ities

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Using figures provided by the American Association of University Professors, Judith Glazer-Raymo says that at the present rate of progress it would take women until 2149 to achieve parity with men as full professors. Progress in academic leadership positions has been equally as slow, particularly at the departmental level. In the summer of 2000 a survey of approximately 92% of the 2817 departments at elite institutions was conducted to develop a set of baseline demographics for department chairs. For the departments in which data were available, the results of the survey showed that men chaired nearly 81% of the surveyed departments while women chaired approximately 19%. With as few as 8 women chairs in 298 engineering departments and less than 6% in the 340 math, statistics, earth sciences, chemistry, and physics/astrophysics departments for which data were available, it is clear that women comprise a very small proportion of these important academic leadership positions. This study discusses the survey results by disciplinary field and reviews the underlying factors that might be contributing to the low proportions of women.

Keywords: department chair, leadership, demographics, AAU, women

A great deal has changed since American women were first admitted to higher education in the 1830s. Today women earn the majority of the bachelors and masters degrees and close to half of the doctoral degrees. The number of women faculty, however, continues to be small, and the number of women administrators is even smaller. According to the 2001-2002 *Chronicle of Higher Education* Almanac Issue, in 1998 women constituted 36% of all faculty, 19.8% of all full professors, and 19.3% of all college presidents.

There is little question that while change must be initiated at all levels of academia, change on the local level depends fundamentally on the sensibilities and skills of department chairs, the guild masters elected by their peers, most of whom are men. Chairs make decisions regarding the composition of committees, most prominently those of personnel and search committes, and allocate teaching assignments and space, as well as make or influence salary decisions. As the MIT Report (1999) has clearly shown, these kinds of decisions have important and profound long-term consequences on the careers of women faculty.[i] Chairs also obtain administrative experience that makes them competitive for higher-level academic leadership positions. In fact, being chair is generally perceived as the best preparation for a career in academic administration.

There are a number of sources that have tracked the progress of women and minorities in upper administration. For example, the *Chronicle of Higher Education* catalogs the characteristics of upper administrators in postsecondary institutions every year; the National Science Foundation issues detailed analyses of key trends in science and engineering research, employment, and education in their biennial reports of science and engineering indicators. A number of universities also prepare profiles of first-year undergraduate students across the country every year. These efforts produce reliable indicators about the rate at which women and ethnic minorities move into the various spheres of academia.

As Mariam Chamberlain has pointed out, however, very little demographic information about department chairs is available. Besides a study conducted in the early 1990s on department chair stress (Gmelch and Gates 1995),[ii] the only other comprehensive source of information that is available on a department by department basis, including names of current department chairs, is that provided by the College Mailing Group, a for profit organization that compiles data for business solicitation purposes (Chamberlain 2001). The goal of the study reported here is to begin addressing this gap in knowledge by exploring data recently collected on the Association of American Universities (AAU) department chairs.

The AAU Data

In one of the first systematic attempts at compiling data on chair demographics, data on rank, ethnicity, and sex were gathered for 2817 departments across all disciplines, nearly 95% of those represented in the AAU during the summer of 2000.[iii] The AAU, founded in 1900, currently consists of 63 leading research universities, 61 American and 2 Canadian, of which about one-half of the members are public institutions. Membership, considered once every three years, is by invitation only and requires agreement by three-fourths of the current members.

The AAU members comprise a range of both institutional size and academic focus. For example, membership includes Harvard, CalTech, Michigan and Iowa State. It is not unreasonable to assume that the demographic data collected on the AAU department chairs are representative of conditions found at most major research institutions. The data were gathered through Internet searches, with follow-up telephone surveys with those departments for which web data were unavailable. The number of departments identified at each university was compared to official tallies to ensure that all departments had been recognized. Programs that were not also departments were not included and most professional schools were not surveyed. We were not able to ascertain rank and sex for all departments, but no

AAU institution had less than 95% of the departments represented. It should be noted that some AAU members are considerably larger than others (e.g., the University of Texas vs. Emory University); the data have not been weighted for this study.

Table 1 (see Appendix) provides a summary by broad disciplinary areas of the number of departments included in the survey. It is important to note that departments were individually mapped into fields specifically for this analysis. For example, at some institutions chemistry might be housed under the College of Arts and Sciences, while at other universities this department might be in a Division of Mathematical and Physical Sciences. For the purpose of our analysis, the department would be placed into the category Mathematical and Physical Sciences.

Departmental data were organized into disciplinary areas. With this organization, arts and humanities comprise over one-third (999) of the 2817 departments surveyed. Almost 60% of the humanities departments were either cultural studies or language departments; these departments are also typically small in terms of faculty numbers. The mathematical and physical sciences (including earth siences, chemistry, physics/astrophysics, computer/information science and astronomy) make up 12.9% (364) and engineering (including biomedical, civil/environmental, computer/industrial and chemical) 11.4% (322) of the departments, the two largest categories of departments after the humanities. At 2.3% and 3.5% of the departments surveyed, architecture and business were by far the smallest groups. Architecture included almost equal numbers of departments of architecture and urban planning. Business spanned departments of accounting, advertising, banking, management and general business.

Department Chair Demographics

As Table 2 in the Appendix shows, of the 2817 departments in the baseline summer 2000 survey, men chaired 74.4% and women chaired 17.5%. As the most elite group of research universities, the AAU has relatively few women in academic leadership positions. With respect to rank, the vast majority of chairs were full professors (73.3%), with a small, but somewhat surprising number of associate professors (8.1%) and assistant professors (4.4%). Most chairs were white (56.7%), with fewer than 10% of AAU chairs identified as of an ethnic or racial minority. However, it is also important to point out that we were unable to ascertain the ethnicity of 34% the chairs, thus the reported numbers could change with additional information. Here it is also important to note that our use of the term chair is inclusive of department heads.

Of the 17.5% female chairs, 56.8% came from arts and humanities and 23.5% from social sciences. Life sciences and natural resources accounted for 7.8% of the women chairs, while mathematical and physical sciences and engineering accounted for 5.7% of AAU female department chairs. Finally, 4.5% came from business and 1.8% from architecture (See Table 3 in the Appendix).

A somewhat surprising number of chairs are not full professors. Associate and assistant level chairs comprise about 14% of the department chairs surveyed and seem to be much more prevalent in the humanities, arts, and social sciences. Nearly 75%, or 261 of the 349 associate or assistant professor chairs, are in the humanities, arts, or social sciences. Of the women associate professors who are department chairs, 67.6% are in arts and humanities, 18.3% are in social sciences, 5.6% are in life sciences and natural resources, 4.2% are in architecture, 2.8% are in business and 1.4% are in mathematical and physical sciences and engineering (Table 4 in the Appendix). Of the women assistant professors who are department chairs, 51.3% are in arts and humanities, 24.4% are in social sciences, 7.3% are in life sciences and natural resources, 12.2% are in business, 4.9% are in architecture. There are no female assistant professor department chairs in mathematical and physical sciences and engineering.

As Table 4 shows, while 12% (237 of 1957) of the male chairs are associate or assistant professors, 25% (112 of 447) of the women chairs are at the rank of associate or assistant. Women constitute approximately 16% (332 of 2055) of the full professor department chairs, but they comprise about 32% (112 of 349) of all the associate and assistant professor chairs. Since promotion to the position of chair is likely to interfere with scholarly productivity, this is not necessarily a good sign if it occurs too early in a career. A study of the circumstances under which women associate and assistant professors become chairs would help us understand the challenges and opportunities facing women in academia.

The data can also be viewed by the field as shown in Figure 1. From the figure it is clear that the majority of department chairs are men, regardless of field. Departments in traditionally male dominated fields such as engineering and the mathematical and physical sciences are almost exclusively chaired by men. It is also interesting to note that the percent of women chairing life sciences, business, and architecture departments has cleared the 10% hurdle. Female chairs relative to male chairs are represented in much greater numbers proportionally in the arts, humanities, and social sciences.

Figure 1 about here

Mathematical and Physical Sciences and Engineering

Looking just at engineering and mathematical and physical sciences departments, approximately 90% of the engineering department chairs were men, while 87% of the mathematical and physical sciences chairs were men (Table 5 in Appendix). Most chairs in both engineering and mathematical and physical sciences were full professors.

Of the departments in each field that were chaired by women, there were 24 female chairs, or 4.2%, of 569 departments in the fields of engineering, math/statistics, earth sciences, chemistry, and physics/astrophysics (Table 6 in Appendix). Earth science departments have the highest proportion of women chairs (12%) and, with only 2% female chairs, engineering and math/statistics departments have the lowest representation of women in leadership positions.

The representation of women as department chairs reflects, in part, the availability pool of women faculty in advanced ranks who would be considered eligible for a chair position. These figures should therefore be interpreted in light of the percentage of full professors who are women in each field. Data from a number of sources can help to contextualize the information presented in Tables 5 and 6.

According to year 2000 data collected by the American Association of Engineering Educators (ASEE 2001), 4% of full professors in engineering departments were female, up from slightly more than 3% in 1998. The NSF's Science and Engineering Indicators (NSB 1998) report that women represented 3.3% of all full-time tenured engineering faculty in 1995, which tends to indicate that the ASEE 4% female full professor in year 2000 is probably reasonably accurate. Of the 36 universities included in the ASEE survey, 29 were members of the AAU. Nelson's data represent another recent source of information on numbers of full professors for some departments in the fields of engineering and the mathematical and physical sciences (Nelson 2002a; 2002b). The data, which consist of numbers of faculty by rank and ethnicity, were collected in 2001-02 for the top 50 departments ranked by 1999 extramural funding. Using these data for AAU institutions only, we calculated an approximate availability pool of women full professors of engineering at 5%, an availability pool for women full professors of chemistry at 6.7%, for physics 5.1%, and for mathematics 4.1%.

Taken together, these findings indicate that AAU women engineering, chemistry, and mathematics chairs are underrepresented by about 2-3% in our summer 2000 survey. The representation of women among engineering and mathematical and physical science department chairs thus, on the whole, is lower than the representation of women in the pool of senior faculty who, at least based on the criterion of academic rank, should be eligible for departmental chair positions. Female full professors are likely to be somewhat younger, on average, than male full professors, which might partially explain their lower representation among department chairs.

Recent research shows that when women reflect at least 25% of the group, gender-based preconceptions are reduced (Valian 1998). Moreover, it appears that jobs held by both men and women in reasonable numbers modify perceptions about the jobs themselves and make them less likely to be seen as male jobs (Hoffman and Hurst 1990). To increase the number of AAU women chairs in engineering from 2% (or a total of 7 women chairs) to 25% in the short-term would be difficult, although the numbers of female assistant and associate professors suggest that the availability pool will increase over time.

Discussion

All fields, from engineering to the humanities, could benefit from an in depth analysis of the number of women chairs in relation to the pool of women full professors, as well as the circumstances in which women become chairs and the problems they encounter in this capacity. More information about women chairs is necessary if we are to accelerate the rate of progress for women in academia.

Anecdotal evidence indicates that chairs seem to be drawn from two groups: those considered by some criteria to be high achieving scholars, and those generally considered to be good administrators. Thus, we would expect department chairs to be above average on either one or both of these dimensions. If women faculty were, on average, less productive scholars than their male colleagues, this might explain their under-representation among department chairs.

Although data that would allow direct tests of this hypothesis are not regularly collected, the possibility that the gender gap in representation among chairs may be caused by gender differences in scholarly productivity can at least be indirectly evaluated by examining the evidence on gender and publishing rates. A recent study found that the well-documented gender gap in publication rates has narrowed since the 1960s such that at the aggregate, the publication rate of women in science and engineering academic positions was about 20% less than the rate for men. More significantly, the study found that when men and women are employed in similar institutions, have similar responsibilities for teaching, and have equal access to funding and research assistants there are no significant differences in publication rates (Yu and Shauman 1998). The findings of this research cast doubt on the hypothesis that women are less likely to be appointed as department chairs because they are less worthy scholars. In fact, according to Astin and Leland (1991), women administrators seem to be more scholarly than male administrators.

If the under-representation of women among department chairs is not due to real differences in the relevant skills, it may be explained by the tendency for women's accomplishments to be undervalued relative to those of men (Allison and Long 1990). Institutional characteristics have also been shown to affect the career progress of scientists and engineers (Long 1978). Because the duties and responsibilities of an adminstrative position, such as chair, can differ radically among universities, the desirability and prestige attached to the position may also vary (Alvarez and Lutterman, 1979). In addition, the process by which the chair is selected may affect the probability that a woman is able to attain the position. For example, the selection process may result in homosocial reproduction, or recruitment in one's own image (Kanter 1977). That is, although a woman may fulfill the objective criteria for becoming department chair, she may be excluded, either consciously or subconsciously, from consideration because she does not share all of the social characteristics of the majority of faculty within the department. Since department chairs are selected by processes in which perceptions of qualifications play a major role, there may be significant room for the influence of homosocial reproduction.

Research has suggested that once women are appointed to leadership positions subordinates tend to evaluate the performance of women and men similarly (Ragins 1991), while peers and superiors do not (Greenhaus and Parasuraman 1993). Given the tendency to undervalue the accomplishments of women, if prior achievements do significantly influence the selection of a chair, we may find that women chairs are more accomplished than their male peers. On the other hand, given that peers and superiors do not evaluate the performance of women and men similarly, women chairs might receive less support from their deans and fellow chairs and, therefore, be less successful and less happy about their experiences than male chairs. This might, in turn, discourage other women from aspiring to this position.

Research has also shown that career processes and outcomes of faculty are significantly affected by demographic factors, such as marital and parental status. Scholars have documented the influence of these factors on gender differences in such areas as prestige of first academic appointment (Long, Allison, and McGinnis 1979) and advancement in academic rank (Long, Allison, and McGinnis 1993). For instance, data on college presidents indicates that most male presidents are married as compared to about half of women presidents (Wenniger and Conroy 2001). A study that collects basic demographic variables such as sex, age, marital and parental status of male and female department chairs, as well as information about their partners and children, would be very helpful.

One final point relates to the role of mentoring in academic leadership. Luba Chliwniak (1997) has pointed out that men are united and women should do the same. Women need to understand the issues facing higher education in general and the challenges facing women specifically, including the need to be united. This understanding is necessary in order to overcome the invisible obstacles that prevent women from assuming positions of leadership in academia. This is also the kind of contextual information that is often transmitted via formal and informal mentoring networks.

Participants selected for the first Women in Engineering Leadership Conference, sponsored by the National Science Foundation in the fall of 2000, were asked to identify the importance of mentoring as a way to prepare for future administrative positions. Almost 70% of the women identified mentoring as very important, with 25% identifying it as important. Alternatively, in a survey of upper administrators at AAU institutions,[iv] nearly 50% of the respondents, 80% of whom were male, identified mentoring as neutral or unimportant in terms of achieving their positions. Is mentoring less important than women think or more important than men think? It is possible that men tend to be less aware of the mentoring they receive, because it is implicit in a system that is built for them to accumulate advantage, while women realize that they need explicit mentoring in order to accumulate advantage in a system that favors men.

Conclusion

Being perceived as a good department chair is widely seen as a reliable indicator of having the talent necessary for other positions of leadership and often provides the successful chair with a prominent position whose influence outlasts the tenure as chair (Hecht, Higgerson, Gmelch, and Tucker 1999). In contrast, those wishing to advance, but lacking the experience, are often seen as being deficient in the appropriate skills, as well as wanting for collegial support or trust. In short, becoming a department chair represents a critical test of the talent and resources considered necessary for higher-level administrative positions, as well as an opportunity to have a positive influence on the department (Gonzalez 2001). Having access to departmental leadership positions, and to the mentoring necessary to succeed, is clearly of great interest if women are to make progress in achievement of high-level administrative positions.

Mentoring must openly address the invisible obstacles women face and make them visible to them and to others. The glass ceiling must be identified and targeted for demolition by all. Thus, a successful mentoring system for women chairs must also include mentoring their superiors and peers, both male and female, so that they do not inadvertently undermine their progress. The only way for women to break into the guild masters club is by throwing light over its rules and changing them. More research on gender equity issues affecting department chairs is necessary in order for women to be able to break into the higher ranks of the union of men that constitutes the academic guild.

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Notes

[i] This assessment is also supported by qualitative comments from NSF POWRE recipients as described in Rosser (2001).

[ii] The Gmelch and Gates survey was conducted in 1991 and included 100 Carnegie Research I and II doctoral granting institutions. The purpose of the survey was to examine the determinants of stress experienced by department chairs, not to develop a national demographic profile that provided information on the representation of chairs. For instance, the survey included only 8 randomly selected departments from each university and it does not appear that departments were stratified as part of the sampling process.

[iii] A second pass of the data was completed in late summer 2002.

[iv] Unpublished data collected by Niemeier for the NSF Conference.

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Appendix

Table 1. Surveyed Depts. By Field (Summer 2000 Baseline)

	Frequency	Percent
Architecture	66	2.3
Arts	277	9.8
Business	100	3.5
Engineering	322	11.4
Humanities	722	25.6
Life Sciences	172	6.2
Nat. Resources	186	6.6
Mathematical and Physical Sciences	364	12.9
Social Sciences	608	21.6
Total	**2817**	

Table 2. AAU Demographic Baseline Profile (Summer 2000 Baseline)

Demographics	Percent (N)
Sex	
Men	74.4 (2095)
Women	17.5 (493)
Not reported	8.1 (229)
Rank	
Full professor	73.3 (2065)
Associate professor	8.1 (229)
Assistant professor	4.4 (125)
Other	1.0 (28)
Not reported	13.1 (270)
Ethnicity	
African-American	1.4 (40)
Asian/South Pacific	3.2 (90)
Hispanic/Latin	1.5 (42)
Middle Eastern	1.9 (53)
Native American	--- (1)
Indian	0.8 (23)
Non-White	0.4 (12)
White	56.7 (1597)
Not reported	34.0 (959)

Table 3. Percent of Chairs by Sex (Summer 2000 Baseline)

	Female (N)	Male (N)
Architecture	1.8 (9)	2.2 (47)
Arts	14.6 (72)	8.7 (183)
Business	4.5 (22)	3.4 (72)
Engineering	1.6 (8)	13.8 (290)
Humanities	42.2 (208)	21.6 (452)
Life Sciences	4.1 (20)	6.6 (138)
Natural Resources	3.7 (18)	7.4 (154)
Mathematical and Phy. Sci.	4.1 (20)	15.3 (320)
Social Sciences	23.5 (116)	21.0 (439)
Total	**100.1 (493)**	**100.0 (2095)**

Table 4. Female/Male Chairs By Field (Summer 2000 Baseline)

	% of	Full Professor		Assoc. Professor		Asst. Professor	
Field	**Depts**	**%F (N)**	**%M (N)**	**%F (N)**	**%M (N)**	**%F (N)**	**%M (N)**
Arch.	2.3	0.9 (3)	1.9 (33)	4.2 (3)	5.8 (9)	4.9 (2)	4.9 (4)
Arts	9.8	13.7 (46)	7.3 (126)	16.9 (12)	18.1 (28)	22.0 (9)	17.1 (14)
Bus.	3.5	4.5 (15)	3.7 (64)	2.8 (2)	3.2 (5)	12.2 (5)	1.2 (1)
Eng.	11.4	2.4 (8)	15.8 (272)	---	5.8 (9)	---	1.2 (1)
Humanities	25.6	40.3 (135)	19.6 (337)	50.7 (36)	32.9 (51)	29.3 (12)	32.9 (27)
Life Sci.	6.2	3.9 (13)	6.7 (116)	2.8 (2)	3.2 (5)	2.4 (1)	2.4 (2)
Nat. Res.	6.6	3.9 (13)	7.8 (135)	2.8 (2)	3.9 (6)	4.9 (2)	8.5 (7)
Math. & Phy Sci	12.9	5.7 (19)	16.0 (276)	1.4 (1)	6.5 (10)	---	11.0 (9)
Social Sci.	21.6	24.8 (83)	21.0 (361)	18.3 (13)	20.6 (32)	24.4 (10)	20.7 (17)
Total (N)	**100**	**100 (335)**	**100 (1720)**	**100 (71)**	**100 (155)**	**100 (41)**	**100 (82)**

Table 5. AAU Department Chair Profile (Summer 2000 Baseline)

Demographics	Engineering	Math & Phy. Sciences
Sex		
Male	90.1 (290)	87.9 (320)
Female	2.5 (8)	5.5 (20)
Not reported	7.5 (24)	6.6 (24)
Rank		
Full professor	87.6 (282)	81.6 (297)
Associate professor	2.8 (9)	3.0 (11)
Assistant professor	0.3 (1)	2.5 (9)
Other		
Not reported	8.4 (27)	11.5 (42)
Ethnicity[1]		
African-American	0.3 (1)	0.5 (2)
Asian/South Pacific	11.5 (37)	4.4 (16)
Hispanic/Latin	1.1 (4)	0.6 (2)
Middle Eastern	4.3 (14)	2.2 (8)
Native American	3.1 (10)	1.6 (6)
Non-White	0.6 (2)	0.3 (1)
White	63.7 (205)	70.1 (255)
Not reported	15.2 (49)	20.1 (73)

[1.] Since ethnicity is not self-reported for all respondents and data were available for less than two-thirds of the departments, this information should be considered exploratory.

Table 6. Engineering and Math & Phy. Sci. Female Chairs

Field (No. Depts.[1])	No. Women (%)
Engineering (298)	8 (2.7) *Departments (N):* Biomedical (2) Civil/Environmental (1) Comp/Electrical (1) Industrial (1) Chemical (3)
Math/Statistics (93)	2 (2.2) *Departments (N):* Math (1) Statistics (1)
Earth Sciences (68)	8 (12.0)
Chemistry (60)	3 (5.0)
Physics/Astrophysics (50)	3 (6.0)
Computer/Information Sci (47)	3 (6.4)
Astronomy (33)	1

[1.] Excludes missing values

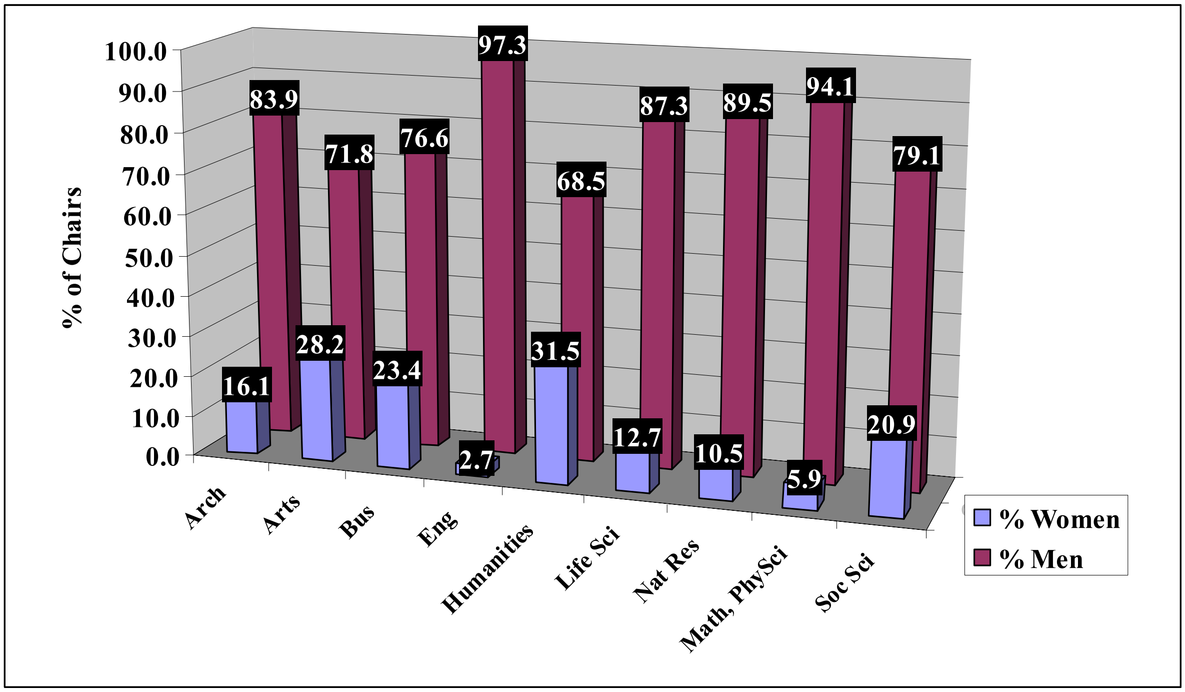

Figure 1. Dept. Chair by Sex and Field