

# **The Experiences and Perceptions of Women Post-Doctoral Fellows in Chemistry: Data from COACH Surveys and Interviews**

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This brief report examines the experiences and views of women post-doctoral fellows in the field of chemistry. The data came from questionnaires given to participants in COACH-sponsored workshops at various national professional meetings. Before attending the workshops participants were asked to complete surveys that asked about their professional experiences and concerns. All surveys were administered on-line and respondents were free to answer or not answer any of the questions. These data were supplemented by personal interviews conducted with six post-doctoral fellows in the summer of 2007.

Data were obtained from 114 women attending 10 different COACH professional development workshops from 2006 to 2014 that were held prior to or during professional scientific meetings in various cities across the United States (see Table 1). Over the nine year period the survey was altered slightly, primarily with the aim of shortening the questionnaire and making it easier for respondents to complete. A substantial proportion of the questions were included in all versions of the survey, and the discussion below focuses on responses to these common questions. The first major section below examines demographic characteristics of the respondents and information about the nature of their work and academic specialties. The second section reports data on how they view their work and career, and the third reports the mentoring and support they have received. The fourth section examines the respondents' views of how equitably women and minorities are treated, comparing their views to those of chemistry department chairs and women faculty. The final section looks at their future plans.

## ***Characteristics of the Post-Doctoral Fellows***

The respondents were in the early stages of their careers having recently received their PhD's. Their average age was 30.9 years (s.d. = 3.8); with three-quarters being 32 years of age or younger. On average they had received their PhD and entered their postdoctoral position less than two years prior to attending the workshop. Slightly more than half of the women (51.9 percent) were married or partnered. About twenty percent of the respondents (19.2 percent) reported having children, and most of these women had only one child. Information about the age of the youngest child was only gathered in the last wave of surveys, and, of those, all of the children were three years of age or younger. About two-thirds of the respondents identified as "white," one-quarter as Asian or Pacific Islander, about 13 percent as Latina or Hispanic and 6percent as African American. They represented all areas of chemistry, although 40 percent were in the fields of physical or inorganic chemistry.

## ***Leadership Roles***

A short series of questions asked about the fellows' participation in leadership and team activities in their post-doctoral positions. Over four-fifths (83 percent) of the respondents reported that they had been asked to perform in a leadership role in team activities, "such as directing students." Over half (55 percent) said that their role in research teams had been very meaningful and another fifth (22 percent) reported that it was somewhat meaningful. Only about a tenth (11 percent) said that it was not at all meaningful. In addition, four fifths of the

respondents said that their colleagues had been very (36 percent) or somewhat (44 percent) receptive to their input and efforts in their department or institute.

### ***Satisfaction, Concerns, and Discouragement***

Table 2 summarizes respondents' reports of their satisfaction with their workload, progress towards their career aspirations, and with their current job, "overall." The majority reported some level of satisfaction with each of these areas. They were least satisfied with their progress toward career aspirations, with almost a third being somewhat or very dissatisfied.

Table 3 summarizes the respondents' reports of their concerns regarding where they "are currently" in their career. Responses to the questions were given on a 5 point scale, ranging from "great concern" (score of 1) to "no concern" (score of 5), and Table 3 reports the average response ranging from those indicating the most concern (lowest scores) to those with the least (highest scores). The postdoctoral fellows expressed the most concern (averaging between "great" and "considerable" to areas related to skill development, identifying research problems, getting a faculty position and research funding. On average, they reported considerable to some concern (averages between 2 and 3) with making career progress, establishing their credibility, spousal employment, and finding a mentor. Interestingly, the smallest average was 2.7, falling between "considerable" and "some." In none of the areas listed did the average response indicate "little" or "no" concern. Note also that the standard deviations were all relatively small, indicating relatively small variation in the respondents' answers.

Table 4 reports responses given to questions regarding balancing work and family life. These questions involved a series of statements to which respondents could indicate a range of agreement (from "strongly agree" to "strongly disagree"). The responses indicate that the majority believed that their supervisor supported their needs to balance work and family life, that their coworkers and superiors were not concerned regarding the time they spent with family, and that they did not feel overburdened by family responsibilities. The majority did not delay their work or education for family reasons (reflected in their young age and largely childless situation) but that they would not pursue a job if it cut deeply into family time. Note however, that there is a fair amount of variation in response to two questions: 1) regarding how much work takes away from personal interests, with almost two-thirds agreeing but a quarter disagreeing and 2) regarding how much "family/friends dislike how often I'm preoccupied with my work while I am at home," with close to half agreeing and about a third disagreeing. These items were moderately correlated ( $r = .21$ ).

When asked if they had "ever felt discouraged in your postdoctoral position," 71 percent of the respondents replied yes. This query was followed by a series of questions asking how much each of a variety of issues contributed to these feelings. Responses varied from "very much" with a score of one to "not at all" with a score of 5. The responses to these items are summarized in Table 5. Average values are shown, with the areas ordered from those to which the most importance was attached (lowest average) listed first. It is clear that issues related to their career (research not going well and long-term opportunities) were the most important factors, with ratings between "very much" and "moderately." Factors regarding personal life, interaction with faculty and department climate were rated, on average, between "moderately" and "somewhat," and the areas regarding interactions with others averaged between "somewhat" and "only a

little.” Note that there was somewhat more variability in some of the items (personal life, interaction with faculty, department climate, interactions with administrators) than with others.

### ***Mentoring and Support***

The postdoctoral fellows also responded to a series of specific queries regarding the extent to which “senior faculty mentor you by giving recommendations” for a variety of activities and “how often” a variety of professional activities were available to them. These responses are summarized in Table 6. The top panel reports the responses regarding recommendations provided for five areas: review panels, as an invited speaker, members of study sections, for awards, and for participation in conferences. The modal category for the first four areas was “not at all.” Fewer than one-fifth of the women reported that there were “very much” mentored through recommendations for what might be seen as the more substantive and important areas, including review panels, speaking, membership in sections and for awards. The only area where substantial encouragement was given was for participation in conferences.

The second panel of Table 6 reports the availability of various activities. Across the five areas the modal category was either “annually” (for poster sessions and meeting of professional societies” or “occasionally” (for luncheons, receptions and other functions. Very few reported regular opportunities for professional interactions.

In addition to the questions about mentoring activities, the fellows were asked if they had “someone they considered a mentor” during their “education and professional training.” Eighty-six percent of the fellows indicated that they had such a person. Sixty percent of the respondents indicated that their mentors were exclusively men, 30 percent that they were only women and the remaining 10 percent that they had both women and men as mentors. The vast majority (70 percent) of the mentors were described as professors or advisors and most of the remaining held positions such as PI or lab director. In addition, three-quarters of the fellows indicated that they had mentored others, with the vast majority (85 percent) indicating that their mentees were both male and female.

### ***Fair Treatment***

A series of four questions asked the fellows about their perceptions of fair treatment for women and minority postdoctoral fellows. The results are summarized in Table 7. Although there were a some with less positive views (13-18 percent), the vast majority of the fellows believed that women postdoctoral associates were treated fairly, were mentored as well as men, and had equal career advancement opportunities as male postdoctoral associates. A majority also perceived that racial-ethnic minorities were treated fairly.

Three sets of questions asked the fellows about factors that affect the recruitment, hiring, and career progress of women faculty. These questions have been used consistently in COACH surveys of both women faculty and department chairs. Table 8 summarizes the responses of the fellows and compares these to the average responses given by women faculty and department chairs in earlier analyses. Data from the women faculty were obtained from workshops distributed before attendance at COACH-sponsored workshops; data from the department chairs were obtained from a survey administered after attendance at a COACH sponsored workshop related to gender equity. The first panel of Table 8 reports views regarding issues that make it

difficult to recruit women faculty. Respondents in all three groups reported that the most important issue was “concerns of the female faculty candidate about having both a family and a successful academic career,” which was rated, on average between a moderate and major difficulty. Note that the department chairs consistently saw each of the issues as more minor than the faculty or postdoctoral fellows. The women faculty and postdocs had similar average scores on all items except that regarding an unwelcoming departmental environment, which the postdocs saw as a more serious issue.

The second panel of Table 8 reports results regarding issues that limit departments’ ability to hire women faculty. The highest average rating was given to an “inability to provide employment for spouse or partner.” This was rated equally highly by the department chairs, although they had similarly high average ratings regarding too few women applicants and losing applicants to other institutions. Interestingly, the postdocs rated a lack of commitment by departmental faculty to increasing the number of women as more important, on average, than either the women faculty or the department chairs. The post docs also had higher average ratings to opposition of current faculty and the lack of financial support.

The third panel of Table 8 reports average scores regarding issues that slow “the career progress of women chemistry faculty at colleges and research universities relative to their male peers.” For all three groups the highest average was associated with “balancing professional and family obligations; and, for post docs and faculty, the average rating of women doing less self-promotion was almost as high. The postdocs and faculty had similar average ratings, in most areas. The exceptions all involved issues that faculty rated as somewhat more important: having few female colleagues, lack of success in funding, exclusion from important decisions, and gender discrimination in the peer review process. In almost all cases, the postdocs rated the issues as more serious than chairs, the only exception being the impact of having few female colleagues.

### ***Future Plans***

Finally, the fellows were asked about where they expected to continue their professional careers. Almost 90 percent reported that they expected to move to an academic position. Most of the remaining women planned to enter the private sector and just two people reported that they expected to go to the public sector.

### ***Interview Data***

While data were available from only a few interviews, the information provided generally supported the themes described above. All of the interviewees were in their late 20s or early 30s and were childless. They were also all very dedicated to their science and enjoyed their work. They expressed a desire to enter academe; although at least one planned to take a job in industry while searching for an academic position. A major reason for wanting to enter teaching was their enjoyment of students and teaching; and at least some indicated a preference for going to a liberal arts school that emphasized teaching over research. Each of the interviewees also expressed concerns about balancing work and their personal lives.

### ***Summary***

The post-doctoral fellows represented all areas of chemistry, and the vast majority was at the start of their careers, in their late 20s and early 30s. The majority also expressed satisfaction with their work and job; and about 90 percent planned to enter the academic world after their fellowships ended. The most concerns were expressed regarding areas related to career progress and establishing their career positions, although there was more variability regarding tensions between workload and personal life. The vast majority of the respondents reported having mentors, but reported receiving relatively few concrete acts of assistance in professional development from the faculty in their departments. In general, the fellows believed that male and female post-doctoral fellows were treated equally, as were those of racial-ethnic minorities. They believed, however, that a substantial number of factors affected the ability of chemistry departments to recruit and hire women as well as women's progress in the field. Their views were more similar to those of women faculty than department chairs. However, the fellows were more likely than the faculty to cite factors related to negative views toward women as affecting both hiring and recruiting. They were slightly less likely than the faculty women to perceive that a variety of factors affected faculty women's career progress. (These differences may well represent the salience of each area to their own lives.)

Clearly, these data could be subjected to more analyses. Several areas could be explored. The first is assessing the extent to which the findings reported above hold across the 9 year span of data. The second involves examining the variations among the, perhaps focusing both on variations in levels of concern and satisfaction as well as differences in views regarding equitable treatment. Third, statistical tests should assess the differences in views of the fellows, faculty, and chairs. Finally, follow-up analyses would be very interesting, both to assess the extent to which the fellows were able to enter academe and the relationship of views expressed at the post-doctoral stage to their later experiences.

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Table 1

*Workshops Respondents Attended, Year and Number of Respondents per Workshop*

<u>Workshop Site and Year</u>	<u>N</u>
San Francisco, 2006*	12
Boston, 2007*	29
Philadelphia, 2008*	11
Washington, D.C., 2009*	12
Boston, 2010*	14
Denver, 2011*	8
Seattle, 2012#	5
Indianapolis, 2013*	11
New Orleans, 2014%	5
San Francisco, 2014*	7
Total	114

\*Workshops held prior to National American Chemical Society Meetings

# Workshop held at the Annual Meeting of the Society for the Advancement of Chicanos and Native American Scientists

%Workshop held at the Annual Meeting of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers

Table 2

*Satisfaction of Respondents with Workload, Career Progress, and Job (%)*

	<u>Workload</u>	<u>Progress toward Career Aspirations</u>	<u>Your job, overall</u>
Very satisfied	17	15	23
Somewhat satisfied	33	37	34
Satisfied	32	17	28
Somewhat dissatisfied	16	28	13
Very dissatisfied	2	4	2
Total	100	100	100

Table 3

*Average Level of Concern Regarding "Where You Are Currently in Your Career" (1=Great Concern, 5 = No Concern)*

	<u>Average</u>	<u>S.D.</u>
Developing new knowledge or skills to help me improve in my work	1.8	0.9
Identifying new problems to work on	1.8	1.0
Getting a tenure-track faculty position	1.8	1.2
Developing a reputation in my line of work	1.9	0.9
Obtaining future funding for my research	1.9	1.1
Getting established in my work	1.9	0.9
Keeping up with new knowledge, equipment and methods in my field	2.0	0.9
Making progress in my field of work	2.0	1.0
Establishing myself where I work	2.2	1.1
Establishing my credibility where I work	2.2	1.2
Establishing my credibility outside of my institution	2.2	1.0
Negotiating for what I need in my first faculty position	2.2	1.3
Finding ways of making my competence known in my institution	2.2	1.0
My spouse and I finding employment in the same location	2.3	1.5
Excelling in my teaching and educational activities	2.3	1.2
Attending meetings and seminars on new methods in my field of work	2.3	1.0
Finding a mentor to help my career advancement	2.4	1.2
Adapting to changes introduced since I got established in my occupation	2.7	1.2

Note: The item "establishing myself where I work" was included in the first set of surveys and was then replaced with three questions related to this area: "establishing my credibility where I work," "establishing my credibility outside of my institution," and "making progress in my field of work." Thus, the sample size for each of these responses is smaller than for the other items..

Table 4

*Concerns Regarding Work Family Balance (%'s)*

	<u>Strongly Agree</u>	<u>Agree</u>	<u>No Opinion</u>	<u>Disagree</u>	<u>Strongly Disagree</u>
My research advisor has been supportive of my needs to balance work and family life	32	41	16	10	0
I delayed finishing my Ph.D. and/or work towards becoming a professor in order to start a family.	5	8	23	21	42
I intend to pursue the job of my choice even if it cuts deeply into the time I have for my family/spouse	7	26	14	45	8
My family/friends dislike how often I'm preoccupied with my work while I am at home.	12	35	19	26	9
On the job, I have so much work to do that it takes away from my personal interests.	12	49	13	23	3
My personal life takes up time that I'd like to spend at work.	4	12	11	54	19
My superiors and peers dislike how often I am preoccupied with my personal life while at work	2	7	13	49	29

Note: The introduction to these questions was worded, "Please indicate how much you agree or disagree with each of the following statements regarding your current career or occupation and family concerns.



Table 5

*Ratings of Factors that Contributed to Feelings of Discouragement (1=Very Much, 5 = Not at All)*

	<u>Mean</u>	<u>SD</u>
Research not going well	1.8	1.2
Long-term career opportunities	1.9	1.1
Personal life	2.6	1.5
Interaction with Faculty	2.8	1.5
Climate in the department	2.9	1.4
Interaction with students	3.4	1.3
Interactions with other administration	3.6	1.4

Note a lower mean indicates that an area was more likely to contribute to discouragement.  
N=75.

Table 6

*Availability of Career Promotion and Career Advancement Activities*

<i>How Often Senior Faculty Give Recommendations (%)</i>				
	<u>Very Much</u>	<u>Somewhat</u>	<u>Not at All</u>	<u>No Opinion</u>
For review panels	9	28	34	29
As an invited speaker	16	29	37	18
As members of study sections	10	26	42	23
For awards	19	32	37	13
For participation in conferences	46	41	11	2

  

<i>How Often Professional Activities are Available (%)</i>					
	<u>Weekly</u>	<u>Monthly</u>	<u>Annually</u>	<u>Occasionally</u>	<u>Never</u>
Poster sessions	0.0	4.8	58.7	31.7	4.8
Meeting of professional societies	0.0	6.7	61.0	23.8	8.6
Luncheons	2.9	23.1	7.7	51.0	15.4
Receptions	0.0	14.4	15.4	59.6	10.6
Other functions	3.0	17.8	8.9	54.5	15.8

Note: The question regarding senior faculty mentorship was worded, "In your current work environment how much do senior faculty mentor you by giving recommendations." The question regarding activities was worded, "How often are the following activities available to you?"

Table 7

*Perceptions of Fair Treatment of Postdoctoral Associates*

	<u>Strongly</u> <u>Agree (%)</u>	<u>Somewhat</u> <u>Agree (%)</u>	<u>No</u> <u>Opinion</u> <u>(%)</u>	<u>Somewhat</u> <u>Disagree</u> <u>(%)</u>	<u>Strongly</u> <u>Disagree</u> <u>(%)</u>
Female postdoctoral associates are treated fairly	37	33	17	12	1
Female postdoctoral associates are mentored as well as male postdoctoral associates	30	28	24	15	3
Female postdoctoral associates have more career advancement opportunities than male postdoctoral associates	2	8	34	44	12
Postdoctoral associates who are members of racial or ethnic minorities are treated fairly	31	27	33	7	2

Note: The items were preceded by, "In your opinion, do you feel that at your institution..."

Table 8

*Perceptions of Issues Related to Recruitment, Hiring, and Career Progress of Women Faculty, Postdoctoral Fellows, Women Faculty, and Department Chairs (Averages)*

<i>To what extent do the following issues make it difficult to recruit women? (1 = not a difficulty, 4 = major difficulty)</i>				
		<u>Postdoctoral Fellows</u>	<u>Women Faculty</u>	<u>Chairs</u>
1	Lack of mentoring of potential women faculty	2.9	3.0	2.5
2	Uncertainty about obtaining employment for partner or spouse	3.3	3.4	3.2
3	Unwelcoming departmental environment for women faculty	3.1	2.8	2.4
4	Concerns of the female faculty candidate about having both a family and a successful academic career	3.5	3.5	3.3
5	Few successful female faculty in the department	3.3	3.3	2.8
<i>To what degree have the following factors limited your department's ability to hire women in the last 5 years? (4 = serious limitation, 1 = not a limitation)</i>				
		<u>Postdoctoral Fellows</u>	<u>Women Faculty</u>	<u>Chairs</u>
1	Too few female applicants for advertised faculty positions	2.5	2.7	3.1
2	Female candidates are in such high demand, we have lost them to other institutions	1.9	2.3	3.0
3	Lack of commitment of department faculty members to increase the number of women faculty	2.8	2.0	1.9
4	Some current faculty members are opposed to hiring women faculty	2.2	1.6	1.3
5	Not enough financial support from the higher levels of administration for making a competitive offer to the women candidates	2.5	2.2	1.8
6	Inability to provide employment for spouse or partner	3.0	3.0	3.0
<i>How important are these factors in slowing the progress of women? (1 = not an issue, 5 = very important)</i>				
		<u>Postdoctoral Fellows</u>	<u>Women Faculty</u>	<u>Chairs</u>
1	Few female colleagues	3.6	3.9	3.9
2	Balancing professional and family obligations	4.5	4.5	4.4
3	Women getting heavier teaching and/or service responsibilities relative to their male colleagues	3.2	3.5	2.8

4	Unwelcoming departmental climate for women	3.9	3.9	3.1
5	Women having less opportunities to be mentored by top chemists	3.8	3.9	3.3
6	Women do less self-promoting and marketing of themselves than men	4.3	4.3	3.3
7	Subtle biases against women faculty that accumulate over the years	4.0	4.1	3.8
8	Women's lack of success in obtaining funding	3.2	3.5	2.5
9	Women's inability to compete for the best graduate students	3.1	3.2	2.6
10	Women being excluded from important departmental and institutional decisions	3.2	3.4	2.6
11	Gender discrimination in the peer review process of their papers and grants	3.2	3.4	2.7

Note: Data regarding women faculty and department chairs were taken from Stockard, J., Greene, J., Lewis, P, and Richmond, G., (2008) Promoting Gender Equity in Academic Departments: A Study of Department Heads in Top-Ranked Chemistry Departments, *Journal of Women and Minorities in Science and Engineering*, 14 (1), pp. 1-27. The wording of individual items was consistent across all surveys. However, the response categories for the questions regarding hiring varied somewhat. From 2006 to 2011 the response categories were "serious limitation, moderate limitation, minor limitation and not a limitation. In 2012 and later the categories were "major difficulty, moderate difficulty, minor difficulty and not difficult, although in one year the first category was labeled "serious difficulty" rather than "major." In addition, data on the recruiting items were not available for one group because the question was altered to a ranking among items rather than a rating scale for each item.