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THE CLIMATE FOR WOMEN IN ACADEMIC SCIENCE: THE GOOD, THE BAD, AND THE CHANGEABLE

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Deficits theory posits that women scientists have not yet achieved parity with men scientists because of structural aspects of the scientific environment that provide them with fewer opportunities and more obstacles than men. The current study of 208 faculty women scientists tested this theory by examining the effect of personal negative experiences and perceptions of the workplace climate on job satisfaction, felt influence, and productivity. Hierarchical multiple regression results indicated that women scientists experiencing more sexual harassment and gender discrimination reported poorer job outcomes. Additionally, perceptions of a generally positive, nonsexist climate, as well as effective leadership, were related to positive job outcomes after controlling for harassment and discrimination. We discuss implications for the retention and career success of women in academic science.

Harvard President Larry Summers' recent speech to the National Board of Economic Research 2005 Conference questioned women's "intrinsic aptitude" for high-level science. His comments have fueled a national debate on causes for gender disparities in academic science (e.g., American Sociological Association, 2005; Ripley, 1995; Valian, 2005; Women in Science and Engineering Leadership Institute, University of Wisconsin, 2005). Although he made many widely disputed claims, Summers was correct that significant disparities remain between men and women in science, despite the fact that women's presence in the sciences has been increasing in terms of the number of women earning science degrees at the undergraduate and graduate levels (National Science Foundation, 2004) and serving on science faculty (National Science Foundation, 2000, 2004). Although more women are entering science, there is a parallel and problematic differential attrition of women from science at every level (Bird, Litt, & Wang, 2004; Kohlstedt, 2004). It is increasingly recognized that this differential attrition even at the very highest level (e.g., among tenured faculty in science) suggests that something about the academic science environment is problematic for women (Preston, 2004).

Specific difficulties faced by female science faculty include less influence and fewer opportunities to hold leadership positions (Carr, Szalacha, Barnett, Caswell, & Inui, 2003a; Niemeier & Gonzalez, 2004; Wright et al., 2003), slower advancement and less representation at top levels (Valian, 2004), more social isolation (Wright et al., 2003; Xie & Shauman, 2003), and (according to some indicators) lower levels of productivity (Sonnert & Holton, 1996), compared to their male counterparts. Various explanations for gender differences in science have been offered apart from differences in ability; these include the pipeline theory (i.e., there are not yet enough women in the sciences for parity to have been reached; Wright et al., 2003), work–family conflict (Wright et al., 2003), and gender differences in personal qualities relevant to science, such as professional styles and goals (Sonnert & Holton, 1996).

In contrast to such theories, we focus on deficits theory, a theory that considers deficits in the scientific environment (Sonnert & Holton, 1996) that might explain differences between men and women in career experiences and outcomes. This theory posits that there are formal and informal structural mechanisms (e.g., discrimination, limited networking) that provide women scientists with fewer opportunities and more obstacles in their career paths, leading to lowered success, satisfaction, and retention in science. According to this theory, negative features of the workplace

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climate, as well as more specific negative experiences (such as gender discrimination and sexual harassment), hinder the success of women faculty in the sciences. In contrast, positive aspects of the climate and strong leadership may promote women's careers in science.

The current study makes unique contributions to the literature by empirically testing the deficits theory in a representative sample of female science faculty. Moreover, we not only examine the impact of sexist and discriminatory practices, which have obvious implications for gender disparities, but also the effects of more general climate and leadership factors. We focus on two widely studied career outcomes (job satisfaction and productivity), but also add a new outcome to the discourse: "felt influence" over unit decisions, resources, and climate. All three outcomes are critical to women's success in the realm of academic science.

Organizational Climate

Organizational climate is the individual's perceptions of the organization's policies, practices, and procedures (Kickul & Liao-Troth, 2003; Seibert, Silver, & Randolph, 2004). Although such perceptions may or may not be accurate representations, they are critically important because they shape individuals' behavior at work and their feelings about the organization (Seibert et al., 2004). In addition, individuals within a work unit are thought to share perceptions of the climate of the work unit (Hulin, Fitzgerald, & Drasgow, 1996; Seibert et al., 2004).

Specific features of the organizational climate, including the extent to which it is sexist, generally positive, and has effective leadership, have been related to work outcomes for women and men. Regarding a sexist climate, a study of women firefighters found that, compared to those who perceived their workplace climate as less "chilly," those who felt the climate was chillier toward women reported that they were less accepted and perceived as less important to and valued by their station (Yoder & Aniakudo, 1996). Perceptions of organizations as tolerant of the sexual harassment of women were associated with reports of lower overall work satisfaction as well as decreased satisfaction with coworkers and supervisors (Fitzgerald, Drasgow, & Magley, 1999; Hesson-McInnis & Fitzgerald, 1997). Further, Hulin et al. (1996) found that tolerance for sexual harassment was a better predictor of job withdrawal and several measures of psychological well-being than personal experiences of sexual harassment. Thus, sexist climates and those permissive of sexual harassment have negative implications for individuals' workplace perceptions and outcomes.

Other interpersonal aspects of organizational climate have also been related to work outcomes. Several studies of men and women have found that supportiveness, teamwork, and positive treatment from coworkers and supervisors were positively related to work satisfaction (Donovan, Drasgow, & Munson, 1998; Johnson & McIntye, 1998; Joyce, Slocum Jr., & Von Glinow, 1982). Further, a meta-analysis of 51 organizational studies found that affective aspects of the climate, reflecting positive interpersonal interactions, were related to job satisfaction (Carr, Schmidt, Ford, & DeShon, 2003b).

Finally, workplace outcomes have been examined with respect to the effectiveness of those in organizational leadership positions. Researchers have found that positive perceptions of organization leadership (e.g., as responsive and communicative) and the fairness of rewards were related to work satisfaction (Zeitz, 1990) and increased organizational productivity (Wagar, 1997). Further, a study of military personnel found that women's perceptions that those in leadership positions were making efforts to stop sexual harassment were related to women's increased job commitment and satisfaction (Offermann & Malamut, 2002). Thus, the literature on workplace climate suggests that those environments that are sexist or more hostile toward women create an undesirable work atmosphere that is tied to poorer work outcomes, whereas positive climates and effective leadership foster good work outcomes.

Gender-Related Issues: Sexual Harassment and Gender Discrimination

In addition to the climate of the workplace, some of the issues that can affect women workers' satisfaction and retention in the labor force are directly related to gender. These issues include experiences of sexual harassment and gender discrimination.

Sexual harassment is defined as the sexualization of a work relationship, is usually directed at women by men, and includes sexist comments (gender harassment), unwanted sexual attention, sexual coercion, and sexual assault (Fitzgerald, 1996). Sexual harassment is more likely to occur in male-dominated environments, such as the sciences (Grauerholz, 1996; Hesson-McInnis & Fitzgerald, 1997; Hulin et al., 1996; Mansfield et al., 1991; Murrell, Olson, & Frieze, 1995). Reported rates of sexual harassment for women faculty range from 36 to 44% (Caroll & Ellis, 1989; Grauerholz, 1996), and a meta-analysis of 71 studies reported that 58% of women in academia had encountered harassing behavior at work, a higher rate than for women in the private sector or (nonmilitary) government organizations (Ilies, Hauserman, Schwaochau, & Stibal, 2003).

Because science is a male-dominated field, and rates of sexual harassment in academia are generally high, women faculty members in the sciences may be at particular risk for sexual harassment. In addition, academia has a hierarchical structure in which those with the most power tend to be male, whereas most of the women are untenured and thus relatively less powerful. Additionally, authority is generally diffused, making oversight of behavior more difficult (Grauerholz, 1996). In this type of gendered organization, sexual harassment can be used as a way of maintaining the existing power structure (Williams, 1999).

Experiences of sexual harassment have been related to a number of negative psychological and work outcomes. In terms of work outcomes, sexual harassment has been associated with lower job satisfaction for Latinas (Cortina, Fitzgerald, & Drasgow, 2002), female blue-collar workers (Kissman, 1990; Ragins & Scandura, 1995), and female utility company employees (Glomb et al., 1997). It has also been linked to less satisfaction with coworkers, supervisors, and work, as well as decreased job commitment and productivity, for women in the military (Fitzgerald et al., 1999; Magley, Waldo, Drasgow, & Fitzgerald, 1999; Newell, Rosenfeld, & Culbertson, 1995). In the university setting, academic and nonacademic women's level of sexual harassment was related to their lower satisfaction with coworkers, supervisors, and work, as well as greater work withdrawal (Schneider, Swan, & Fitzgerald, 1997).

Because sexual harassment involves treating women differently (i.e., sexually) because of their gender, it constitutes a form of gender discrimination (Paetzold, 2004). Gender discrimination is a particular type of unfair employment discrimination, which occurs "when persons in a 'social category'... are put at a disadvantage in the workplace relative to other groups with comparable potential or proven success" (Dipboye & Halverson, 2004, p. 131). An example of gender discrimination is the unequal distribution of resources, such as pay or work space. Women in male-dominated occupations are more likely to experience gender discrimination than those in traditionally female jobs (Mansfield et al., 1991). A study of elite women scientists (recipients of prestigious postdoctoral fellowships) found that 73% reported some form of gender discrimination (Sonnert, 1995).

The negative psychological and work outcomes that are associated with gender discrimination toward women are similar to sexual harassment outcomes. For example, experiences of gender discrimination have been related to lower job satisfaction for women managers (Murrell et al., 1995), as well as decreased professional self-confidence and career satisfaction and an increased sense of isolation for women in academic medicine (Carr et al., 2003a).

Both sexual harassment and gender discrimination, even in their mildest forms, may act as daily hassles or microstressors; these are small, relatively subtle experiences that, over time, may accumulate to have a substantial impact on the target (Harrell, 2000). Further, sexual harassment is recognized as an act of aggression against women (e.g., Koss et al., 1994; O'Leary-Kelly, Paetzold, & Griffin, 2000). These explanations can help to account for the specific negative work outcomes with which harassment and discrimination are associated. In addition, these negative events, even when not directly experienced, can create an inhospitable work environment.

The Current Study

The goal of the current study was to examine how general features of the climate, as well as specific experiences (i.e., sexual harassment and gender discrimination), relate to important job outcomes for women faculty in science. A great deal of research has focused on the harmful effects of sexual harassment and gender discrimination on women working in different occupational sectors. We aimed to extend this literature by focusing specifically on the realm of academic science, which can be an especially chilly environment for women, and to focus simultaneously on both personal experiences of workplace sexism and the larger workplace environment, assessed in three ways: sexist climate, general climate, and strength of leadership.

In our study, we distinguished between events that were directly experienced (sexual harassment and gender discrimination), and more general perceptions of aspects of the workplace climate, consistent with the approach used by Fitzgerald and colleagues (1999; see also Donovan et al., 1998). Although previous studies have often conceptualized, and found support for, organizational climate and ambient sexual harassment as predictors of particular episodes of sexual harassment (e.g., Cortina et al., 2002; Fitzgerald et al., 1999; Glomb et al., 1997; Hesson-McInnis & Fitzgerald, 1997; Newell et al., 1995), we sought to examine the direct influence of aspects of the workplace climate on workplace outcomes above and beyond the effect of personal experiences of sexual harassment and gender discrimination.

In assessing the impact of personal experiences and workplace climates, we focused on three work outcomes. The most important and frequently studied outcome is satisfaction because job satisfaction has been demonstrated to predict retention and intention to stay at a job (Glomb et al., 1997; Higgins & Thomas, 2001; Sourdif, 2004). In addition, we have considered two additional outcomes: felt influence and productivity. Both of these variables are important subjective indicators of success for academics and are related to job satisfaction (Patterson, Warr, & West, 2004; Zeitz, 1990). As such, this work contributes to the literature by broadening our understanding of the impact and cost of negative workplace climates and experiences. Specifically, we hypothesized that female science faculty who reported more sexual harassment and gender discrimination would report less job satisfaction, less felt influence, and lower productivity. Further, we hypothesized that women who perceived their department climate to be less sexist, more generally positive, and involving stronger leadership would report not only greater job satisfaction, but more influence in their department and higher productivity after controlling for the effect of sexual harassment and gender discrimination.

METHOD

Procedure and Participants

In fall of 2001 a 10-page survey was mailed to all female tenure track natural science (including engineering) and social science faculty, at or above the rank of assistant

professor, at a large Midwestern university ($N = 415$). A second survey was sent to all nonrespondents 3 weeks later. Survey responses were anonymous and confidential. Fifty-two percent of the natural scientists ($n = 135$) completed the survey, and a comparable 47% of the social scientists ($n = 73$) responded. There were no differences between respondents and nonrespondents by race, rank, or college/school. Although these are the only indicators we have with which to evaluate sample representativeness (i.e., indicators for which we have data from university records and survey responses), our overall response rate is comparable to response rates for other surveys of similar length administered to persons of high status, such as university faculty (CSHPE & CEW, 1999).

Of the respondents, 67 were assistant professors, 73 were associate professors, and 68 were full professors. They came from the colleges of Engineering ($n = 16$), Medicine ($n = 56$), Literature, Science, and Arts (LS&A; $n = 66$), and other colleges and schools (e.g., School of Public Health, Pharmacy, Kinesiology; $n = 59$); 11 women did not report their college. Women ranged in age from 29 to 69 years, with an average age of 46.48 ($SD = 8.74$ years). Over three-quarters of the women in the sample self-identified as White ($n = 167$), nearly 15% ($n = 30$) were women of color, and 5% ($n = 11$) did not indicate their racial/ethnic identity. The number of years women had worked for the current university ranged from 1 to 41, with a median of 7 to 11 years.

Measures

We assessed two kinds of gender-related experiences, three aspects of the workplace climate, and three job outcomes, as well as control variables. Whereas the measures assessing gender-related experiences assessed women's specific, firsthand experiences, measures of the workplace climate tapped general perceptions of the workplace.

Sexual harassment. To assess women's experience of sexual harassment, three items adapted from the 1994 Survey of Federal Employees (U.S. Merit Systems Protection Board, 1994) were used. One item asked women to report whether they experienced unwanted and uninvited sexual attention, including behaviors such as sexual teasing, jokes, pressure for dates, unwanted phone calls and e-mails, unwanted touching, stalking, rape, or assault in the past 5 years. Two other questions asked participants to indicate how often they had overheard insensitive or disparaging comments about women made by faculty (item 1) and students (item 2) on a 5-point scale ranging from 1 (*never*) to 5 (*weekly*). All three questions were standardized and averaged, with higher scores indicating more sexual harassment toward women (alpha = .69).

Gender discrimination. This variable was assessed using a measure adapted from the Texas A&M University Campus Climate Survey (Hurtado, 1998). Participants indicated whether they had experienced job-related gender discrimination at the university in the past 5 years in each of the following areas: hiring, promotion, salary, space/equipment or other resources, access to administrative staff, graduate student assignments, or other areas. We then computed a simple count of the number of areas in which gender discrimination occurred from 0 to 7 areas.

Sexist climate. Perceptions of a sexist climate were measured with three items from Riger, Stokes, Raja, and Sullivan (1997) and six items from the University of Virginia School of Medicine Gender Fairness Environment Scale (Hostler & Gressard, 1993). Items assessed the extent to which participants felt that their departmental environment was one in which there was inequality between women and men (e.g., "Some faculty have a condescending attitude toward women;" "Men are more likely than women to receive helpful career advice from colleagues"). Participants responded on a scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Appropriate items were reverse-coded, and a mean of all nine items was computed such that higher scores indicated a more sexist climate (alpha = .89).

Positive climate. The general climate of the participant's department was measured using a scale adapted from the Texas A&M University Campus Climate Survey (Hurtado, 1998). Participants rated their department using 5-point (1–5) semantic differential scales in which each pair of descriptors served as the anchors for the poles of the scale. The following seven dimensions were rated: friendly–hostile, disrespectful–respectful, collegial–contentious, collaborative–individualistic, cooperative–competitive, not supportive–supportive, and homogenous–diverse. Appropriate items were reversed and a mean was computed such that higher scores indicated a more positive departmental climate (alpha = .86).

Leadership. We assessed participants' perceptions of the leadership in their department with nine items adapted from the University of Michigan Medical School Faculty Survey (Betz, 1994). Six items created for this study were added. Items assessed the department chair (or director) as an effective administrator who supports faculty fairly and is committed to a diverse environment (e.g., "is open to constructive criticism;" "articulates a clear vision"). Respondents rated the leadership of their chair on a 5-point scale that ranged from 1 (*poor*) to 5 (*superior*). A mean of all items was calculated, with higher scores indicating more effective chair leadership (alpha = .96).

Job satisfaction. Job satisfaction was assessed using 13 items; 11 were adapted from the University of Michigan Faculty Work-Life Study (CSHPE & CEW, 1999), and two were created for this study. Items asked about overall satisfaction with the following dimensions of professional development: faculty interaction ("opportunity to collaborate with other faculty," "level of intellectual stimulation in

my day-to-day contacts with faculty colleagues," "amount of social interaction with members of my department"), resources and salary ("level of funding for my research or creative efforts," "current salary in comparison to the salaries of my colleagues"), success as a teacher ("ability to attract students to work with me," "sense of being valued as a teacher by my students," "sense of being valued as a mentor or advisor by my students," "sense of being valued for my teaching by members of my department"), success in scholarship ("sense of being valued for my teaching by members of my unit/department," "sense of contribution to theoretical developments in my discipline"), and work–family balance ("balance between professional and personal life"). Participants responded on a 5-point scale that ranged from 1 (*very dissatisfied*) to 5 (*very satisfied*). All items were averaged, with higher scores indicating more career satisfaction (alpha = .86).

Productivity. Women's perception of their productivity was assessed using two items. Participants were asked to label the most reliable indicators of productivity in their field from a list of possible criteria (e.g., external grants, number of articles published in refereed academic or professional journals). Participants were asked to use the criteria they selected to (a) rate their overall productivity compared to researchers in their area and at their rank nationwide and (b) rate how they think their department views their productivity, compared to the departmental average. Both questions were asked on a 10-point rating scale that ranged from 1 (*much less productive*) to 10 (*much more productive*). The two questions were averaged, with higher scores indicating greater perceived productivity (alpha = .68).

Influence. The extent to which women felt that they had influence in their department was assessed using nine items from the University of Michigan Faculty Work-Life Survey (CSHPE & CEW, 1999). Participants rated how much influence they had over educational matters (e.g., "unit curriculum decisions"), resources (e.g., "securing the facilities or equipment I need for my research"), and creating the overall climate (e.g., "affecting the overall unit climate/culture") using a 5-point scale that ranged from 1 (*really no influence*) to 5 (*tremendous influence*). Items were averaged, with higher scores indicating more felt influence in the department (alpha = .85).

Control variables. Participants self-reported their racial/ethnic identity. Due to the small percentage of women of color, race was coded into a dichotomous variable (0 = of color, 1 = White). Participants also self-reported the rank of their primary budgeted appointment for the 2000–2001 academic year (1 = assistant professor, 2 = associate professor, 3 = full professor). Finally, women self-identified as a social scientist (0) or natural scientist or engineer (1).

RESULTS

Preliminary Analyses

We included race, rank, and type of scientist as control variables because we expected that they would be related to our other study variables in meaningful ways. Given the smaller number of women of color in academic science compared to White women (National Science Foundation, 2004), we theorized that women of color may have more negative experiences and perceptions of their department climates than White women. In terms of rank, we speculated that career stage would have implications for our dependent variables, especially productivity and felt influence. Finally, because the natural sciences are more male-dominated and have a more masculine culture than the social sciences (National Science Foundation, 2004; Wyer, Geisman, Ozturk, & Wayne, 2001), we expected differences in climate perceptions to vary by type of scientist.

Analyses were first performed to examine relationships among our control variables. Chi-square analyses indicated that there were differences in rank by race; White women scientists were more likely to be at higher ranks than women scientists of color, $X^2(2, 197) = 14.99$, $p < .01$. However, there was no relationship between race and type of scientist or rank and type of scientist.

To determine whether there were differences in our study variables by our control variables, three multivariate analyses of variance (MANOVAs) were performed. Each of the control variables (race, rank, and type of scientist) served as the independent variable for one MANOVA, and our eight primary study variables (sexual harassment, gender discrimination, sexist climate, positive climate, chair leadership, job satisfaction, felt influence, and productivity) served as the dependent variables in all three analyses.

The overall MANOVA for differences in our study variables by race was significant, Wilks' Lambda = .91, $F(1, 181) = 2.18$, $p < .05$; however, follow-up analyses of variance (ANOVAs) revealed that the only variable that was significantly different by race was felt influence (see Table 1). Specifically, White women scientists felt they had more influence in their departments than women scientists of color. The overall MANOVA for rank was also significant, Wilks' Lambda = .80, $F(2, 190) = 2.63$, $p < .01$, and the follow-up ANOVAs (see Table 1) indicated that positive climate, felt influence, and productivity differed significantly by rank. Post hoc analyses indicated that differences in perceptions of climate by rank did not reach significance. However, full and associate professors felt they had significantly more influence in their departments than assistant professors, and full professors felt they were significantly more productive than both associate professors and assistant professors.

Regarding differences by type of scientist, the overall MANOVA was again significant, Wilks' Lambda = .92, $F(1, 190) = 2.08$, $p < .05$, and follow-up ANOVAs (see Table 1) indicated that there were significant differences for sexual

Table 1

Analyses of Variance for Dependent and Independent Study Variables by Race, Rank, and Type of Scientist

	Race			*Rank*				*Type of Scientist*		
Dependent Variables	*Of Color M (SD)*	*White M (SD)*	*F*	*Asst. M (SD)*	*Assoc. M (SD)*	*Full M (SD)*	*F*	*Social M (SD)*	*Natural M (SD)*	*F*
Sexual Harassment	.12	.12	.01	.20	.13	.04	.59	−.08	.23	6.18**
	(.74)	(.86)		(.82)	(.77)	(.90)		(.68)	(.88)	
Gender Discrimination	.63	.82	.48	.78	.97	.62	1.34	.58	.91	3.23*
	(.97)	(1.29)		(1.25)	(1.25)	(1.20)		(1.01)	(1.33)	
Sexist Climate	2.95	2.71	1.43	2.85	2.85	2.51	2.95*	2.45	2.89	10.68***
	(.95)	(.92)		(.89)	(.88)	(.95)		(.89)	(.90)	
Positive Climate	3.10	3.23	.47	3.09[c]	3.15	3.46[c]	3.31**	3.48	3.11	7.89***
	(1.11)	(.85)		(.90)	(.84)	(.88)		(.89)	(.86)	
Chair Leadership	3.22	3.37	.52	3.27	3.35	3.51	.97	3.68	3.22	9.53***
	(1.10)	(.98)		(.96)	(.98)	(1.02)		(.94)	(.98)	
Job Satisfaction	3.63	3.62	.01	3.59	3.55	3.75	1.38	3.77	3.55	3.73*
	(.79)	(.74)		(.72)	(.65)	(.83)		(.67)	(.77)	
Felt Influence	2.20	2.70	9.20***	2.35[ab]	2.69[a]	2.87[b]	7.49***	2.78	2.58	2.95*
	(.79)	(.75)		(.73)	(.72)	(.78)		(.73)	(.78)	
Productivity	6.34	6.78	1.24	6.06[a]	6.65[b]	7.41[ab]	10.11***	6.74	6.71	.01
	(1.80)	(1.77)		(1.95)	(1.55)	(1.50)		(1.59)	(1.83)	

Note. Degrees of freedom are as follows: Race = 1,181; Rank = 2,190; Type of Scientist = 1,190. For Rank, means with the superscripts [a] and [b] are significantly different from each other at $p < .05$; means with the superscript [c] are significantly different from each other at $p < .10$.
$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .01$.

harassment and the three climate variables. Specifically, natural scientists reported more sexual harassment and perceived their climates to be more sexist than social scientists; social scientists felt that their department climates were more positive and that their chairs provided better leadership than natural scientists. Given these differences by race, rank, and type of scientist, we controlled for these three variables in subsequent regression analyses. Correlations among variables and descriptive statistics appear in Table 2.

Regression Analyses

To test the study's hypotheses, three multiple regressions were performed, with job satisfaction, influence, and productivity serving as the dependent variables. All three models had three steps. On the first step, race, rank, and type of scientist (social or natural) were entered as control variables. On the second step, gender discrimination and sexual harassment were entered. On the third step, sexist climate, positive climate, and chair leadership were entered.[1]

Table 2

Correlations, Means, and Standard Deviations

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. Race											
2. Rank	.28***										
3. Type of Scientist	.04	−.08									
4. Sexual Harassment	.02	−.06	.18**								
5. Gender Discrimination	.08	−.04	.11	.37***							
6. Sexist Climate	−.05	−.14	.23***	.46***	.57***						
7. Positive Climate	.05	.15**	−.18**	−.36***	−.35***	−.59***					
8. Chair Leadership	.07	.09	−.22***	−.28***	−.21***	−.44***	.65***				
9. Job Satisfaction	.03	.10	−.09	−.26***	−.33***	−.52***	.68***	.59***			
10. Influence	.23***	.28***	−.09	−.11	−.25***	−.45***	.43***	.49***	.54***		
11. Productivity	.11	.31***	.01	−.13*	−.05	−.18**	.34***	.30***	.45***	.32***	
Mean	–	2.00	–	.08	.75	2.69	3.24	3.37	3.61	2.65	6.67
Standard Deviation	–	.81	–	.82	1.20	.93	.88	.98	.76	.77	1.75

Note. For Race (0 = Women of color, 1 = White); For Type of Scientist (0 = Social, 1 = Natural).
$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .01$.

Table 3

Multiple Regression Analyses of Job Satisfaction, Influence, and Productivity Predicted by Sexual Harassment, Gender Discrimination, and Climate Factors

	Job Satisfaction			*Influence*			*Productivity*		
Variable	R^2	B (β)	*SE*	R^2	B (β)	*SE*	R^2	B (β)	*SE*
Step 1:	.024			.105***			.104***		
Race		.01 (.01)	.16		.39 (.18)**	.17		.08 (.02)	.37
Rank		.08 (.09)	.07		.21 (.21)***	.07		.71 (.32)***	.16
Type of Scientist		−.19 (−.12)	.12		−.16 (−.10)	.11		.06 (.02)	.26
Step 2:	.130***			.057***			.019		
Sexual Harassment		−.14 (−.16)**	.07		.02 (.02)	.07		−.30 (−.14)*	.16
Gender Discrimination		−.17 (−.28)***	.05		−.15 (−.25)***	.05		.01 (.01)	.11
Step 3:	.384***			.218***			.087***		
Sexist Climate		−.15 (−.19)**	.06		−.22 (−.27)***	.07		.01 (.01)	.19
Positive Climate		.36 (.43)***	.07		.02 (.03)	.08		.43 (.22)**	.20
Chair Leadership		.19 (.25)***	.05		.29 (.37)***	.06		.27 (.15)*	.16
Total R^2	.538***			.381***			.210***		

Note. For Race (0 = Women of color, 1 = White); For Type of Scientist (0 = Social, 1 = Natural).
$^*p < .10$. $^{**}p < .05$. $^{***}p < .01$.

The results for job satisfaction can be seen in Table 3. None of the control variables entered on the first step predicted job satisfaction. However, the experiential variables entered on the second step accounted for a significant 13% of the variance in job satisfaction. Women scientists who reported more sexual harassment and gender discrimination were less satisfied with their jobs. The climate variables entered on the third step explained an additional 38% of the variance in job satisfaction. Women scientists who viewed their department climate as more sexist were less satisfied with their jobs, whereas those who viewed their department climate more positively and those who reported more effective leadership were more satisfied.

The findings for the influence variable are also shown in Table 3. The variables entered on the first step accounted for a significant 11% of the variance in felt departmental influence. White women scientists and women scientists at higher ranks perceived having more influence in their departments. The variables entered on the second step accounted for an additional 6% of variance in felt influence. In particular, women scientists who reported more gender discrimination felt they had less influence in their departments. Finally, over and above the effects of control and experiential variables, the climate variables explained 22% of the variance in influence; women who perceived the climate in their department to be more sexist reported having less influence, whereas those who perceived more effective chair leadership reported having more influence.

Finally, the results for productivity can also be seen in Table 3. The demographic variables entered on the first step accounted for a significant 10% of the variance in productivity; women scientists of higher rank reported more productivity. Gender discrimination and sexual harassment, entered in the second step, did not account for a significant additional amount of the variance in productivity. The climate variables entered on the third step accounted for a significant 9% of additional variance in productivity. Specifically, women scientists who reported a more positive climate described themselves as more productive.

DISCUSSION

The current study sought to identify factors that promote and hinder the work outcomes of women scientists, as suggested by deficits theory (Sonnert & Holton, 1996). Specifically, we hypothesized that negative gender-related experiences would be related to negative work outcomes, whereas a positive workplace climate would be related to positive work outcomes, after controlling for the effects of negative gender-related events. Our hypotheses were largely supported.

Our two measures of negative gender-related experiences had the strongest influence on overall job satisfaction, consistent with many previous studies of the impact of sexual harassment and gender discrimination on workplace satisfaction (e.g, Cortina et al., 2002; Magley et al., 1999; Murrell et al., 1995; Fitzgerald, Drasgow, Hulin, Gelfand, & Magley, 1997; Fitzgerald et al., 1999). These findings reinforce that sexual harassment and gender discrimination have a significant negative impact on women's overall attitudes toward their employment, and extend this line of inquiry to the context of academic science. As job satisfaction relates to job turnover (e.g., Glomb et al., 1997; Higgings & Thomas, 2001; Sourdif, 2004), these results offer a potential explanation for women scientists' higher rate of attrition compared to male scientists.

Gender discrimination was also related to women scientists' level of felt influence in their department. Gender

discrimination may signal to women their lesser value relative to men in their department, which may translate into women feeling that their opinions are not valued. Further, the differential opportunities for women and men may limit women's actual ability to influence various aspects of their department. In particular, discrimination in hiring and promotion may limit women's progress into tenured positions in which they can have a say with less fear of negative repercussions. Although gender-related experiences were not significantly related to productivity, the negative relationship (approaching significance) between sexual harassment and productivity is consistent with studies of women in the military (Fitzgerald et al., 1999; Magley et al., 1999; Newell et al., 1995). Nevertheless, the relative lack of a relationship may speak to women scientists' resilience in the face of inequity.

Meaningful patterns were also found for our measures of department climate. Women scientists who perceived the department climate to be sexist reported lower levels of felt influence and job satisfaction, the latter of which is consistent with the findings of Fitzgerald and colleagues (Fitzgerald et al., 1999; Hesson-McInnis & Fitzgerald, 1997; Hulin et al., 1996). Thus, both personal experiences of unequal treatment and a general climate in which men and women are treated unequally (controlling for their personal experiences) related to women's sense that they had less say in how decisions were made in their department and their overall sense of dissatisfaction with their workplace.

In contrast, women's perceptions of a positive or supportive department climate were related to higher levels of job satisfaction and productivity. A positive academic climate, as measured here, is one in which there is more collaboration and cooperation, respect, and collegiality. Factors such as collaboration are thought to be critically important for increasing positive work outcomes for women scientists; for example, Sonnert and Holton (1996) found that women scientists' more limited opportunities (compared to men) for egalitarian collaborations may create an obstacle to their career success.

Further, women scientists who perceive that their departments have a more positive climate may be more integrated into their departments and therefore experience less social isolation from their colleagues. Closer relationships are likely to have practical implications, such as facilitating the dissemination of information and networking opportunities (Sonnert, 1995), as well as implications for psychological well-being. In addition, the importance of a respectful work environment for work outcomes has been demonstrated in previous research on workplace incivility (Cortina, Magley, Williams, & Langhout, 2001). Both the agentic and social aspects of a positive work climate are likely contributors to women scientists' increased output and positive feelings about their jobs.

Effective chair leadership was related to all three of our work outcomes: job satisfaction, influence, and productivity. Management and organizational leaders determine the organization's norms, values, and guidelines for appropriate behavior (Offerman & Malamut, 2002). In an organization with diffused responsibility, as in academia, this role is often served by the department chair. Our results suggest that the clear communication of expectations and the fair treatment of individual faculty members facilitate positive outcomes for women scientists, even after controlling for sexual harassment and gender discrimination. Clear guidelines regarding faculty evaluations and the routine dissemination of information may be means of reducing unintended gender discrimination (Sonnert, 1995). Further, a chair that women scientists view as an effective leader may also help to create a positive and nonsexist atmosphere.

Although not a focus of the current study, our bivariate correlations demonstrated relationships among all three of our climate variables and our two gender-related experiential variables that are consistent with the large body of research on this topic (e.g., Fitzgerald et al., 1999; Hesson-McInnis & Fitzgerald, 1997; Hulin et al., 1996; Newell et al., 1995); specifically, sexual harassment and gender discrimination were related to more sexist climates, less positive climates, and less effective leadership. Hesson-McInnis and Fitzgerald (1997) have suggested that sexual harassment may be more easily reduced through changes in the organizational climate (e.g., reducing tolerance for sexism) than through changes in individual harassers. This notion, combined with our results, suggests that improving the organizational climate may promote positive work outcomes directly, as well as indirectly, by reducing women's experience of negative events such as sexual harassment.

Further, our preliminary analyses demonstrated that there were important differences between natural and social scientists. In particular, natural scientists reported more sexual harassment than social scientists. In addition, natural scientists viewed their department climate more negatively (more sexist, less positive, and having less effective leadership) than did social scientists. Thus, in terms of both their experiences and perceptions, women in the natural sciences perceived their environments to be more hostile. These differences are likely due, in part, to the fact that the natural sciences are more male-dominated than the social sciences in all areas except the life sciences (e.g., biology; National Science Foundation, 2004). Previous research has identified male-dominated environments as predictors of negative outcomes for women, such as sexual harassment (e.g., Hesson-McInnis & Fitzgerald, 1997). Further, in environments in which women are a numerical minority, they may experience increased pressure to perform, social isolation, and discrimination from men in their departments (Kanter, 1977), as well as a conflict between their identities as women and scientists (Settles, 2004). Interestingly, despite these differences, natural and social scientists did not differ in their job satisfaction, felt influence, or productivity. These findings suggest that women in the natural sciences may have developed effective coping strategies as

a means of dealing with their more negative environments, such as finding sources of support both within (e.g., mentors, women scientist organizations) and outside (e.g., family, friends) academia.

A few other interesting findings not central to the study's hypotheses were observed. In particular, women of color reported having less influence in their department than White women. Because they may experience multiple forms of discrimination and harassment, and they are likely to be racial tokens in their departments (and possibility also gender tokens), women of color may experience even greater social isolation than White women scientists (Kanter, 1977). In addition, we found that women scientists of higher rank reported more productivity and felt influence, but not more job satisfaction, than those of lower ranks. These findings suggest that a higher rank may bring some benefits to women scientists, but it does not fully buffer negative experiences.

Limitations, Future Directions, and Recommendations

As with any study, this research is not without limitations. First, the women in our sample came from one university; thus our results may be limited in their generalizability to other groups of academic women in science. However, this university resembles many other large public universities in its size, gender ratios, hiring practices, and related variables. The generalizability of our results may also be limited by our moderate response rate. Our response rate is typical for this type of study (CSHPE & CEW, 1999), and the women in our sample are representative of other university women scientists, according to the indicators on which we are able to compare them. However, it is possible that our respondents had more negative, or more positive, experiences than nonrespondents, that led them to participate in the study.

Second, our measures assessed individual perceptions of experiences. For many of our constructs, the individual's perspective on her environment was central to the research question. In the case of work productivity, more objective measures may have been useful but would have created problems for participant anonymity and comparability of productivity measures across fields. Further, self-report is a common method for assessing productivity (Xie & Shauman, 2003) and is highly correlated with other methods, such as peer assessment (Cole & Zuckerman, 1991).

It is possible that there is some confounding between our climate measures and our measure of job satisfaction. However, we note that of the 13 items in the job satisfaction measure, only three assess directly interactions among faculty; two items pertain to objective resources (funding and salary) and four to aspects of teaching. The climate indicators, in contrast, are based solely on specific kinds of comments or behavior, or on very general characterizations of the interpersonal environment (e.g., hostile, competitive, etc). Therefore, we believe that these measures assess conceptually and theoretically distinct aspects of faculty experience. Finally, this study was entirely based on single-source, self-report data, raising the possibility that common method variance could drive significant relationships. However, the diverse pattern of correlations among study variables (including near-zero correlations) argues against a mono-method-bias interpretation of results (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

The results of our study suggest avenues for further research. Future studies could consider theoretically relevant departmental characteristics, such as size, gender composition, and sex of the chair, as predictors of job outcomes, climate perceptions, or gender-related experiences. Further, additional studies could examine our climate variables as predictors of work outcomes for male science faculty because environments hostile toward women may also negatively affect men (Miner-Rubino & Cortina, 2004). Longitudinal studies could establish whether a supportive climate created by the leadership of the department chair could decrease sexual harassment and gender discrimination within the department over time. Finally, research outside of academia, perhaps with women scientists working in industry, could examine whether the factors of focus in this study are relevant in nonacademic settings.

In line with the deficits model (Sonnert & Holton, 1996), we found that sexual harassment, gender discrimination, and a sexist climate create serious obstacles for women scientists. However, we also found that a positive climate and strong leadership are factors that promote positive outcomes for these women. Further, our variables accounted for over 50% of the total variance in job satisfaction, with our three climate measures accounting for the largest portion. These findings support the importance of the workplace environment for the satisfaction of academic women scientists and suggest that institutions need to implement policies that can improve the climate for this group. Our results, then, point to several aspects of the academic workplace that may be enhanced to support the careers of women scientists.

The leadership provided by the department chair appears to be an especially important factor in improving women's work outcomes. The chair can improve the workplace climate for women in the sciences by encouraging collegiality among faculty members (e.g., identifying areas of overlapping research interests), ensuring gender equity in departmental assignments (e.g., not assigning institutional housekeeping activities only to women faculty), and discouraging sexist behavior of faculty members (i.e., addressing offensive comments made by male faculty on behalf of women, who may be afraid to do so; Bensimon, Ward, & Sanders, 2000). That is, an effective departmental leader can create bridges for women faculty, as well as use their positions of power to protect women's interests.

In addition, department chairs may themselves serve as mentors to women faculty or they may implement structured mentoring relationships (Bensimon et al., 2000). Mentors can make otherwise unspoken norms

and expectations clear, identify departmental procedures and politics, and assist in the practical aspects of teaching, research, and service activities often required of faculty. Although ideally mentoring relationships would be formed naturally, this often does not occur, especially for women in male-dominated departments. Thus, the role of the chair in facilitating such relationships can be particularly important.

These recommendations for change highlight the importance of the chair or department leader in creating a positive climate for women faculty. Further, they require a chair who is open-minded to women as science faculty, and to the possibility that women's experiences and perceptions of the department may differ from theirs (given that most science department chairs are men; Niemeier & Gonzales, 2004). Thus, it is critical that department leaders are selected in a way that ensures that women faculty have an influence on decisions. In addition, university and college administrators should institute mechanisms that provide periodic checks on women faculty's satisfaction both with their department leaders and their experiences as faculty members. Faculty and administrators invested in a diverse workplace can increase the success and retention of women scientists in both the natural and social sciences by creating mechanisms that encourage collaboration and mentoring and by fostering good leadership practices.

In sum, the results of our study have contributed to the extant research in several ways. First, we demonstrated that experiences of sexual harassment and gender discrimination have negative consequences for women science faculty. Further, our results indicated that perceptions of the work climate have a direct effect on women scientists' job outcomes, even after controlling for perceptions of sexual harassment and gender discrimination. Finally, we extended previous research by focusing on women faculty's perceptions of their influence within their departments. By doing so, we have expanded our knowledge of the extent to which the two types of workplace variables of interest in this research, personal experiences and climate perceptions, have an impact on job outcomes for academic women scientists. Although our research was not able to disprove Summers' contentions about the inherent scientific ability of women scientists, it did highlight the degree to which organizational and situational factors act as barriers or facilitators to the success of academic women scientists.

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NOTE

1. To test for interactions by type of scientist (natural or social), a second set of multiple regression analyses was performed. These analyses was the same as those reported here, except that they included a fourth step in which five 2-way interaction terms, comprising the five main study variables (sexual harassment, gender discrimination, sexist climate, positive climate, chair leadership) by type of scientist, were entered. For the interactions, continuous independent variables were centered (except sexual harassment, which was already a standardized measure) and interaction terms were formed multiplicatively (Aiken & West, 1991). Of the 15 interactions tested, only one was significant: type of scientist moderated the relationship between gender discrimination and felt influence. Specifically, for social scientists, experiencing more gender discrimination was significantly related to having less influence; for natural scientists, gender discrimination and felt influence were not significantly related.

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