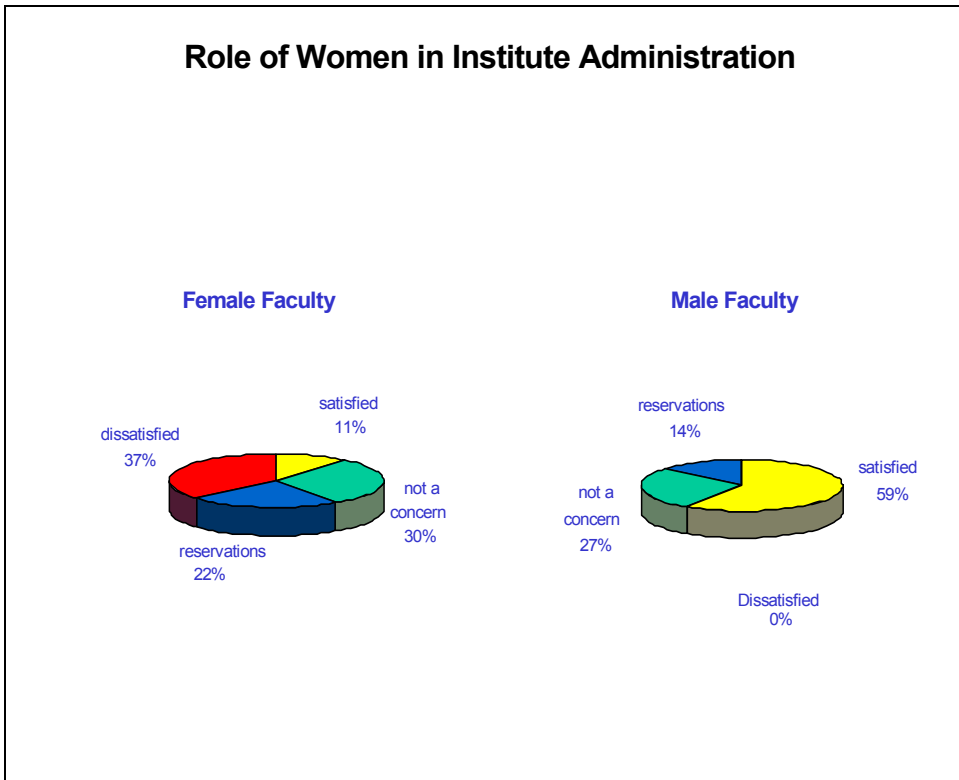


Figure C1

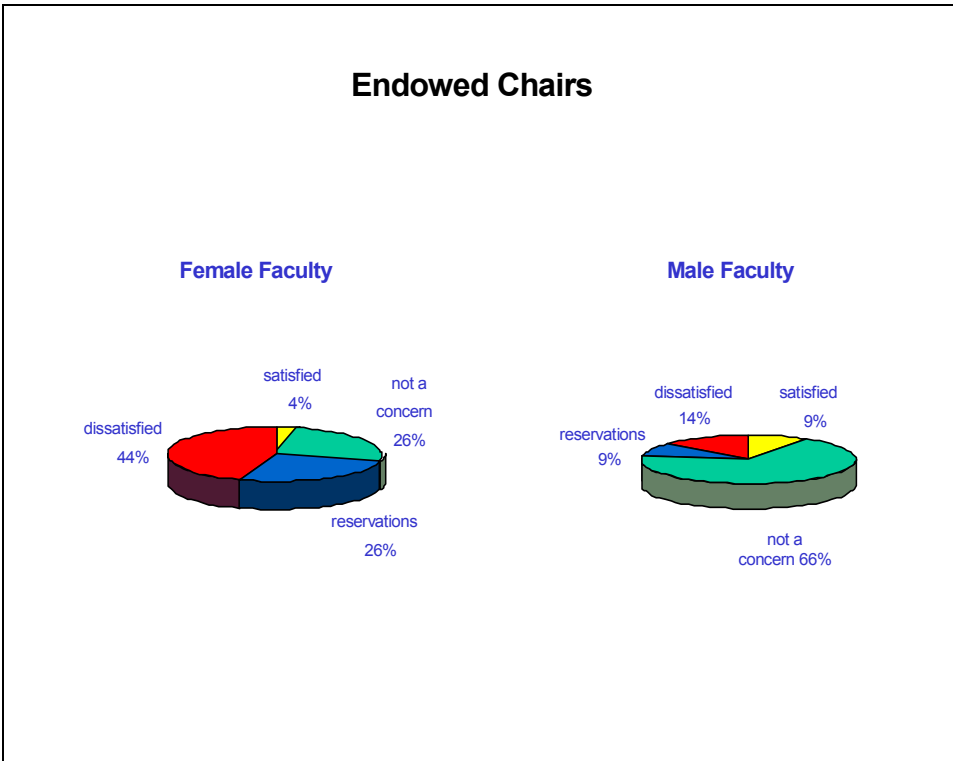


Figure C2

Interaction with the Trustees

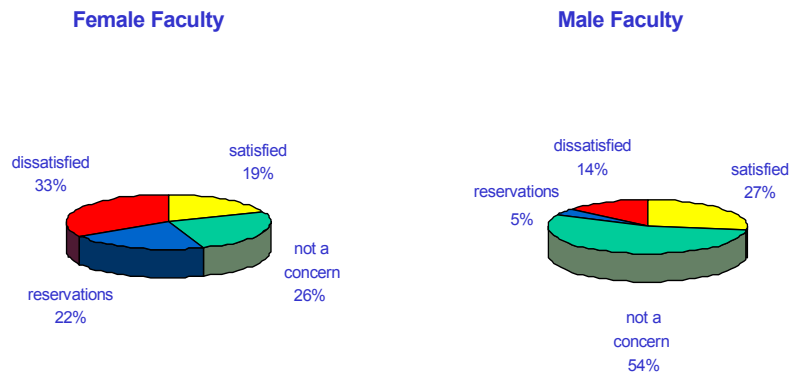


Figure C3

Service on Key Institute Committees

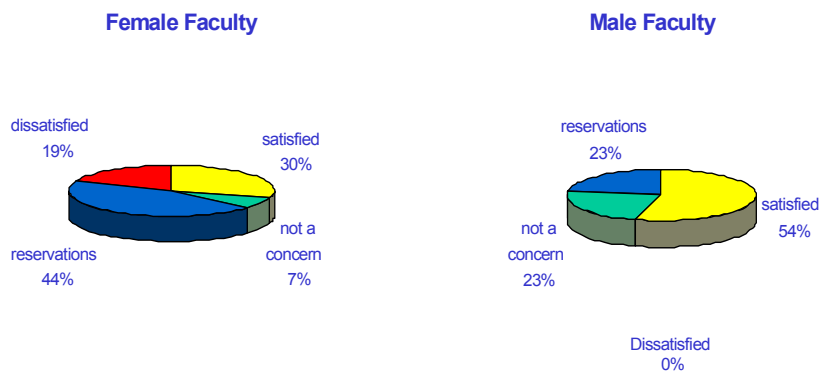


Figure C4

APPENDIX D: Faculty Responses regarding Career Advancement

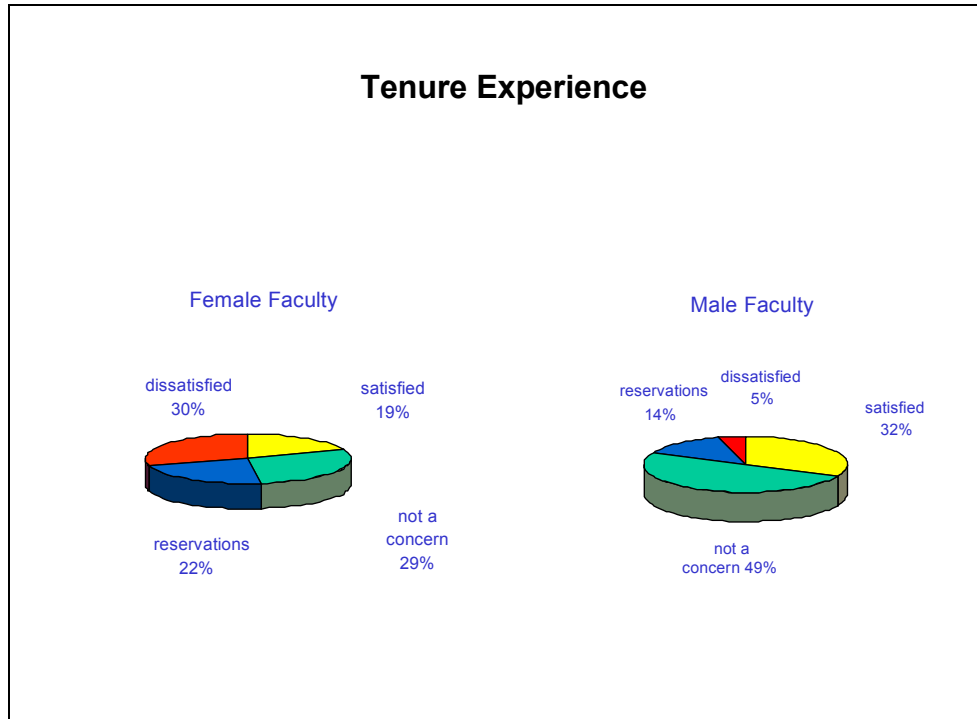


Figure D1

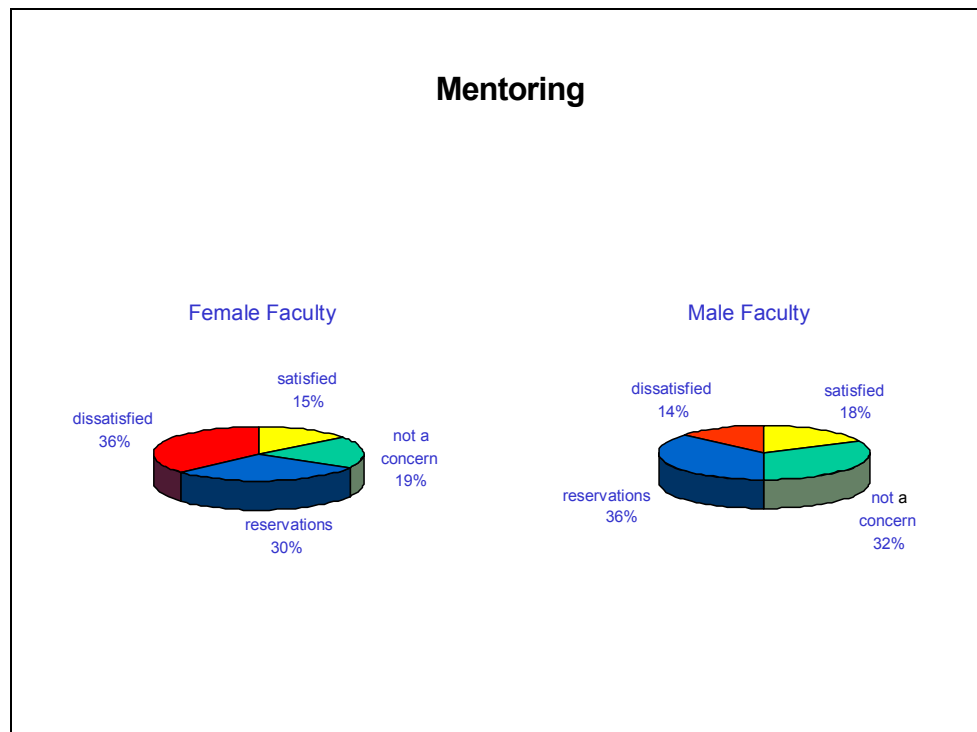


Figure D2

Promotion Rate

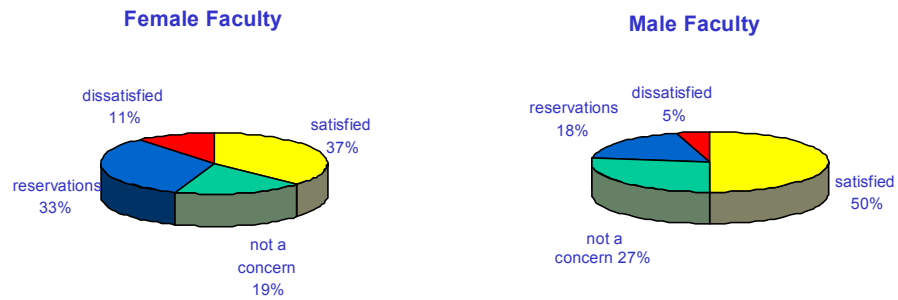


Figure D3

Nominations for Awards

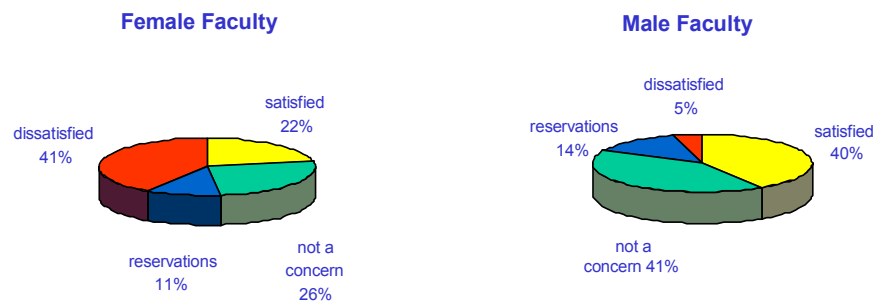
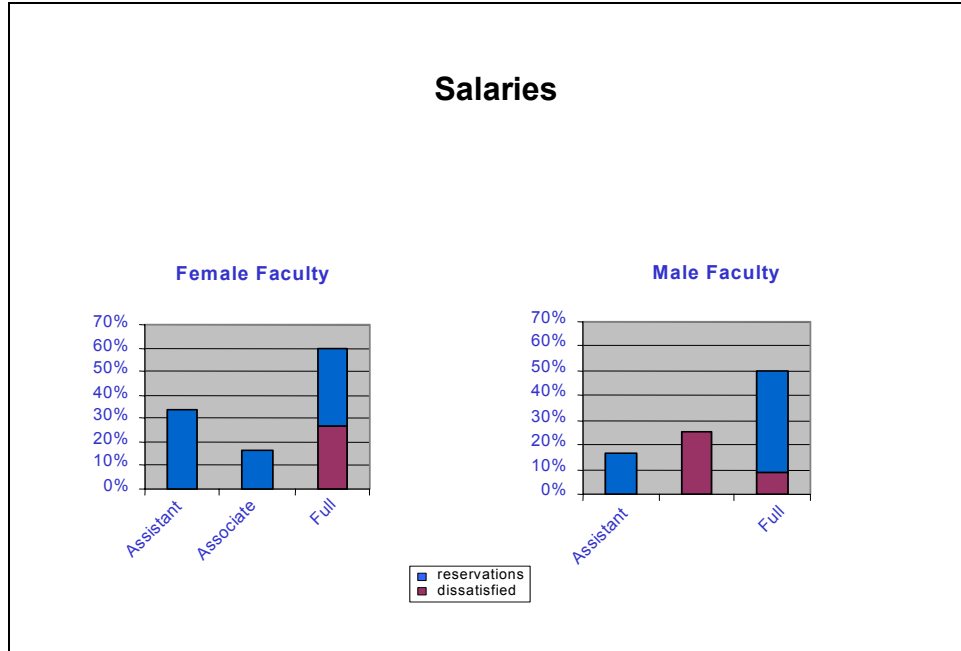
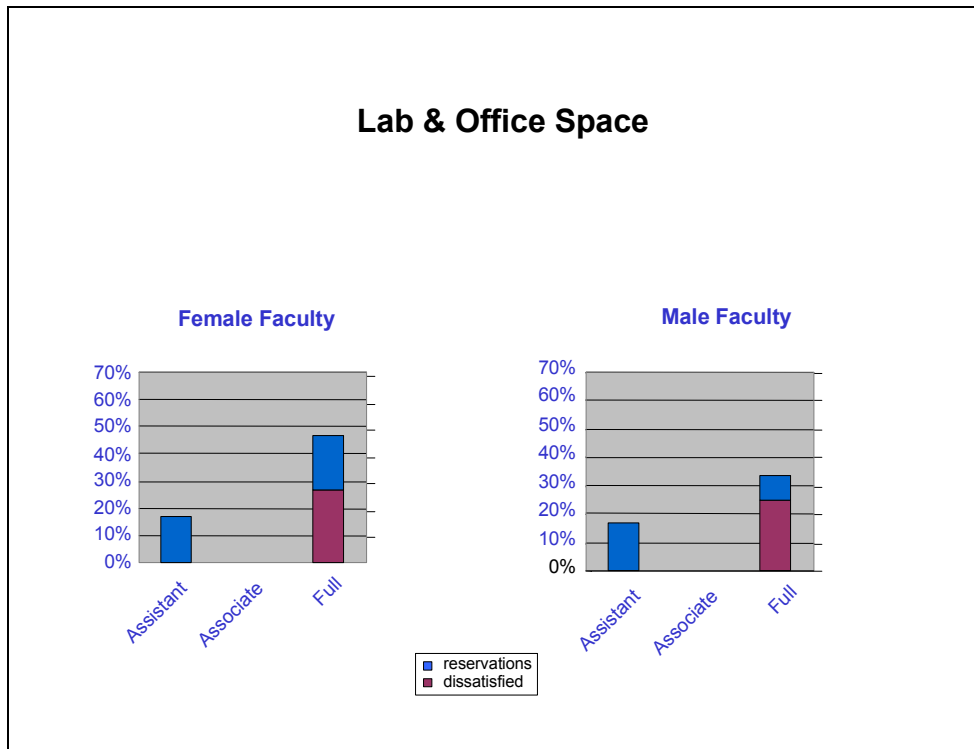


Figure D4

APPENDIX E: Evolution of Attitudes



Graph E1



Graph E2