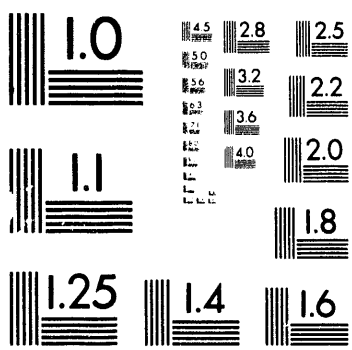
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Pilot Project on Women and Science

A Report on Women Scientists at the University of New Mexico and Los Alamos National Laboratory

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Pilot Project on Women and Science

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Introduction and Methodology

The Pilot Project on Women and Science took shape in the context of several intiatives devoted to the study of science, gender, and culture. In the fall of 1990, representatives from the American Association of University Women visited the University of New Mexico as one of six universities that AAUW had identified for productive studies of minority women in the sciences. At this same time, Arizona State University was initiating its CIMD (Coalition to Increase Minority Doctorates) project focusing on students entering the sciences. Meanwhile, scholarship devoted to the study of women, gender, and science had been receiving increased attention, and had informed the curricular and research agendas of both the UNM American Studies Department and Women Studies Program. With New Mexico being home to a major research university with several women science faculty members, as well as to Los Alamos National Laboratory, one of the most prestigious science laboratories in the nation, the environment seemed ripe for a study that would focus on the particular problems and experiences encountered by a diverse population of women scientists in this region.

In the fall of 1991, through the coordinating efforts of the University of New Mexico and Los Alamos National Laboratory, the

Pilot Project on Women and Science was initiated as a year-long study of women scientists at both the university and the laboratory. Its purpose was to gather information directly from women scientists in an attempt to analyze and make recommendations concerning the professional and cultural environment for women in the sciences. In setting our goals and research agenda, we as the investigators sought to bring together several different approaches to this kind of study. Each of these approaches has in the past offered a distinctive way of coming to terms with the fairly dismal statistics on women and science that were recently summarized by Anne Fausto-Sterling, Biologist and Professor of Medical Science at Brown University. She points out that while "white males make up about 47% of the US workforce," they comprise "over 80% of the scientists and engineers." On the other hand, "white women make up about 42% of the US workforce but only about 15% of the science and engineering workforce." The figures for racial minorities are worse. African Americans, for example, "make up 12% of the population but only about 2% of the S&E workforce." Nor is this situation likely to improve. As she points out, "the numbers of women studying science have leveled off since 1986 and the numbers of minorities, except Asian-Americans, have actually declined." More specifically, "the percentage of blacks receiving bachelors of science has declined from 6.4% in 1979 to 5.6% in 1986," and "Hispanics, who make up 9% of the US

population dropped from 3.3% to 2.7% of the S&E bachelors while Native Americans remained steady at 0.4%" (Fausto Sterling).

Much recent scholarship devoted to the specific subject of women in science, as well as the more general inquiry into matters of gender and science, offers a variety of explanations for this state of affairs. Women, who have largely been excluded both from systems of higher education in this country and a variety of intellectual pursuits until well into this century, have rarely had either the background or the opportunity to enter the scientific professions. Their social and psychological development has instead been directed into the more traditional feminine roles and occupations. Even among those pioneering women who have tried to enter the inner circle of science, most have encountered "barrier after barrier" (Zuckerman, Cole, Bruer). While the exclusion of women from science can in part be explained in terms of women's historical predicament, several recent feminist theorists of science have also focused attention on the historical development of science as a masculine profession. According to them, the exclusion of women from science must also be explained as the result of its construction by an elite group of European men who narrowly defined science in terms of their own peculiar epistemology and culture (Keller, Merchant, Harding). These cultural critiques of sciences have been particularly challenging, for as Keller points out, they align the construction of science with the historical and

psychological construction of masculinity. Thus even as small numbers of women have broken through traditional career barriers, they have often had to adjust and negotiate their very identities in order to be part of this cultural masculine domain. As Fausto-Sterling explains, the dominant view of science as a "hyper-rational system of thought" makes it into "an alien and hostile place for women and people of color" (Fausto-Sterling).

Given the pervasiveness of this situation, we thought that an inquiry into the professional and cultural experiences of those women who have begun to infiltrate the field of science would be a productive way to combine empirical and theoretical approaches to the study of women, gender, and science. Some recent research, particularly in the social sciences, lays the groundwork for this kind of research by quantifying a number of factors responsible for keeping women outside the sciences (Berryman, Cole, Kahle, Kundsin, Malcolm, Ott and Reese, Ramaly, Zuckerman). Yet such quantitative research tends to emphasize statistics and patterns rather than the individual voices of women scientists. Moreoever, many of these studies have not been informed by the recent theoretical investigations into issues of gender and science that question the exclusive effects of a predominately rational and objective way of understanding the world (Bleier, Fausto-Sterling, Fee, Harding, Haraway, Hubbard, Keller, Merchant). Very few have followed the lead of writer and journalist Vivian Gornick who, almost ten years ago, went

directly to women scientists and conversed with them about their individual experiences. Among the questions that informed her conversations were these: "What are the clear--as well as the incalculable--costs of being one, or one of a few, among the many? What if a woman in science feels she must prove herself many times more often than a man does; that her work is more often challenged and less often supported; that she cannot get grants, equipment, promotions, and tenure as easily as her male counterparts do; that she works under the peculiar strain of an excluding hierarchy of working colleagues that is always operative and always denied?" With these questions, Gornick carved out her approach: "I decided simply to go to scientists who were women and say to them, 'What has it been like for you?'" (Gornick).

In our Pilot Project on Women and Science, we have tried to build on the foundation of much of the quantitative data collected on women in science, shape our inquiry according to recent theoretical questions about the "masculine culture" of science, and proceed in the spirit of the kind of explorative conversation that governed Gornick's interviews. We accordingly developed an initial research agenda that would allow the project to proceed and develop organically--making it possible to continue to shape strategies as we gathered more and more information along the way. While our purpose was also to be as inclusive as possible in working with a scientific culture that

has traditionally been dominated by white men and western ways of thinking, it is simply a fact that the overwhelming majority of women in science come from Anglo and European heritages. In all of our mailings and contacts, our study regrettably did not reach any African-American women. Because of the demographics of the state of New Mexico, however, where 38% of the population is comprised of Hispanics/Latinos, and where Native Americans constitute a very small but conspicuous part of the population, our study was fortunately able to foster at least some emphasis on the diversity among women scientists that has been notably missing from much historical and theoretical research.

In attempting to begin the project in a deliberately open-ended manner, Dr. Ruth Salvaggio, principal investigator for the project, initially contacted several women science faculty members at UNM for ideas about how we might proceed. Uniformly, their response was that it would be best to go directly to women scientists themselves in order to conduct any effective needs assessment. Since the most detailed and direct information could be obtained through personal interviews, the project was set up to focus on in-depth intereviews with select women scientists. But because it would be impossible to reach a large number of women scientists through such a time-consuming procedure, the project would also include administering a questionnaire to all women scientists at both UNM and Los Alamos.

We began to collect data in the fall of 1991, with interviews of women science faculty at the University of New Mexico. Those interviewed at UNM were selected from different scientific fields--from science departments in the College of Arts and Sciences, and from the research faculty in Medicine and Nursing--so as to ensure representation from diverse scientific disciplines. Strictly for the purposes of this study, we interviewed women who occupy positions in what are traditionally known as the "hard" sciences. While the definition of "science" ranges from Physics and Chemistry to the fields of Psychology and Anthropology, only those fields more associated with the social sciences have attracted increasing numbers of women. Because we were specifically interested in women who entered the far more exclusive male domains of science, we focused on these women in our UNM interviews, yet included a wider population in our questionnaire mailing. The Los Alamos women scientists we interviewed all worked in the traditional scientific disciplines, notably in the physical sciences that have long dominated the research agenda at Los Alamos. In this more restricted community, we took time to interview every woman scientist who wanted to speak with us. We do not specify in more detail the disciplines of the women scientists in order to help insure the anonymity of participants.

Our purpose was to keep the interviews as open and

conversational as possible. Instead of developing specific questions that might narrow the scope of the project, Salvaggio encouraged participants to supply whatever information they thought would be relevant to the study. At the same time, in order to secure coherence in the subjects discussed, she also developed a list of topics to be shared with all interview participants. The purpose here was to try to follow ethnographic rather than quantitative methods, allowing maximum opportunity for respondents to help set the research agenda, without losing a sense of unified concerns that held the project together.

Transcription of the UNM interviews produced over 400 pages of information that we were able to sort and categorize through Ethnograph, a computer program. Deborah Klein, Graduate Research Associate for the project, with the assistance of Kari Wyma-Dominey, Women Studies student intern for the project, was responsible for entering and sorting all interview data on the Ethnograph program. Preliminary analysis of this data was then used as a basis for developing the questionnaire to be distributed to all UNM women science faculty and all participating women science staff at Los Alamos. Interviews of women scientists at Los Alamos had to be delayed because of necessary negotiations concerning our research contract with the laboratory.

We therefore proceeded with development and distribution of

the questionnaire in January of 1992. The response rate to the questionnaire was very high, with more than a 60% return from participants at both institutions. By the time we had received most of these responses, we were able to use preliminary analysis of this data to sharpen even further the questions and topics used in the interviews of Los Alamos women scientists. In this way, the project continued to develop organically, with each preliminary set of data informing the next stage of the project. Finally, with the completion of all interviews at Los Alamos and the University of New Mexico--a total of forty-six interviews producing hundreds of pages of information--and with the results tabulated from 126 questionnaires, we began a comprehensive analysis of all data and the writing of the final report.

Our research team was comprised of Ruth Salvaggio, principal investigator for the project; Deborah Klein, Graduate Research Associate; and Kari Wyma-Dominey, Student Intern. Salvaggio, Associate Professor of American Studies at UNM, directed and coordinated all work on the project, conducted initial consultations with UNM faculty about the scope of the project, developed the topics and questions for interviews and questionnaire, conducted all interviews with UNM women science faculty and half of the interviews with Los Alamos women science staff, and made initial contacts with librarians at the UNM Centennial Science and Engineering Library that houses extensive holdings in the areas of gender and science. Salvaggio was also

responsible for the writing of most of the report--the Introduction, all interview analyses, and the Summary and Recommendations. Klein, a Ph.D. candidate in Educational Foundations, conducted half of the Los Alamos interviews, transcribed most of the interviews, and consulted with Dusty Lateef of CIRT about the structure and execution of the questionnaire. She also helped coordinate the project, set up all computer and office materials, and was responsible for writing the section of the report devoted to analysis of the questionnaire data. Wyma-Dominey, a Student Intern in the Women Studies Program, also helped transcribe interviews, administer the questionnaire, and write the analysis of the questionnaire data. She conducted all of the bibliography research at the UNM Centennial Science and Engineering Library, and prepared the Bibliography at the end of the report.

What this report offers, as the "pilot" nature of the project indicates, is an initial attempt to understand the ways in which women scientists view themselves, their profession, and the scientific culture they inhabit. Recording what these women say about their backgrounds and educational experiences, their current positions, the difficult negotiations many have made between their personal and professional lives,. and their relative positions "inside" and "outside" the scientific community, our report calls attention both to the individual perspectives offered by these women and to the common concerns they share.

Perhaps most important, while maintaining a quantitative methodology that allowed us to survey a large number of participants, our report brings to the forefront the individual voices of women scientists who have taken time to reflect on their varied experiences. Their reflections often bridge many of the concerns reflected in both the empirical and theoretical studies devoted to gender and science, and thus establish an important praxis for future research.

Women in science constitute a small but dynamic population that has historically inhabited a culture hostile to their presence. What they have to say about entering, accommodating, and transforming that culture--within the university and in the confines of a prestigious national laboratory--takes its place as part of the story of how contemporary women are redefining both themselves and the world of science.

Interview Analysis

We conducted interviews with the University of New Mexico women science faculty during the fall of 1991. These interviews followed no specific format; they were intended to be open and conversational. Salvaggio did present participants with a list of topics which they could choose to address in their comments. Some respondents spoke spontaneously and freely; others preferred to answer specific questions. At this point our purpose was to provide some parameters for the discussion and at the same time allow participants to contribute other concerns which we may not have anticipated in our choice of topics. The list of topics presented to participants included the following:

-- Background (class, ethnic, cultural)

-- Education (mentoring, courses, graduate school, fellowships, lab/work experience)

-- Current Position and Work Environment

-- Relationship with Colleagues

-- Relationship with Students

-- Advancement in the Profession

-- Negotiations Between Personal and Professional Life

-- The Culture of Science (assumptions, styles, methods, approaches, self-esteem)

-- The Community of Science (women in a male domain, women and persons of color in a white domain)

-- Suggestions and Ideas (how to bring more women into science; how to make science more inclusive)

We began interviews with Los Alamos women science staff in late spring of 1992. Having already transcribed and studied the results of the UNM interviews, and with preliminary data from the questionnaires then in hand, we formulated five questions for the Los Alamos participants. Again, however, our purpose was to keep the interviews open and conversational. The questions we presented to participants generally followed the same list of topics that governed the UNM interviews and informed the questionnaire. At the same time, they also allowed us to focus on issues that appeared to be specifically relevant to Los Alamos women science staff and to expedite our discussions with this larger group of participants. These questions were as follows:

1. Can you talk some about your background and education, especially those experiences and people that influenced you (positively or negatively) in entering the sciences?
2. How would you describe your current position as a woman scientist?
3. As a woman scientist, have you had to make negotiations between your personal and professional life--and if so, what kind of negotiations, with what effects?
4. How do you see yourself "fitting" into a predominately

male-dominated field? Are you one of the guys, treated differently, feel accepted or outside?

5. What suggestions would you have--in terms of both general ideas and specific policy recommendations--for improving the position and environment for women in science?

After transcribing and coding all interviews, we structured our analysis around several major subjects that clearly emerged as those which participants discussed most frequently and in the most depth:

Background

Mentoring

Ethnic and Minority Issues

Sexual Discrimination and Harassment

Personal and Professional Negotiations

Policy Matters

The Culture of Science

The interview analysis that follows therefore proceeds in the context of these main subject categories.

University of New Mexico Interviews

Backgrounds

"This is actually something I was thinking about before coming over, because this whole question of the sort of backgrounds that women have, age and socioeconomic class and why you have gone into science, really intrigues me." The women scientists we interviewed at UNM spoke at length about their backgrounds--specifically about their class status, the educational level and professional status of one or both parents, and the particular influence that their parents exerted on their career choices. Beyond that, many also spoke about certain predilections that led them into the sciences and shaped their professional ambitions. Generally, their responses show that early encouragement and support breed success. While these women are not all children of scientists, they all come from nurturing home environments that clearly paved a smooth road for their various paths into the sciences.

Virtually all of the participants described their background as middle class. As one put it, "Well, I'm basically white and middle class ... so I had a lot of privileges in that sense." A few did relate that their backgrounds were "lower middle class" or somewhere "on the poor side of middle class," a status that was inevitably linked to families with a strong work ethic and upward professional ambitions. Only one respondent said that

her family was "very poor," and here again, this status was linked to a successful "struggle" for the children to move into the educated professional classes.

Several respondents connected their class status to either a scientific or general academic family background in explaining why they were influenced to pursue their own academic careers. "My personal family background is very scientifically oriented," one explained, "a very nurturing home environment with respect to the academic. Books everywhere, a lot of encouragement." Others commented on the professions of their parents--fathers who were doctors, professors, or engineers, and mothers who were nurses or teachers. Virtually every woman scientist we spoke with at UNM could recall some positive family influence--in terms of relative economic privilege or parental encouragement--that could account for her pursuit of a scientific career.

While fathers often served as career models for their daughters, several respondents spoke at length about their mothers as the shaping influence in their careers. "So how did I get here? How did this happen to me? It's mainly through the encouragement of my family, especially my mother." Another was more specific: "Well, it really wasn't my family ... [it was] my mother who had always pushed us to try to get a good education." And another: "When I look back ... it was to my grandmother and my mother ... So it was really through the maternal side, as it

turns out. My dad is just a [professional worker] and didn't play much of a role." And another: "From the time she had me ... she always wanted me to be a scientist." While these four responses are not typical of all or even most of the women we interviewed, they nonetheless reveal a tendency on the part of UNM women scientists to speak in more depth about maternal rather than paternal influence. Several women scientists mentioned their fathers' influence, but none elaborated on it in the ways that women spoke about their mothers. "My mother would never have encouraged her daughters into a traditionally female profession.... She is very sensitive to pay differentials ... and the amount of work that women do for what they are paid.... So she strongly encouraged our interest in science and engineering because she could see from her experience that they were valuable professions." Another relates: "She really made big time science fair things. We would go to the university and talk to people there. They would give us bacteria and we couldn't pronounce the names ... and we would call it A-gar, and we would boil it in the kitchen.... She tried to promote science in a lot of different ways." While several white women scientists narrated such stories about their mothers, all of the women from ethnic and minority backgrounds spoke at length about the influence their mothers exerted on their careers.

Aside from such influences, what specifically led these women to become interested in the sciences? Many of those

interviewed spoke of an almost natural inclination for science. "I knew it for myself. It's hard to see where it came from, if it's indigenous or what.... It's the first thing I ever had to think about. -[Science] was the first time I'd ever moved the gears. And that was such a wonderful feeling." Another reflects: "Ever since I can remember, I liked science.... I was fascinated by ants and rings and gems. I would dig holes to see. One time I dug a hole about six feet and I was tracing the ants all the way." Another describes herself as simply always having a scientific bent: "I was the kid in the family that was always off in the corner doing little experiments and trying to figure out how things work." Yet another, who also felt that she had a natural inclination toward science, discovered this interest comparatively late in life: "I am an accident. I went back to school to get my degree, after having raised [a child] at the grand age of [late twenties]." For these women, no matter when the specific scientific career began, it grew from what they perceived as a natural apptitude or inclination for the practice of science. For at least one woman, it was the absence of "gender assignment" in household work that allowed both her and her sisters to pursue professions that had been culturally designated as male domains.

Virtually all of the women scientists we interviewed at UNM came from supportive backgrounds. Some were urged to be inquisitive from an early age; others were encouraged to seek

economically rewarding and intellectually satisfying professions. Only one described a cultural background that stifled her intellectual curiosity. For most of these women, then, science was not so much a chosen profession, but a profession for which they had been prepared from an early age. Many women may have these kinds of stories to tell about their childhood, but only a very few break through into the ranks of such a male-dominated field of research. How and why these breakthroughs happen has a good deal to do with their educational experiences, and in particular with the kinds of mentoring they received in their educational institutions. But as far as background and early childhood experiences are concerned, nearly all of the women we spoke with told stories of safe and comfortable home environments, stories of encouragement and support.

Mentoring

The women we interviewed at UNM have all been highly successful in their educational careers. They all hold Ph.D.'s, they are all research scientists, and all but one hold tenure or tenure-track positions. Yet the stories they tell about their education are often mixed accounts of successes and frustrations. With only one exception, none of these women had female science professors during their college education. Many had no women professors at all. In trying to gauge the possible effects of this virtual absence of female professional role models, we asked participants specifically about any problems they encountered with mentoring. Practically all of them spoke about such problems, though at the same time they also had stories to tell about positive mentoring that they had received from certain male professors. A few women also talked about the importance that professional women's organizations and groups held in their careers. Throughout our conversations, we had also inquired about their own initiatives to mentor students, particularly female students. It was clear from their responses that successful mentoring of women--at all educational levels--is an activity that these women scientists view as crucial in attracting and retaining more women in the sciences. Most of the women I spoke with view this effort as part of their own professional commitments.

"Now that I look back and realize that there weren't any women teachers, you wonder how that might have influenced [me]. But I kept plugging away." The experience of this particular woman scientist was not uncommon among those we interviewed. Most were surprised to reflect on the absence of women professors and female role models in their careers. One responded: "You know, I never gave that a thought, but I don't think I did have any." And another: "I'm trying to even remember if I had a woman instructor." Others simply replied: "Never, not even through grad school. Never." "No, they're weren't any at all." "I had no women science professors my entire career." Only one of the respondents specifically commented on the negative impact of this situation: "I had no female professors. I would go to meetings. All men. It really bothered me. Every time I needed help, I had to ask a man. And that's always been true." Another respondent was surprised to recall that she had several women science teachers in high school. "When I look back on it, I guess it's surprising. I had a woman chemistry teacher, and a couple of black women math teachers.... I didn't recognize it at the time as anything special, but now that I look back on it, yes, it probably was, yes."

Interestingly, the only respondent who recalled a woman science professor described how this woman had been long devalued in her profession. "She was a lecturer when I entered.... She was the wife of an eminent [scientist]. It turns out that she is

one of the most eminent [scientists] in the U.S. now. And she should have been at the time but she wasn't recognized.... When the school came under pressure to have women full professors, they jumped her immediately to full professor. She was already recognized throughout the country as a star...."

What, then, was the impact of this absence, or in one case, this devaluation, of potential role models on these women? On the one hand, the seeming lack of consciousness about professional women role models might indicate that women in science tend simply to adapt to the dominant male culture of science. They might take for granted the fact--and it has long been a fact--that most senior positions in science are occupied by men. On the other hand, several of the women we interviewed spoke with much regret about the absence of good mentoring in the sciences throughout their education.

The problem, it seemed to them, was not that they had no female professors who could mentor them, but that as women students in the sciences they simply did not receive the serious attention of their male professors. One repeats: "I had no mentors. I had no mentors. I had nobody to help me through the various stages, so when I finished grad school, I immediately quit science.... I was completely on my own. So I then got another field, and then moved again and had to start a whole new field." Another says: "It was make it on your own. Don't ask

for help. There were no mentors.... To this day there may not be. I don't know. They put more people through, but still most of them are men." Several of the women I spoke with related specific negative experiences that they encountered as women science students. One says: "I went to try to get help from a chemistry professor, and he told me I should drop out and get married." And another: "There was a junior high school teacher who said in so many words ... 'this is science now and the boys are going to do better than the girls, but don't worry girls, you'll do better in English.' My response was to get the best grade in both." Another commented on the sexist guidance female students receive when they indicate an interest in the sciences: "If girls are interested in science, the guidance counselors would tell them to be a nurse or a medical technician."

The message we kept hearing was simply that women did not receive the kind of mentoring that male professors offered to their male students. One respondent recalls: "I remember feeling victimized by school when I was an undergraduate. I was paying this money and they were treating me terribly ... and making me feel bad about myself and I couldn't figure out why. I didn't fit in and I should fit in. I don't know...." At least two of the women interviewed thought that it was women students who expecially needed to be made aware of this situation so that they could change it. One observed: "There are female students who don't get mentored as well as male students. In part, it's a

lack of communication. I spend a certain amount of time telling my female students how to talk to their male professors." The other respondent described women's lack of awareness and isolation in the profession: "I think one of the things that happens to women ... is they don't know what kind of mentoring you're supposed to get. They don't realize what some people may be getting and what they may not be getting." This general sense among female students of "not fitting" and not being aware of "what they may not be getting" can be traced back to early school experiences. Virtually all of the women we interviewed claimed that the mentoring of women must begin very early, well before they are acculturated to lose interest not only in science but in many intellectual undertakings. "That's right," one respondent said, girls "lose it when they are in sixth grade. By the time they are in sixth grade they can't ask questions anymore, and then they don't really feel confident asking questions up to the time they are seniors in college."

Given their complaints about the general lack of mentoring they received, how did these women scientists manage to make it into the ranks of practicing scientists? Obviously some of them simply kept "plugging away," as one respondent put it. Several also spoke about certain male mentors who were crucial in helping shape both the course of their education and their careers. These men were variously described as "engaging," "extremely supportive," "a fabulous person," "just fabulous," "a wonderful

mentor," "the sort of person I could take my ideas to and he wouldn't just squash them." Whatever the circumstance, many of these women did indeed find some kind of support and direction that they typically associate with a specific memorable individual. One spoke about a supportive group of male friends in her field who helped her practice tactics for giving talks. And another credited a few "politically liberal men" with increasing the numbers of women in a certain scientific field and making its doors "less closed for women."

A few women also spoke about the importance of professional women's groups and organizations. "I think those kind of groups are helpful because when you talk to other people, you realize that some things are happening to you not because you are you, but because you are female." One respondent described in detail the workings of a particular national women's professional group in her field of research. "It just gets everyone together, everybody that wants to, a couple of hundred people for a couple of hours and a wonderful feeling, a feeling that you don't often get in your own university." She went on to explain the practical benefits of such an organization, particularly for women who do not have the opportunity to pick up the tricks of the trade at their own institutions. Years ago, she related, they "put out some wonderful booklets called 'How To Get a Job' and 'How To Keep a Job,' and I felt that those were what I had instead of a mentor. Because I never had anybody to teach me to

do this, to try to walk them through their first presentations and interviews and such."

Given the general lack of any female professional mentoring for these women, it is perhaps not surprising that many of them have committed themselves to the mentoring of their own women students. "I believe enormously in mentoring and I try to do it on a personal level. If the students were exposed to more information about women in the sciences, I think it would help enormously." Asked if they devoted special attention to their female students, most responded that they did. "Oh yes, unquestionably I do. I guess I sense that a little more at the graduate level, because those are the women who are really thinking of their careers." Another spoke about the women in her lab: "I give them special effort, along with the women in my class. And not just the women, but women and minority students. I go out of my way to help them. I do more for them than for the white male students, and it is absolutely conscious." Others described specific efforts and accomplishments in this kind of mentoring. "I'm on a lot of peer review committees," one explained, "and we were able to get stipends for Native Americans--Navajo and Hopi." Another describes how she "wrote up information on how to survive [an education in science] and on how to get to know the professors." Some talked about how the mere presence of a woman science professor makes a tremendous difference for women students. One put it this way: "They see a

real woman scientist who can talk about football scores and sex and politics and television and talk about science as if she loves it. Because I do love it." Another pointed out the difference it makes for both women and men: "I think it must be nice for women to have me around on the faculty, for women graduate students. Certainly they work comfortably with me. ... also think it's possible that what the women are finding that's different, the men are also finding that's different."

Yet a commitment to mentoring also has its drawbacks, especially for women professors. Some felt difficulty in negotiating their way through a maternal role that they were perceived as occupying. "I don't like being the nurturing female.... I don't like that image and it has been put on me in the past and I resent it. I have been one to guide and to encourage, but I have also been one to say when some work is severely unsatisfactory. That's been a problem, and so it's a difficult role for me." Another explained: "Dealing with the students is sometimes like dealing with my kids, and it irritates me when it's like that. Nurturing all the people in my lab, and wishing I could nurture more, well, it's hard." When one woman was asked if she often felt perceived as a mother to her students, she replied: "I've been amazed. Sometimes I feel more like a shrink than a mother."

Whatever the problems and difficulties, it was clear that

the women we spoke with at UNM considered mentoring to be a crucial activity. One of them explained its importance in very practical terms: "I get out of that class roughly ten young women ... who say 'I never thought I could understand this before, but you make it seem so real. And I walk out of here and suddenly I know things I never thought I could know.' My having that, that chance, that opportunity, is one I take very seriously." Perhaps the best description of what happens in successful mentoring was described by this same woman: "What I do take seriously and do enjoy being is a radically different female role model for my students."

Ethnic and Minority Issues

With only a few exceptions, the UNM women scientists we interviewed were from Anglo or European heritages. Yet virtually all of them talked with concern about the dismally low numbers of people of color in the ranks of science. As one respondent explained, the numbers are "incredibly small." There also seemed to be general agreement that fostering more diversity in the scientific community would likely improve the practice and profession of science. "My perfect world," explained one woman minority scientist, "would of course be to have a much more mixed faculty. I think the faculty has become aware of women's issues, to some extent.... But I don't think they get the sense that it would be good to have more involvement from minority faculty.... My perfect world would be to have the professors much more interested in different cultures somehow." A white woman scientist spoke of the improved atmosphere in her department that accompanied an increased population of Spanish-speaking students and faculty along with more faculty from the "international community." She described a department gathering that was "very international and ethnically different from what you usually see," and added that "it's very good for the students."

What cultural diversity does exist among university scientists is more often due to the increasing number of international students in the sciences rather than to what are

generally regarded as "minority" populations in the United States. "There are very few blacks," one respondent flatly stated, "much fewer than women." Several respondents remarked as well on the comparatively low numbers of young white American students entering the sciences, and lamented the general lack of scientific and intellectual interests of both male and female white college students from the U.S.

The situation of Hispanics/Latinos is a complicated one, especially here in a state with some 40% of the population comprised of varying Hispanic populations. One woman of color on the faculty complained that professors do not often recognize the large component of Hispanic students in their classes: "You say, how many do you think you have? 'Oh probably not many.' [But] if you counted them up you would find ... I always have 30%-40% in my classes." She went on to explain how many professors, notably in the sciences, are simply not aware of minority issues and the peculiar problems faced by minority students: "I bring up minority issues and I'm the only professor who brings up minority issues and it's uncomfortable for me. It would be an impossibility for most professors because it's not something they feel or they feel they have as part of their bias.... I don't think they hear minority students. They are still in the consciousness of encouraging assimilation, complete assimilation."

Another woman of color spoke of the problematic way in which various Hispanic and Chicana students are encouraged to enter the lower ranks of science. This seems particularly the case with Nursing. She described the easy "access" for young Hispanic women to the many "associate degree programs in the state and community colleges," along with "very aggressive recruitment in the high schools" that promise "in two years you can have a job." Asked why more of these young women do not pursue higher degrees, she responded: "I don't think we have saturated the knowledge base that they can do it at a baccalaureate level. And the other thing is that we tend to go for a lot of accommodation, like two plus two programs.... So what happens is that our funding is patch-up and not science based."

Not surprisingly, several of the white women scientists I spoke with found their own career opportunities limited in ways similar to those suggested above for Hispanic women. As one put it, "I was raised to be a nurse, or a teacher, and certainly a mother, and I'd betrayed them all." The issue here is one of cultural expectations and the ways in which institutions enforce prescribed roles for women. One of the white women scientists described her minority students this way: "Being a research scientist is not something they've ever thought about, they've ever heard of, they've ever developed an image of.... They would probably be considered a failure by their families, in some way." According to a minority woman scientist, Hispanic nursing

students do not see "the institution or people working" for them. She went on to explain that it is "not so much that they lack self-esteem, but that they don't have the aggressive, assertive behaviors that make an institution respond."

How can institutions respond? "Well, I think we just have to talk about things ... have to raise issues." Some women faculty felt that they needed more information in order to improve their teaching and make science a more hospitable environment for diverse populations. "I want some advice, if we are talking about a particular minority group here ... some very concrete advice about things I need to know about these people. It's just like any time you enter any new social group, you need to find out about your new neighbors."

Another white woman scientist described a particular experience with one of her students. "My graduate student is a very, very shy [woman of color].... And she just started out painfully insecure. It would hurt me to watch her. If I would ask her questions she would just freeze. And she's getting much better, she's come a long way." Reflecting on the more general situation, she continued: "Certainly the lack of security, or self-confidence or self-esteem, in the [minority] female students.... They are great and I keep telling them, but they don't know that. You have to be fairly aggressive to succeed so I sometimes wonder if I'm doing her a favor, if I'm getting her

in over her head." A woman of color faculty member had similar mixed feelings about one of her students: "I don't know.... [there is] one [minority] undergraduate woman who has been in the lab and I think she sees my life and goes, 'I don't want to do that.'" Yet another white faculty member spoke of cultural differences that tended to work against her Native American students: "I see there is definitely a pattern in their view towards their surroundings.... A lot of them are doing extremely poorly. They don't remember, they don't have the typical ability that all of us grow up with of regurgitating information which is, unfortunately, a big part of introductory courses. But they are very interested and they are very synthetic. They put a big picture together but they can't articulate the parts of it, and that is what we're usually tested on, the parts. If you ask them questions where they are required to sketch an answer or put it in a larger context, they seem to do better. But when it comes down to remembering what a specific term is, they just have no idea."

The need to be aware of such cultural differences was a topic discussed by many of the women scientists. A white respondent explained the impact of this consciousness in her own thinking and teaching: "I'm aware of ways in which we can make things more open to others. This is something ... I hadn't thought about. I've talked to [a colleague] about it a little bit. Her idea is to just let minority groups know that they can

have something to offer too, that alternative ways of thinking about problems can be very beneficial. I think that can be imparted in the way that we teach." Unfortunately, she goes on to explain, there is too much emphasis on the facts and information of science: "We've got to impart all of this information to these people and we've got to get through it," often at the cost of devoting time to "explaining what science is all about." As a result, we don't "get people turned on to the process." A woman of color on the faculty cautioned that there is also the need to recognize diversity within minority populations: "I would have more in-services just to raise awareness. I think most professors don't have a clue that when they are looking at minority students and women ... well, maybe with women they understand that there are differences among women ... but they do not understand that there are differences among minority students. In fact, in terms of participation and rejection of their culture, the students are at every point in the spectrum." Just as important, there is also the need for support among minority women faculty in the sciences. This same faculty member continued: "When I go to [a minority women's gathering at UNM], I see all the people that can support each other. For me it's ... wonderful to even be on the periphery of that and see that in some places it's happening."

What might be different about science if its ranks included more representation from diverse populations? While there seemed

to be general agreement among these women scientists that, as one said, "science is science," no matter who practices it, there was also some sense that different cultures and sub-cultures might shape a different scientific environment. One white respondent reflected on her participation in a program addressing minority issues in the sciences: "Those meetings were more fun than any I've ever been to. I would come home from those and think we are really missing something, we are too serious, we are ... when the professors from the black colleges in the South would get together, I felt like it was a privilege to be there. And they had such fun, and were fine scientists. It was totally positive. We're really missing something here, not getting more of these folk in our department. How can we get them? I don't know what to say."

How can universities recruit more women of color into their faculty ranks? "That's a problem," one respondent said, and then went on to reflect on the situation in the biological sciences: "Women have for a long time made up 50% of the graduate students in biology and so we had a pool to choose from who could become faculty members.... In terms of minority students, I think we will have more success with minority males to begin with. Gradually, as the number increases and as we really talk to the people that are coming up, it will make it easier for more minorities. The thing is, there is not this huge rush and so the length of time it takes to increase the numbers is going to make

it more difficult.... It seems like the longer it takes between generations of scientists, the more difficult it's going to be."

Several women, mainly white women scientists, claimed that every effort was being made to recruit minority scientists. The problem, they claimed, is simply that the pool is too small, and that minority scientists are in high demand. Yet one woman of color on the faculty saw things differently: "Everyone talks about minority scientists as if it's heaven. It's not heaven. A few people get recruited but a lot of people don't get recruited, and you still have to face up to that stuff."

Sexual Discrimination and Harassment

Matters of outright sexual discrimination are often hard to distinguish from feelings of discomfort and exclusion typically experienced by women in male-dominated professions. The women scientists we interviewed at UNM described instances of both overt discrimination and somewhat milder forms of exclusion and harassment. In general, most of the respondents felt that while they had not experienced serious or continuous discrimination, they had nonetheless found it necessary to negotiate their ways through sexist environments, especially in their graduate education. Most elaborated on at least one or two experiences they encountered with sexual discrimination.

To a large extent, sexual discrimination and harassment were considered to be matters of definition. As one respondent explained, it was "not really harassment" that women scientists encountered, but "simply lack of understanding or communication." When another was asked if she had ever experienced sexual discrimination or harassment, she answered in this way: "Yes, yes, depending on how you define it. Not being treated seriously--that of course has happened. But sexual harassment here, not really." One woman explained that what she basically had to deal with was "what would nominally be called a patronizing attitude." Another explained the problem in terms of having to work in a "very hierarchical" environment "where the

senior, mostly male faculty dominate things." Yet another described the effects of sexist language, continual references to "he" or "men," as having the effect of erasing women in the room. While she did not consider such language necessarily discriminatory, she reflected: "I would guess that a lot of times the men are really forgetting that [we women] are really there or that we are different...." One respondent offered this example of how it feels to be outside the dominant group: "Like with comprehensive exams, where you sit there with five professors, five men in a small room, and answer any question they want to ask you for two or three hours. It was terrifying. I would have felt a lot better about it if a woman was there. It mattered to me."

Several women, however, did describe outright forms of sexism in their profession. One respondent, reflecting on her graudate education and her present position, offered this general statement: "When I think about things that went on there and things that have gone on in the department, I'm really surprised at the amount of overt sexism that is tolerated in academia. Somehow it's all in the guise of academic freedom, but industries wouldn't allow this because they know they would be sued." Another, describing a few of "the most powerful guys" in her field, simply said: "They're sexist, period." And another similarly characterized a well intentioned, high-ranking scientist: "I think in his heart he's a sexist."

Hiring practices in male-dominated fields are often breeding grounds for sexual discrimination. Several of the women I interviewed spoke of an "old boy network" that worked, and continues to work, to the advantage of young male graduate students. One respondent described how a former department head in one of her graduate programs told her: "See, women don't belong in [science], and you don't belong in [science]. I don't know what you're doing here. You should just quit right now. You'll never make it, and you just don't have what it takes." Another described what she felt was a typical male response to hiring practices in science departments where one or two women are already on the faculty: "When we were interviewing [women], this guy said, 'I think we already have enough women in our department.'" She paused and then added: "I don't fight these guys anymore."

The sexist behavior of such scientists is varied--at times patronizing, at other times exclusive and demeaning. One respondent described a professor "who would invite his male students to come over to his house and talk to him and just wouldn't remember to invite his female students. If you asked him for a list of students, I bet you he would have forgotten to mention his female students." Another told the story of a senior professor who would congratulate her by patting her on the shoulder and saying "'oh, aren't your mom and dad proud of you.'" At the same time, she went on, another group of male faculty

would be talking "and just completely ignore me. I wasn't even introduced." Yet another described a professor whom she had been "thinking a lot about" lately "because of the [Clarence] Thomas affair.... He was a sort of warm, touchy person, and there were women in the lab who were offended by the way he interacted with them." At least one respondent related the story of how a male professor wrote a sexist recommendation letter about "how dumb I was, that 'really she would probably be a very good teacher, but we don't expect any research out of her.' It was a real hatchet job."

Given the treatment that several women received from what one respondent described as a "hard core of pretty awful men," several of these women scientists spoke of ways they developed to deal with the resulting personal and professional damage. One respondent, who described her graduate school as "an exercise in loss of self-confidence" and a place where "female graduate students put up with a lot," talked about the lessons she learned and passing them on to others. "What I assured [other female students] is that it's not you. If people there are making you feel worthless, it's them, not you." Another told me that she simply refuses to participate in symposia that do not include women scientists among their participants. "You can document," she explained, how "symposia organized by men use very, very few women.... For a long time, I felt really frustrated at not being invited to be in symposia when younger male colleagues were. My

policy now at meetings is, I don't attend symposia if there are no female speakers." And yet another described how she "turned down a couple of men who wanted to work in the lab" because she felt that they were "very aggressive." She explained: "I didn't want them coming in there and ruling my women.... I don't feel I owe it to them and I think I made the right choice in trying to avoid that conflict, at least in my lab. I'd like [the women] to have a haven where they can get in there, learn to do some science, get some self-confidence, before I throw them to the wolves."

Personal and Professional Negotiations

Because female professionals often have husbands or partners who also hold professional positions, their personal lives do not strictly follow traditional male-female roles in which the husband leaves home to work while the wife/mother engages in domestic work. As one woman scientist put it, "your husband is almost always at least at your level of education, but that's not true of the male population. They'll often have a whole range of educational backgrounds for their wives." Accommodating dual careers therefore becomes a primary concern for both partners, but especially for professional women who generally still follow their spouses to the man's place of employment. The UNM women scientists we interviewed were somewhat evenly split on how this general situation affected their careers. Some described themselves as "lucky" and "fortunate" in accommodating dual careers, while others spoke of failed marriages and the costs of following a male spouse to his career destination. Moreover, for those women who raised children, their primary responsibility for child care clearly affected the ways in which they pursued their careers. For the most part, these women scientists had been largely successful in juggling and negotiating these kinds of personal and professional concerns. But some did indeed suffer professional losses, and virtually all of them had to make accommodations along the way.

For some, these accommodations were simply part of what one respondent described as a research career that simply did not follow the "straight line." Others, however, spoke of career interruptions that at least had the effect of delaying their research development and agendas. Two respondents, for example, described completing their Ph.D.'s and following their husbands to the husbands' place of employment. One explained the move as a clear mistake: "At that point it was certainly sacrificing," she related. "Everyone told me it was a big mistake.... It hurt my career a lot." The other described less obvious costs to the move: "It never occurred to us that I should stay and finish and then be in a better position to look for a job. So, I left during a very crucial last year, and I was very isolated. I did finish my thesis on my own, but I didn't have advanced seminars that hone your skills, and I was more insecure than other people going into my first job."

The varied accommodations made by these women scientists range from carreer delays and random employment to divorce. One respondent related how she took several non-professional jobs in moving with her husband. Another, reflecting on the "temporary" professional positions often held by wives of scientists, explained the effects in this way: "Over and over this happens. Women cease publishing when they get married." Yet another described the "extreme difficulties" of securing employment when you are perceived as the "wife" of a scientist rather than as an

independent researcher on your own. "I would sit at home twiddling my thumbs, going crazy, going 'how could I have ruined my life? Now I've come here with no job.'" Not surprisingly, some women left their husbands because the pressures of accommodation were simply too great. "It resulted in a divorce," one explained to me, "because he didn't want to leave and I said 'I cannot accept this. I have tried to put something together and it's like struggling uphill.'" Another told us, "My husband couldn't handle me going back to school and focusing on that, so we broke up." A younger woman scientist explained that "one of the biggest fears of women I know in the sciences is that they are not going to make it personally." She went on, "We often talk about how few women scientists manage to stay married. It's really a tiny fraction, it's awful."

Not all the stories told by these women depicted such scenarios. About a fourth of the UNM women scientists we interviewed spoke of successful marriages and supportive spouses. One described "complete support to the point of excess in my family situation," and another described the "comfortable situation" of a husband with career mobility. Another reflected on the value of a former husband: "What [this marriage] solved for me was that I finally had somebody who was supportive of my education." At least one respondent described a successful partner hire when she followed her husband to his employment and was promised a position for herself: "All the promises were

kept.... they came through and hired me without a search in a tenure-track position." Yet one woman scientist, who was comfortable in both her professional position and personal situation, nonetheless spoke of the negative perception of women when they leave their positions for personal reasons: "There's just another person that somebody points to and says 'she started out really good but she had these kids and followed her husband to another job.'"

Most of the women interviewed acknowledged the primary responsibility assumed by mothers in both child care and housekeeping. "As helpful as they are, and my own husband is very helpful," one explained, "when push comes to shove, you're the one who takes the kid to the doctor, you're the one who goes home early, you're the one who spends the most time in the evening doing all the zillions of things that need to be done." Another used almost these same terms: "You are the one who is going to spend a lot of time taking care of the kids in the home. I don't see that being in science changes anything here." The effects of these extra demands are obvious. As one respondent put it, "I basically feel that I don't put in the extra hours that I might have in the absence of my children." Yet another respondent described the extreme demands she encountered as a single parent in graduate school: "Fighting for custody, not getting any child support, making $8,000 a year, going to school at night, maintaining a 4.0 ... I don't think I could do it

again. Now I couldn't, but apparently I did then."

Not surprisingly, several women explained how they consciously planned their lives around both children and a career. "There were always child care concerns and times when the child was sick," one related, "and I think I did structure my life around my daughter." Reflecting on the effects of this situation, she went on: "I think I was delayed in finding out that research was enjoyable to me, because I really didn't have the time to do it at first, and I probably wouldn't have gotten tenure at my first institution." Another explained how she delayed having children until after achieving some job security: "I think it's telling that it wasn't until I was secure in my career ... that I thought I could have a child." Another, who raised children early in her career, explained how she was "embarrassed to ask" for any "special treatment because I was a woman."

This same respondent, however, went on to describe how this situation has changed. Professionals, she believes, are now more conscious about child care concerns. Another respondent shared this sense of change: "I notice there is a difference in culture now," she observed. "I would have been embarrassed to say that I have to stay home with this sick child. And I would never have taken my child to a seminar or even an informal gathering or function of the department. But now I see that friends, who are

very well established, do bring the baby to a seminar." She reflected on these changes, and then added: "I thought women weren't supposed to behave like this. This is why people don't want women in science. The baby's crying." At least among the women we interviewed, there was a sense that the presence of both mothers and children is somehow changing the scientific environment in academia. But what these changes mean for women--in terms of their own career development and research agendas--remains to be fully delineated and understood.

Policies

What can be done to increase the numbers of women in science? In particular, what policies might be adopted that would help make science into a more hospitable profession for a diverse population of women and men? The two policy matters most frequently discussed by the UNM women scientists we interviewed concerned maternal leave and tenure guidelines. Several respondents also spoke about their support for affirmative action and partner accommodation policies, as well as for much needed connections between university science departments and educational programs at all levels. A few described courses and "in services" devoted to the subject of women and minorities in science, and various kinds of support groups that help bolster the self-confidence of women embarking on scientific careers.

Most of the women interviewed complained about the absence of a maternal leave policy at UNM. Although female professors may use their sick leave to take time off for childbirth and infant care, the university presently has no official policy for maternity or family leave. "It is a completely inadequate policy," one respondent complained, "We need a policy about maternity leave." Another put it this way: "The maternity leave policy here is ridiculous.... I'm worried about that. I don't know how much support I'm going to get from my department, or the dean, or the university administration." And yet another simply

asked: "Why are universities so backward in having policies about maternity leave? I don't understand." One respondent told the story of how she tried to secure additional travel funds for infant care when she was nursing her child and had to bring the child to a conference: "I wrote a little justification, explaining that I didn't want to stop nursing just because I was going to the meeting. And boy, if [my request] didn't come to a grinding halt." Her story reveals the general perception felt by many of these women that their role as mothers who give birth and who are largely responsible for infant care is simply not understood. Several felt that the absence of maternity leave policies could harm their careers. As one respondent explained, "We need maternity leave for women especially if they do not have tenure, if they choose to stretch out the time before the tenure decision. [Policies] like that could help out tremendously."

Regardless of whether a woman coming up for tenure gives birth to a child, it was generally felt that there should be some flexibility in the tenure expectations for women scientists. Some respondents simply felt that tenure requirements are generally too harsh. "There's a sense that there are enormous expectations prior to tenure but not after tenure. We need to even that out," one explained. "I think that they require a super human effort," another said, "and if they would be more reasonable in their requirements, maybe more women would manage to stay with their mates." Several respondents did relate

flexible tenure schedules to child birth. As one explained, "There are universities where you can ask to stop a tenure clock, and if you ask because of having a child, you are automatically granted that request." Another put it this way: "With more flexible tenure clocks ... if people want to spend more time with their young children, if they need that time, then they can take it without sacrificing their careers."

One respondent, however, was less optimistic about the implementation of such a policy: "I think it's not so easy to delay the tenure clock. That probably can't be done as a policy," she said. But she then went on to advocate special consideration for women coming up for tenure: "If I were a dean looking at a borderline case of a woman who seems not to have a big list of publications but who seems to be picking up, well, I think women get better and better. They get more and more confident. They continue to work. They don't stop after tenure the way some men do." This senior woman scientist went on to justify her beliefs: "I think there is a pattern. At least I've noticed it myself, and I've read there's a pattern that women start more slowly--either because of family obligations or because they have to gain confidence. I think there should be a policy of preferential keeping of women who seem just to be starting to take off. I think that is very common."

Among other policy matters discussed were those of

affirmative action and partner accommodation. Generally, the women interviewed endorsed the idea and practice of affirmative action in hiring. As one put it, "I'm a big supporter of affirmative action. I think we need to push things right now." Another, who explained that she herself was hired under such a policy, related how she answered a colleague who asked if she was bothered about being a "token": "I said 'hell no, I don't care how you hire me. You're going to forget, everybody's going to forget what pot it came out of.'" Another, asked if she had problems with affirmative action, responded simply: "No, because I think I deserve the job."

Several also mentioned that they endorsed some sort of partner or spousal accommodation policy. As one put it, "I'm really for it, because we've lost good people without it." Another mentioned the possibility of creating split positions for couples: "I think that universities uniformly need some kind of policies about split positions. I don't think that split positions are ultimately the best solution, but they're a decent interim step that gives both people status and keeps both involved." In advocating national policies on this matter, she went on to explain how we need models for such policies: "The way to do this is not university by university. How do we get nationwide standards for tenure and promotion? What we really need is for someone to develop nationwide standards here too, so the universities don't just ease their ground and say 'We don't

see anybody else doing this; how would we do this?'"

Because mentoring was considered to be crucial to virtually all of the UNM women scientists interviewed, it was not surprising to hear several speak about policies that would help enforce connections between university science departments and various educational programs. One spoke about the need for there to be more "coordination between the science departments and the [university] College of Education. Some coordination would be helpful so that they understood our perspective on what we really wanted from high school students coming in to be trained, and we understood their perspective on their needs for certification and on what they are trying to do to make people employable, and so on." Some respondents mentioned "outreach" programs that, as one explained, "help foster contact with more young women who are making decisions about their high school curriculum that are going to affect their ability to enter college." Others felt that female students simply need to be exposed to more women scientists: "I would get every minority student and every woman student and invite them in to talk about science as a culture and what we're expected to do in science, because it's not that scientists are into one thing or act in one way.... Make the students aware. Make the students conscious." Another put it this way: "Junior high and high school girls need to see that there are women in science and engineering, and we are actually relatively normal people! There's nothing weird about us."

In general, there was a sense that both women students and faculty in the sciences need to build their self-confidence, and that various kinds of official and unofficial support groups can help foster self-esteem. One respondent explained the need for such efforts "because a lot of subtle things that happen can undermine your self-confidence in graduate school. And virtually everything that we do requires a lot of self-confidence." Several mentioned groups for women graduate students that, as one explained, "allow them to talk about issues and even hear about what problems they might be encountering.... I think at that level it's always useful. You're around other women." Another emphasized the need to talk as well about a variety of matters: "I would have more in-services where we talk about things, where someone comes and brings up some issue, and we actually discuss it intellectually together, especially cultural diversity." Another reflected on the support that women in her own department provide all the time for each other: "We do it constantly and we do it consciously--always running in with 'I need help.'" She then added: "I wouldn't make it without them."

While virtually all of the UNM women scientists interviewed had some policy suggestion to offer, there was also a sense that policies can only do so much. If we can increase the numbers of women in science, if more women are there to promote changes within the scientific professions, then much of the remaining work will be easier. As one respondent explained, "Just more

numbers and the whole thing gets more natural, and becomes less of an issue." Another, committed to this task yet weary of its progress, added this caution: "I don't know. I used to have five-year plans. Now I have twenty-year plans."

The Culture of Science

Science, like many professions, possesses its own peculiar culture. In part this culture derives from the characteristic behavior of scientists, and in part it reflects the general demeanor of the environment in which science is practiced. Because science has historically developed as a western male undertaking, its culture has necessarily been shaped by Anglo and European men. As scientist Evelyn Fox Keller argues, the very factors that have contributed to the development of western concepts of masculinity are also those that have shaped the development of science. Or as one UNM woman scientist put it in describing her graduate background, "there was a lot of feeling that to be a scientist you had to be a man. If you wanted to wear a dress or make-up, that was somehow anti-scientist. You had to emulate men in order to be a scientist. And that's damaging to women."

Recent feminist inquiries into the historical and cultural construction of science have called attention to the distinctly masculine identity of the scientific professions. In many ways, they point out, to be a scientist is to be a man, or at least to act like a man--to be reasonable, objective, logical, strong, assertive, intellectually aggressive and competitive. While these traits may not essentially define what is male, they have

certainly defined western masculine culture and its intellectual systems. When women enter these systems and professions, they often must negotiate their way through an alien culture--making various accommodations, assimilations, and transformations. I asked one minority woman scientist, for instance, if it was possible for women, especially minority women, to be truly comfortable in the scientific world. She replied, "as long as they lose their culture, they will be fine.... That's the hard part that I see, and the thing is, it happened to me. I saw it happen to me."

What exactly does happen when women enter a culture that has been defined and dominated by men? What cultural conflicts do they experience, negotiate, accommodate? What are the cultural effects, to use Vivian Gornick's words, of "being one, or one of a few, among the many?" In our conversations with UNM women scientists, we talked about their responses and reactions to the masculine culture of science. Most of them described feelings of being outside. Even those few who sensed little cultural conflict couched their responses in somewhat tentative terms. When we asked one of these women if it bothered her that she was the only woman in her field, she replied firmly: "No, oh no." But then she went on: "I don't know. Maybe I don't think about it much. I don't.... See, you get used to it. It's a way of life for you, meaning that's the way it is and always has been." Another replied similarly: "That was sort of the way the world

was, and I didn't get all radical about it.... Maybe I just didn't see it."

One participant, however, as if responding to these statements, described how easy it is for women to lose a sense of their identities: "You can forget as you assimilate into the dominant culture. You forget." She went on to describe her own situation: "I still don't feel totally part of it. I mean I still feel like a lot of the priorities and a lot of the ways decisions are made in science are not necessarily the way I would make decisions." Another described the awkwardness of social events where she feels called upon to interact with both colleagues and their wives. "I don't personally want to make a big effort to hang out with the guys and make a big issue that I'm your colleague, blah, blah, blah," she explained, and yet "on the other hand, I don't want to act as if I'm just being polite. Of course I have a lot in common with the wives who are mothers, so I'm happy to talk with them. It's a funny sort of social situation." And yet another described the feelings of insecurity that she herself felt when she was beginning her career: "I did always assume that it was something that happened to women more than men."

These varied responses offer different examples of the sense of otherness described by most of the UNM women scientists we interviewed. At the heart of their observations was a feeling of

discomfort with the predominately masculine demeanor of science. A couple of the respondents actually described certain "male preserves" in their particular fields, research sites where women were simply not allowed. Others spoke of disciplines that continue to be "a bunch of macho" and "excessively competitive." One respondent explained: "What I'm afraid of is that in just the last ten to fifteen years, we've gotten so mechanistic in our thinking. It's become more and more masculine, to my sense, especially in these competitive fields." Another, referring to just this kind of problem, said: "Among ourselves we talk about how crazy it is. And part of it is this macho thing that if we are going to make it in this boy's club, we can't be weak." As if summarizing the general problem confronting women in any male-dominated profession, one respondent explained her predicament in terms of a question: "How am I going to be perceived? Am I going to be perceived as a female or am I going to be perceived as a professional?" For many men in science, she complained, "female and professional are somewhat mutually exclusive."

What makes matters worse is that scientists seem not to regard their profession, much less the practice of science itself, as something influenced and shaped by culture. One of the respondents had this interesting story to tell about the general resistance to viewing science as anything but a pure intellectual discipline. She described a conversation at a

national meeting where she was talking about "minority issues" and "cultural matters." She was approached by a senior science administrator: "He said, 'Now come on, are you going to tell me there is a cultural imprint on the periodic table?'" She explained to me her frustration at this comment: "It's like the Thomas hearings, you know. I said, I'm not stupid. I'm not going to take away your periodic table. But when a student comes in and says 'can you explain the organization of these elements, these atoms,' and you turn to that student--that's when culture comes in. Either that student feels welcome or unwelcome, included or excluded, that they can or cannot participate. That's when culture comes in and that's when you have to be aware of who you are." Then she added: "And I don't think scientists are a very friendly bunch for people from other cultures."

How would scientific culture change if more women entered the scientific professions? We asked UNM women scientists how the practice of science might be different, or is already becoming different, because of the different kinds of behavior and experiences that women bring to it. Virtually all of them had something to say on this topic. As one put it, reflecting on the "male club" of scientists, "here's an issue I've come to understand, and through reading have come to understand even more, and that is, we women--it sounds so vague, but it's true--we do things differently from men. There is a male style, a male aggressiveness, there is a male combativeness, a male

appreciation for combat and controversy and throwing ideas out as if they were darts.... Whereas women often want to consolidate." After describing a personal experience with this kind of male behavior, she continued: "The men think that's the only way to do it ... they really think the male way is the only way. Well, it's served them quite well. They've had the field for the last thousand years. So they know how to do it. It works for them. But there are other ways."

Her sense that males possess a distinctly competitive and combative attitude about science was shared by several others. "There is definitely a sort of aggressive style," one respondent explained about the practice of science. She went on to describe how this style affects professional interactions. "More women seem to be a little more amenable to other interpretations, and a little more diplomatic in their handling of questions. Sometimes I'm a little apprehensive about the combative style of presentation and defense of research. It seems a bit masculine in some ways." Another respondent described the language and approach of women as "warmer," and explained the effects of this difference in her own engagement with students: "I'm trying to let them know that it is okay, that you can make it without doing it at the expense of others--which is certainly not the way that I was introduced to science. It was very, very competitive, aggressive." Yet another described how in her lab she tries "to foster a lot more cooperation than existed in the program in

which I was trained."

In general, there was a sense among these women scientists that women interact with others in less competitive and aggressive ways, and that this difference might well produce changes in the practice and environment of science. As one explained, "It's not necessarily in how people do science, but how people interact with each other--the styles of presenting science, the styles of interaction." When women are not assertive, they may be perceived as somehow not measuring up to the interactive styles of men. One respondent complained that women are often faulted for not being sufficiently interactive. Relating the story of a particular woman scientist who was accused of just this, she explained: "Now I have some questions. Was it because she didn't know how to interact, because she didn't want to interact, she didn't know what was expected, or because she didn't feel welcome?" Another described the discomfort that several women graduate students felt at a series of student discussion groups. "Some of the women got really frustrated with the way interactions took place. So they did a little study on lots of issues related to group interactions." She went on to explain how they gathered this data for the specific purpose of changing interaction patterns at these meetings: "Their objective in all this was to get the people who were very domineering in conversation to back off a little bit, to pay a bit more attention to how they're interacting."

Several of the women we spoke with described a variety of other ways in which science might change if it included more women in its ranks. For some, the mere presence of women signals a more open and diverse environment. One respondent, describing how it felt "wonderful" to be in a field with significantly increasing numbers of women, added, "What if we more than doubled the number of women? How much more relaxed I'd be." Another simply pointed out that more women in science would make for a profession that more accurately reflects the composition of the real world. "With a higher percentage of females, it makes the whole situation seem a little better, a little more 'normal' than it was before." Yet another reflected a similar attitude: "I think that simply having more women in science shows both women themselves and female graduate students that you don't have to be a man to be a scientist. The more women you get in science, the more diversity of personalities you get."

Others spoke about distinctive aspects of their work that might well be attributed to their gender. "I guess the foremost example I can think of in my own work," one respondent explained, "is this tendency I have to do synthesis work at the interface between fields." Another wondered if her general approach to science was marked by her gender: "I don't know ... but the way I try to approach my science is more holistic, looking at the whole picture." At least two respondents commented on the different assumptions that women scientists have brought to

research on mate selection, particularly the notion that female plants and animals to some degree choose their mates. Another, speaking more generally, had this to say: "Certainly, some fields of science changed dramatically when women began to be taken seriously...." As one respondent put it, "I think that we just ask different questions."

One important reason why women may approach science differently has to do with their cultural experiences as mothers. Everyday concerns become mixed with scientific thought. "Just the scheduling of kids on different schedules, and then a husband, and then all this stuff that's involved with your job--it brings home meaning to the absent-minded professor." But it also prompts changes, this respondent went on to explain, in "the subtle way you think. I just feel like I have a lot more on my mind." Another spoke about changes likely to take place in the environment of science when women occasionally bring their children to the lab. "I think it's great," she told me. "This is where it's really having an impact." Perhaps the deeper impact, however, is in the ways that mothering can change the way scientists think, and thus change scientific epistemology itself. "Oh definitely," one respondent explained, "I notice change in my attitude about a whole range of topics including science and the ethics of science ... an attitude that a mother would have that a woman necessarily wouldn't." When asked more specifically about these attitudes, she replied: "I've now developed views that I

never thought I would have toward things like ... the ethics of the development of certain aspects of science or technology. I have stronger views about that. Having children, you tend to have a longer term view."

Several women spoke about the need to reconceptualize science, and described specific ways in which they attempt to do just that in their own research and teaching. One explained that what she aims for is a more "inclusive science, science in which publishing a million papers in the best journals is not necessarily the best science or the best for the progress of science. I think that it's important to be thoughtful, important to communicate. I don't see people communicating much." Another spoke of the need to size down science: "They think they are studying the entire world. They think that what we are learning and studying as science is all, everything, it's it. But my feeling ... I happen to believe that what we are studying is a very tiny component of reality." Another respondent reflected similar ideas about science and described her own efforts to change this scenario. "I go out of my way to let students know that there is so much that we don't know. I don't want them to look at this and say they have figured it all out. I see it absolutely from the other extreme. I see that we have figured out these few little things, but that there is this whole mysterious universe out there about which we know nothing." And another was all too clear about her own struggle to resist the

competitive and combative ways of science. "Right. I will never be, and I consciously think about not becoming, the model of the male way of doing things, of doing science." She went on to consider how different her own career might have been had the approaches and styles of science not been so strictly defined by one gender: "To be in an environment where your female way of doing things had credence, had credibility, was recognized as real and successful, would have made my job, would make my life now, easier."

Questions of culture always seem to hinge on questions of identity. How do you define yourself, name yourself, in a given culture? For many women, becoming a scientist often means losing at least some of the identity they have assumed as women. They must inevitably act and think like male scientists have thought for centuries. But for some, becoming a scientist means adding the contributions of women to a predominately male discipline and, in the process, changing that discipline. One respondent spoke eloquently about her own experience here: "That gratitude for being a woman, and for the rich background that I have had, and for being able to enrich myself and enjoy other women as friends and colleagues, has all come to me very profoundly just in the last couple of years. So now, and never before would I have said this, I say 'woman scientist,' now I say 'woman scientist.'" Her remarks reflect those of a woman of color on the science faculty who insisted that women scientists must bring

their different selves and cultures to science, rather than "give up who we are" in order to become part of an already existing culture. This project, she explained, is crucial not only for women but for the contributions and fates of different cultures. As she succinctly put it, "we have problems to solve for which we don't have solutions within one culture."

Los Alamos National Laboratory Interviews

Backgrounds

While the Los Alamos women scientists we interviewed came from varied backgrounds, most had received some sort of parental support and encouragement to pursue an interest in science. Growing up in middle or professional class households, their parents were themselves often members of the scientific or education professions. Many respondents singled out the particular influence of their fathers, though several also talked about the general encouragement they received from both fathers and mothers as well as other influential female figures. A significant minority of women, however, came from backgrounds in which neither science nor advanced education were particularly encouraged. Inevitably they had been steered into science by other individuals and cultural influences. Whatever the source of influence, all of the women we interviewed seemed to look back to something--persons or events--that initially encouraged them to enter the ranks of science and sustain their professional development.

"My father always said to me that you can always do anything. He always said that to me. This was fifty years ago. And it was unusual." Many of the Los Alamos women scientists spoke in this kind of way about fathers that they now perceive as

"unusual" or somehow special for the professional support they offered their daughters. One described herself this way: "I'm the engineer my father never was." Others described themselves as following the lead of their fatherly role models. One woman's father was a "science education professor" at a large state university, and another described her father as an "accountant" whose interest in "numbers and earth science" exerted a positive influence on her. Other respondents identified their father's professions--mathematician, chemist, doctor, engineer--as being especially significant in shaping their own careers.

Several respondents were also quick to contrast their mothers' roles. "My father's a doctor and my mother's a nurse," one said, and went on to detail her father's shaping influence: "He would take me into work with him when he had to go in for emergencies and stuff." But another sketched a very different scenario: "My father was the engineer and my mother was the teacher. My father had about zero influence in convincing me to go into the sciences. He was surprised when I decided. Now my brother also is an engineer, and that was expected and cultivated." Another compared the influence of her parents in this way: "My father was very good at telling us what we should do. My mother was the same, but less visionary.... My mother was very much my father's helper." And another: "My father was a chemical engineer and my mom was in education.... My mother was very afraid of science and math ... and my father begged me

not to go into teaching, and instead go into science."

In relating these traditional differences between the occupations of mothers and fathers, it was clear that while some of the women we interviewed consciously broke away from the positions and professions of their mothers, others were positively influenced by the example of both parents. "Both my parents had advanced degrees" and provided "a real intellectual environment at home," one respondent related. "Both my mother and father had been to college ... and they sure did think education was a good thing," another explained. One woman, identifying her mother as a chemist and father as an engineer, put it this way: "From the day we were born we were told we were going to go to college." Another focused more specifically on the positive parental support she received as a young female: "I didn't realize until I hit college what a great service my parents had done for me simply because they never, ever, made me feel like it was strange for a seven year old girl to want a microscope."

While most of the Los Alamos women scientists we interviewed told stories of supportive parents and family backgrounds, many had clearly worked against the odds in entering the ranks of science. In virtually all of these cases, the women came from backgrounds where, for different class and cultural reasons, advanced education was not particularly valued or encouraged.

"I'm the first person in my family to go to college and complete a degree," one respondent explained. "There wasn't a background in academia. I was never pushed by my family to go into science. They just weren't involved that much in my schooling." Another called particular attention to the cultural expectations for her as a young woman: "There weren't many in my family who had gone to school. We were immigrants.... Girls got married right out of high school." Another described a similar cultural predicament: "I was from a second and third generation [immigrant] family. My mother said why did I ever want to go to school ... when you're just going to be spending your life in a kitchen.... So that was my first thing to overcome, my cultural background." And another, who described herself as "always interested in science," simply said of her parents: "They were factory workers."

For these women, encouragement even to think of entering the scientific professions came from elsewhere. Several women commented on these alternate sources of influence. One explained, "My mom never graduated from high school, and my dad graduated and worked ... as a jack of all trades." But then there was Sputnik. "When Sputnik came along, for me, it was just a question of which branch of science I would choose." Another explained the pivotal experience for her of growing up in a town that housed a major research plant. "My parents weren't highly educated, and there weren't any big influences from there....

But the parents of some of my friends were chemists. When it was noted that I was intelligent and liked this kind of thing, they would encourage me. In the science fairs, you know, and back in the mid-sixties the whole space race thing."

A couple of the women we interviewed identified specific people other than parents who exerted special influence on them when they were young. In both cases, these individuals were their aunts. One respondent, who claimed that her interest in science seemed to be "just born in me, not something from the outside," added: "I had one aunt who encouraged me in this. And I think that if she hadn't encouraged me, I would have lost it. But she did encourage me." Another, when asked about parental or family support, put it simply: "It was my aunt, who was chairman of the high school science department.... I always looked up to her. I lived far away, but she always encouraged me. She would send me science books and so forth."

For some of these women, a little encouragement could go a long way. For most others, the support and guidance they received early in life clearly established grounds for the confidence they needed to enter the traditionally male domain of science.

Mentoring

The following story, told by a Los Alamos woman scientist reflecting on the support and obstacles she encountered in her science education, sketches the kind of narrative typically related by the women we interviewed in describing their experiences with mentoring.

"My first positive influence in math was in 7th and 8th grade in elementary school.... I had an old fashioned math teacher, and I guess I must have shown an apptitude in math because she would take me under her wing and we would spend a little extra time talking about math, set theory and stuff, and I really enjoyed it a lot. But then I had a downswing in Algebra in high school, and almost flunked the course. Had a math teacher, a male ... he seemed not to be friendly to girls. He would pick out a couple of boys in the class whom he would treat as friends. I always felt intimidated by him. I had a hard time with the course. Then I had another upswing in 11th grade. I had a male teacher ... he was just great. He spent some time with me and he really turned me on to major in [science] in college."

There are, to be sure, the accounts of successful mentoring, stories of the special teacher or professor who took extra time to work with and encourage particular students. But these

stories are few compared to the much more frequently related accounts of teachers who variously discouraged, ignored, and at times even intimidated their female students. Stories of successful mentoring are also sprinkled among many accounts of the remarkably small number of women science professors who could serve as models for female students. In general, the Los Alamos women scientists we interviewed told us much more about the problems and failures they encountered with mentoring. Several spoke, often with deep concern and emotion, about the need to change our educational system so that it is more responsive to young girls and offers more encouragement and guidance for them in the sciences.

"It was uncomfortable. I had a Research Assistantship and I was the only woman. Had a male advisor who was not supportive. It was hard. I quit after my masters although I often wished I had stayed." This feeling of discomfort, of somehow being out of place, was described by many of the women we talked to. "I didn't quit," another related, "but I had a hard time getting through college mostly because I was the only woman. I had no study groups to go to. I did it on my own, and that was very hard to do." One respondent described the debilitating effects of this situation: "I was the only female in my class.... I felt isolation. I was a senior before I realized that the reason why those guys were doing so well was because they had a study group. I was in the women's dorm and they were all rooming on

the same floor. Our girls dorm was overcrowded, but the male dorms had study rooms. They really had access.... I didn't do well my freshman year, having been in an all girls school where we spoke our minds and we talked philosophy and the rest of it. It was a shock to me after six years that they didn't hear female voices. I thought that I was stupid.... It had to be me." Another explained her similar predicament in this brief way: "Very few female cohorts and no solidarity at all. Rather isolated."

The feeling of isolation experienced by many of these women is very likely connected to the virtual absence of female role models in the sciences. Almost all of the Los Alamos women scientists we interviewed told us that they had no female science professors or, at best, recalled only one woman professor. Their comments here read like a litany: "Actually there were not very many female professors. Mainly male. In my [specialty area] I had only one female instructor the whole time." "They were all male. One [woman professor] in graduate school, and that was it." "There was one female [science] professor who warned me of several things, like glass ceilings. But she was supportive and said if you like what you are doing and can live with that, then go ahead." "No female professors that I ran across. I was the first female Ph.D. in [my specialty] at my university." "When I started I was shocked to see that there were no women at the universities. It took two or three days to see. There are no

women here. I don't know how it is now. I presume it is better." "Yes, there was one then. But I think she was the only one." "Absolutely not. There were no female professors." "We had one. She was a little on the grumpy side." "I worked with two fabulous women professors.... I think they feel very discriminated against." "In college I didn't see a single female female faculty member at the time I was there. If you read Science magazine, things haven't changed that much." One respondent offered this statement, which might well serve as a summary commentary: "There were no role models. Absolutely none."

Accounts of successful mentoring focused, not surprisingly, on the single science professor, most often a woman, who took time to work with a female student. "I had a female calculus teacher the last year. She was absolutely wonderful and was one of the reasons I felt, well, that if she could teach this, I could certainly learn it," one respondent explained. Another responded enthusiastically: "Oh, yes, I did. In fact her name was [X], and she was a math professor in my undergraduate college. That was a very big factor, my first ever female role model in the sciences. And she was really great. She balanced everything. She was feminine. She was technical." Some respondents recalled pivotal teachers in their earlier education: "The person who was most responsible for [my interest in science] was [X] who was a high school teacher.... She made it seem easy

and fun." "My 9th grade algebra teacher, a woman, a nun ... was instrumental in looking at my college plans." Yet it was clearly not easy being one of the rare female mentors in science programs. One woman we interviewed described her successful postdoc experience with a woman full professor at a major institution, and then added: "My first day on the job she said, 'I don't want to alarm you about rumors that I am trying to leave, but I am.' She just wasn't happy there."

A couple of respondents described the positive experience of attending all girls schools where their interest in the sciences was promoted. As one put it, she just never felt different there as a woman in science. "It just never came up.... So it was a real surprise to find, when I got into a more normal environment, that in fact I was doing something that was sort of special." The experience of one woman in her engineering college classes offers a striking contrast: "In a class of thirty it was very typical for me to be the only female. You got used to it."

A few of the women we interviewed also told stories of influential male mentors. "My mentors in high school were all male," one explained, "and I did have mentors along the way, people who were very encouraging." A couple recalled specific persons: "The man who supervised my master's thesis had a tremendous influence on me," one respondent told us. Another recalled a specific male professor who was "enthusiastic about

our studies."

Still, most women talked about problems rather than successes with mentoring. Some simply never received mentoring at all: "I was never in a true mentoring situation," one explained. "Not much mentoring," another told us, and then added: "But I was top in my class ... and my good grades got me attention." Another responded: "No, I was not [mentored]. In fact, the only mentoring I had--and maybe I didn't need any because I said 'okay, this is what I'm going to do'--was from my parents. They said 'yes, go for it, we'll get you through college somehow.' They didn't have to because I got a scholarship." It was clear that some very bright women in the sciences did not receive the attention that young male scientists are often given.

Similar accounts of discouragement and intimidation were common. "In college I had nothing but encouragement to leave the field," one respondent explained, and added: "I was told by my college advisor that I was taking the place of a man who was going to need this degree to feed his family, and I should go and do something else." Several women related stories of this kind of poor guidance. "It was actually stated to me at one point that you could make as much money with a masters, you're going to get married, you're going to have children. It's really not necessary for you to go forward and get your Ph.D. I didn't

really question it that much. I got my masters and got out." Another looked back to the poor guidance she received in high school: "When I was in high school, what I really wanted to be was an architectural engineer. But when I went to the guidance counselor, she was a woman, she said 'women don't do that,' and totally discouraged me from going."

For a few women, negative mentoring experiences damaged their education and careers. One respondent related this story: "I had one particular professor ... who could barely get one word to me. So I left and never quite got the assistance I needed for that class." When told she needed to take another course from this professor, she quit. Otherwise, she explained, "I probably would have gone on to my Ph.D. I really like research and working in the lab, and have not had a lot of opportunities to do that."

What can be done to improve mentoring for female science students today? Several respondents were quick to offer suggestions. One reflected on the positive impact that female role models played for her: "When I was growing up, I saw women who went into higher education.... I think just the image of educated women is an important step." Another felt that we need to work hard to combat cultural influences that persuade young girls to turn away from education. Until their junior high school years, she explained, "girls are better in school than the

boys." We need to change their "perceptions" of themselves and their abilities around this crucial time. One woman we interviewed, as a result of getting "depressed about the fact that there were no other girls" in her classes, joined with a dean in her graduate school to conduct a study of women pursuing engineering degrees. They found that women in engineering tend to be "very, very good students" but that they have serious problems with their confidence: "A guy can feel comfortable making C's in engineering classes, and he knows he'll be a good engineer. It's no problem. But we found that the females who stayed in engineering had to be A or B students in order to feel confident." Clearly any initiatives that could boost the interest and confidence of female students in the sciences would be desirable.

Yet while cultural and individual changes are desirable, the educational system itself also needs to be changed. Several of the women we interviewed complained that our schools are simply not good enough, and that young girls tend to suffer even more from poor educational systems. As one explained, students are "cubby-holed" from the beginning, "the boys can do this and the girls can do that. There are so many problems with the educational system," she continued, "which is part of why I was even thinking of going back and teaching.... And having female role models would make a difference. There just aren't that many." Another complained that our schools, instead of

"capturing people's imagination at a young age" are "squelching" it. And another, complaining about "special programs" for select "talented kids," added, "not all kids show special abilities when they are young.... Education should be full."

Clearly many of the women we interviewed at Los Alamos felt that their own education was less than "full." Pursuing their studies without role models, lacking supportive mentors, and often encountering discouragement, they offer crucial insight into the kinds of obstacles that female science students have encountered in the past--obstacles that many likely still encounter today.

Sexual Discrimination and Harassment

While not all of the Los Alamos women scientists we interviewed felt that they themselves had experienced sexual discrimination, most talked about various kinds of discrimination and harassment that women in the sciences can and do generally encounter. The message we kept hearing in our interviews seemed conflicted. One the one hand, many of the women scientists we spoke with said that they did not generally feel that sexual discrimination was a problem. On the other hand, many of these same women would talk at length about specific cases and kinds of discrimination that they or their colleagues had encountered. Others went beyond specifics and generalized about the prevalence of sexual discrimination at the lab. Several also distinguished between overt and covert forms of harassment and discrimination, while still others were not sure if certain problems they encountered had in fact resulted from sexual discrimination. Whatever their responses, it was clear that most of the women we interviewed were eager to talk about the topic of discrimination, and would typically reflect on the topic at considerable length throughout their interviews.

Those who generalized about sexual discrimination at the lab offered various descriptions of its manifestations and effects. Some made large claims about discrimination. As one respondent

explained, "discrimination happens all the time." Another, asked if she herself experienced sexual discrimination, replied: "I would say that almost any woman at the lab must say yes." When we told her that this was not the case, she added: "People have blinders on.... Some of them may not admit it, but most will if their bosses are not there." One respondent in fact described the blindness she once felt about sexual discrimination: "I wasn't aware that I was segmented out. I wasn't aware that I was not given what I might have received. I didn't know I was supposed to be getting it. I wasn't paying attention."

Others, however, had clearly been paying attention from the very beginning. "When I came here, there was blatant discrimination," one respondent told us. She went on to describe her own difficulty securing a job at the lab, and claimed that only after someone had filed a suit "to enable women to work" in a particular division did the situation begin to improve: "They were being dragged kicking and screaming into the 20th century." Another described how she was hired along with "several young males" who were given preferential treatment from the start: "They were younger, had more places to go--subtle types of things. I felt the group was grooming certain people, and these young males were being groomed while I was just assigned a job." She went on to reflect on the social context that supports this kind of discrimination: "I think there are problems with women in predominately male office environments because you can't go in

and discuss things socially. You have to keep things on a more professional level because you can't socialize.... There were no other women in my section." Another respondent described a very different hiring situation. When three positions were opened, she was one of three women who were hired. "However, once I got that job ... I was given no freedom. I could not do what I wanted." She reflected on the situation in this way: "I think that with some group and division leaders there's just a lot of discrimination against women. There's an assumption that they can't do whatever it is. They can't manage a project. They can't take responsibility. They can't plan and finish things on time. They can't organize well enough to do it. These are the things I've actually heard said by these people."

One particular reason cited for the presence of sexual discrimination is the existence of an informal network among professional men who support each other--what several respondents referred to as the "good old boy" network. "It depends on who belongs to the 'in' group. If there are any women, they are few, and they are kind of 'in' and 'out,'" one respondent explained. She went on to describe her frustration with these boundaries: "The group leader recently made a statement that there are some people who are trying to do away with old boy networks.... What do you do in a situation like this? How do you get by this? I'm very unhappy with this situation.... I felt that my voice has not been listened to. My present group leader treats me like an

idiot." Another explained similar difficulties with the evaluation of proposals: "There are problems in getting outside funding for a woman. I am writing proposals and they do not get out of the lab. I think there is a good old boy network here."

Not all of the women we interviewed shared the belief that sexual discrimination was prevalent at the lab. A few dismissed the topic entirely. More commented on how the situation had improved over the years. "In the early days ... I think the lab was very bad in the way it treated women.... But in the last fifteen years I think it's been just fine. And for the most part, my own personal experience has been positive." Like many of the women who claimed not to have experienced discrimination, this respondent offered this typical added comment: "But I have had friends who have had bad experiences."

Others were not sure if the problematic treatment they experienced actually resulted from sexual discrimination. As one woman put it, "I don't think that it was entirely that I was a woman. It's hard to know." Another was equivocal about her experiences: "There are a lot of things that happen because you are the only female. I go to a technical conference and I'm the only woman and I don't get invited out with the guys. That happens a lot. I don't call it discrimination. Maybe it is discrimination."

Specific cases of sexual discrimination, however, were indeed recognized and described by many of the women we interviewed. Their complaints typically concerned issues of discrimination in salary matters, the securing of jobs and funding, and prevailing attitudes and assumptions about women. While most of the women who commented on salary generally felt satisfied with the salaries they received, there was nonetheless the sense that gender-based salary discrepancies did indeed exist. As one respondent put it, "We're making good salaries and we don't want to complain about that. We're very thankful. But then you compare [with the men] and it's not so fair.... A few years down the way I realized that if I had been a man in [my] position, he would be getting more than I was offered." Another respondent struck a similar tone: "I make more money than I ever expected to make," she explained, but continued: "I have a friend who's checked the library. She's appalled that we make so much less than guys that have the same number of years and the same background."

Several women also related stories about discrimination they encountered when they sought employment at the lab and at other institutions. Women scientists who were wives of male scientists at Los Alamos told of being promised positions that did not materialize. One respondent explained that in the past the lab had often "profited from the wives of the husbands, because they bring in the husbands and then they'd hire the wives at very low

salaries and not treat them well at all since they knew that they had to stay here." Another reflected on her past: "I've had at least one job that I was greatly more qualified for than the man who got it. I've had several jobs that I was qualified for, but was never even given an interview." Another complained about one of her supervisors: "I don't know what he was up to. He was clearly very traditional about women. I had a job offer from somewhere else and he squashed it for me. He told the person there that I would go where my husband was and that was it." Several also complained about discrimination they encountered in securing fellowships and funding. "The only time I felt segregation," one respondent explained, "was when we were trying to get fellowships. There were five women and two men. And the men got them, and none of the women. Later on we heard that they never hired women there." Another had a different kind of story to tell about fellowships. She related an account of a woman who received one of the Oppenheimer fellowships: "Her university said that [this woman] was the best in [her field] in the past fifteen years and won all the awards.... But one person in my group said to me, 'she just got it because she's a woman.'" In relating these instances of discrimination, several women talked at length about the positive effects of class action suits filed at the lab.

Many of the women we interviewed commented on discriminatory attitudes about women that paved the way for actual cases of

sexual discrimination. One respondent, for instance, described her group leader as having "a very negative attitude toward females. If [women] thought differently or behaved differently than his set structure of behavior, it was a problem. Hostility." Some related stories of overt discriminatory assumptions about women: "I know one guy who said he didn't like having females because they didn't tend to stay in the area, they'd run off and have kids." Others spoke of more covert discriminatory attitudes: "My colleagues, even though they respected me and all that stuff, would ask a male colleague his opinion before they would ask me." One respondent, who had unsuccessfully requested leave because of a broken marriage and impending child care obligations, related this conversation with her group leader: "He just said to me, 'This is unfortunate that the government has to hire pregnant women. They're just not good workers, but we're stuck with it and we have to do it.'" She continued: "This man has to be smarter than that.... He's surrounded by other people who were ... upset and went to him afterwards. He later apologized to me to indicate that he didn't mean me, that his remarks weren't directed toward me. He has these ingrained notions. He didn't understand that he was making a discriminatory remark. He didn't have a clue how this affects his workers."

These kinds of attitudes and assumptions about women seem to underlie the patterns of sexual harassment that several of them

described. Most complained about various kinds of verbal harassment--descriptions and comments that have the effect of belittling women. One respondent related this account: "I was the only woman taking my degree and I was rather harassed at times. I can remember in a [graduate science course] there were two women in the class, and if I asked a question the professor would say, 'Oh, the little lady has a question, what is it sweetheart?'" She continued, "I am not your sweetheart, I just have a question." Another described the similar effects of being the only female in her program: "Just sitting around at coffee breaks, the engineers were always talking about what dumb thing their wife did the night before, or what stupid things their daughters would do. It was just a rotten environment." Others described their encounters with harassing jokes at the lab. "Every once in a while you hear a comment like 'When are you going to take physics seriously and stop having kids.'" She continued, "On the third kid, well, two seemed to be reasonable, but on the third kid I got more looks.... Partly it's a joke, but the other part is that they're just not used to it." Another related her experience with such jokes in this way: "There's some people who really do not mind having a woman around, but they like to see if they can get your goat.... Just comments like, 'Here comes the token female,' and 'That's nobody who's a boss.'" When asked how she copes with this kind of joking, she replied: "I like to use the hollow laugh."

Specific cases of harassment ranged from abusive treatment to pranks. One women described how she "had to put up with things like pictures of naked ladies" She continued, "I had to ask to have them taken down. I'm not exaggerating." Asked about the response to her request, she said, "He took one down and put up one with a little more clothes on. That was supposed to be better." Another recounted her experience with a co-worker who kept questioning her abilities to perform the job. It was "unpleasant," she told us. Others described pranks that they encountered in graduate school. As one respondent generalized, "There were just some people ... who made things very, very hard." A couple of respondents related experiences that involved sexual advances. One respondent described a "fatherly" professor who had helped many female students, but who had nonetheless "come on to me" at one time: "It was very distressing."

A lengthy story related to us by one woman scientist offers important insight not only into the experience of sexual harassment but the effects of undergoing both harassment and the grievance procedure. This woman told us how she was asked to sleep with her supervisor in order to secure a decent job review. "When I refused his demands, I was marked as a troublemaker. He had always been one to grab at you in the lab. That had been going on for ten years. He had done it to the other women, too. I found out when I filed a grievance. Our particular group runs in the good old boy segment, and everybody kept quiet." After

registering complaints with his supervisor, she encountered even more harassment--"not sexual, he was just accusing me of everything that went wrong"--and was ultimately told that the whole problem was her fault. She explained, "I didn't have the sense to figure out that this was the good old boy system." When she was finally told in her review that "I need continuing counseling because I can't get along with people," she filed an official sexual harassment grievance. "It was horrible, it was really horrible," she told us. The grievance procedure dragged her through a tormenting experience that ultimately resulted in her having to be hospitalized for a nervous breakdown. When at last the grievance was settled, she was moved to a new division where she feels recognized and respected. She ended her account this way: "These are the reasons I wanted to participate in this study. I want people to know that this happens, and that it is covered up. There is still discrimination and cover up."

The effects of this kind of harassment and discrimination are difficult to gauge, but clearly they undermine the confidence and self-esteem of these women. One respondent described the effects of discrimination in a single phrase: "It makes me question myself." Another told us that harassment and discrimination "tend to undermine your confidence. They tend to make you feel uncomfortable. Then you don't feel as good about yourself intellectually because you have to contend with all these other issues." Even covert discrimination can have

debilatating effects. One woman reflected emotionally on this kind of discrimination and its effects: "I really think it's the female thing. I'm not accorded the respect. I'm not listened to the way I should be.... And they don't even see it. That's the worst part.... It's miserable.... I really struggled, and I had a real issue with worth, with my self-worth. So by the time I got here, I was so proud of myself. I was on top of it. And now I'm back to where I want to crawl into a hole."

"Which is kind of sad," she added. "I'm trying to recover my self-confidence."

"I think this is more the case than anything else. Women follow their husbands here."

"I think most ... of the women that are here are here because of their husbands."

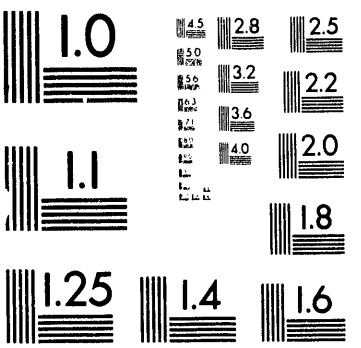
"There may have been some joint decisions, but I can't think of a single [woman] who came here and whose husband followed her."

"He was hired here and so we came here. That was the standard then. I never thought about it, and I guess I don't want to have after-the-fact regrets. It was just the way the world was organized."

These observations from Los Alamos women scientists indicated that this may also well be the way that Los Alamos is organized: husbands secure appointments at the lab, their wives follow them, and then many of these wives, themselves scientists, also secure appointments at the lab. This scenario has both positive and negative aspects. On the positive side, officials at Los Alamos have obviously made an effort to employ available women scientists and at the same time promote partner/spousal

hires that stand to generally improve the personal and professional lives of its science staff. On the negative side, many of the women we interviewed described the costs of following their husbands to their careers. In the vast majority of cases, it is the woman who must make career concessions when both spouses are attempting to secure professional employment.

In our interviews we heard varied stories of how women scientists followed their husbands to Los Alamos and secured their own positions at the lab. One described her hire as something that happened "by the way," in the process of hiring negotiations. Another described a period of being "rather frustrated" while she waited "not knowing whether I was going to get a job here or not." Another worked in a hospital for two years before a position materialized for her. Some had to wait until they secured U.S. citizenship before they could even apply for positions. One respondent described a particularly "frustrating situation" of having to deal with a prospective employer who told her "'I don't hire degreed women.'" Another described several odd jobs she held before being able to secure a teaching position, and then later a job at the lab: "It was very unequal." Two respondents described strikingly different experiences in seeking employment at the lab. One, who actually thought about changing her career, suddenly found herself being sought out: "I thought about being a lawn and garden person. I thought about being a midwife.... But then essentially they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looked for me. I didn't even have an interview." The other, however, spoke of broken promises. After a prospective employer "invited me out for an interview and told me he was going to hire me," she related, "I resigned my job and gave up my appointment only to find, he had his secretary tell me, that the job didn't materialize." It was several years later that she was finally hired full time. When we asked one woman why she thought she was hired, she replied: "Of course because of my husband, of course because of my work, why not use us?"

While some of the women we spoke with accepted their predicaments as somehow dictated by the "way the world is organized," others described making deliberate personal and career decisions. One explained: "I decided to get married and have children. It was a very clear decision and it obviously affected my career in a very profound way.... Instead of this steep upward move, I started moving sideways." Later, she added: "Most men would probably not have decided the way I did." Another respondent, who did not follow a spouse to Los Alamos, told us: "I have always put my profession ahead." But she then added: "My attitude is now starting to change." Another, who plans to marry, explained her situation in this way: "I guess when you want to start having children, you have to start thinking about who's going to be the primary earner, and go where they want to go. So I imagine I will face that problem eventually." Some others, who came to Los Alamos as single

women, eventually married a scientist at the lab. As one explained, "I was warned that it's a very married community."

The message we kept hearing in our interviews is that women scientists, for better or worse, do make career decisions in the context of personal and family decisions. In the process, they experience certain professional costs and setbacks. Many of the women we interviewed spoke specifically about these career concessions and the problems they posed. Several had to change their research fields or leave secure jobs elsewhere. As one explained, "It's true that if I had not had this [spousal connection], I never would have come here. I would have stayed in [my original field]." Another explained her "major concession" as her "change in career": "When I finished my M.S. in [a particular field], I decided not to go for my Ph.D because it would have required moving." One respondent described the general cost encountered by professional women who follow their husbands as fundamentally a loss in "self-esteem." Reflecting on the overall situation of wives in Los Alamos, she said bluntly: "Your husband is neat and important, and you're crap." Another, herself successful in securing a position at the lab, told the story of a female friend who holds a Ph.D. from a major ivy league university and works as a secretary at the lab: "So she ends up as a secretary because she came here with her husband, found a job, and now has been sort of classed into that job."

Whatever the specific concessions experienced by these women, there is a general sense that their careers have suffered. As one explained, men who do not have family responsibilities can devote themselves entirely to their research. Describing a male colleague, she says: "He's my age. He's got two kids a little bit older than mine. His wife stays at home. He works all the time. His publications are amazing." Another reflected on the accommodations she made in her career: "This whole thing threw me years behind my male peers as far as where they were on the professional ladder. You know, the raising of children, going around with a husband, and changing jobs. So I would say if you really were serious, you have to put [your career] first." Asked if she had any suggestions for dealing with this scenario, she added: "I don't see any easy answers. I think that each person has to figure that out."

Given the situation that--at least now in our culture--women are the ones who negotiate career decisions around their spouses, partners, and families, it seems likely that these career accommodations will continue to complicate the lives of women entering the scientific professions. One young woman we interviewed described just the sort of ambivalent feelings that are sure to be on the minds of many women her age: "We want to have a family. I don't know what I'm going to do. Do I really want my job? Do I want to stay here, do this? You leave for more than a year, whew, you're out of date."

Policies

When we asked women scientists at Los Alamos what policies they would recommend for improving the environment for women in the general profession of science and specifically at the lab, their overwhelming response concerned issues of child care. Again and again Los Alamos was faulted for not having adequate child care policies. Several respondents also spoke of the need for family care policies and parental leave. Next to these concerns, the most frequently mentioned policy issues centered on better implementation of part-time and flex-time schedules. In matters of education and recruitment of women scientists, many spoke of the need to establish stronger networks among women entering the scientific professions so that more can be informed about and brought into professional positions. Some felt that women's support groups would help with this effort. We asked some respondents if it would be easier for Los Alamos to recruit more women scientists if the lab diversified its research agenda, and received different responses to this question. In general, although the women we interviewed felt that many problems confronted by women in science were cultural matters that would take time to change, all of them nonetheless had at least some policy changes to recommend that could be implemented immediately or in the near future.

Complaints about existing child care policies were widespread. Here are just some of the statements we heard about existing inadequate policies:

"What do I do about daycare? There's no daycare. When my children were young, it was horrible."

"I do think the child care issue is a key one ... and I think that the referral service is a real joke."

"Childcare--it was awful when they were infants. You get a sitter and then the sitter leaves, so you have to find someone else you trust. It was hard then."

"I think it's disgusting the lab doesn't have child care."

"It cost me an arm and a leg."

"DOE has child care centers ... but the lab has always fought it off."

Several women we interviewed connected child care problems to general problems concerning matters of family and parental leave. "I think the lab is very backward in its family leave policies, period. Childcare is just a minor part of it.... What bothers me is overall family leave, both child care and elder

care," one respondent told us. "We're a squeezed generation," another explained: "I have elderly parents coming up here, and as my kids grow up, I start worrying about my parents." "I'm going to face it with my parents," another told us: "I'm in my mid-thirties, my mother's in her mid-sixties. If I have kids in the next couple of years, I could be taking care of both in my forties. Unless they have something where it would be easier to work that out. On site daycare." Several pointed out that care of both children and the elderly traditionally falls to the woman. As one respondent told us, "it was always the woman taking care of things." Another complained about the limits of using existing sick leave policies for taking care of sick children. "If you have a child who is ill, you are not allowed to take more than one day of your sick leave to take care of this child. This is an absolute absurdity in this day and age. They are forcing you to lie," one respondent told us. Another offered this explanation for the existence of such problems: "The attitude here ... is that your home life is your home life, and your work life is your work life, and the two are totally separate."

The comments about child care offered by one respondent, who spoke in detail and at length about the situation, summarize the feelings of many of the women we interviewed. "Los Alamos itself has no on site daycare facility. They do have a child care provider reference service. They have no on site child care

facilities. And they also have no mechanism for bringing your children to work if you need to on an emergency basis.... At DOE and [other national labs] they have daycare centers ... and you can bring your children to work." She went on to list five other labs that offer on site child care. One of these centers, she related, "had doughnut sales in the lobby to provide scholarships for people who can't afford it." Others "allow you to bring your children to work with you on an infrequent basis until they are approximately ten years old. Los Alamos has nothing that even resembles any of that. In fact, instead of being family neutral, I would say that Los Alamos is family aversive. Woman situation adversive." Asked why something is not done to remedy this situation, she replied: "Who's going to be the sacrificial lamb? This is a small town, limited areas to work. Nobody wants to make those kinds of problems."

Next to the issue of child care, the policy concern most frequently discussed by the women we interviewed was part-time and flex-time work. Most of the complaints registered about these policies concerned the largely negative attitudes that prevail particularly about part-time employment. And since, as the women we interviewed explained, policies about part-time and flex-time work are administered locally, the success or failure of these policies often varies from one division leader to another. Several respondents told stories of division leaders who simply will not support requests for part-time or flex-time

schedules. "It's a local phenomenon," one explained: "Let's say you're a secretaty who wants to work from 7 to 4. And the group leader says 'sorry, we're open until 5.' You don't have enough power or clout because you're just a secretary. I'm only lucky," she explained because of her position as a staff scientist, "that my hours can be flexible." Another respondent traced the problem to "a lot of managers" who simply "don't see the advantage" of these policies. Many women felt that these "local" problems with the implementation of part-time and flex-time policies resulted from the lack of general institutional support particularly for part-time work. "I think the the attitude toward part-time work, like the attitude toward on site daycare, is very poor," one respondent told us. "This lab takes absolutely no position, offers no institutional support for that sort of thing," another explained.

While virtually all of the women who spoke about part-time policies were in favor of them, there was disagreement about how the policies should be implemented. One respondent felt that "a large-scale policy would be bureaucratic, whereas a one-at-a-time policy would be more of a reflection of the fact that you've actually changed the group think." Others felt differently. As one explained, "If you have a supervisor who doesn't support it, you can either quit, be given horrible assignments and no raises, or look for another job." In general, there was a feeling among the women we interviewed that the laboratory administration could

take some steps to support the implementation of such policies.

The observations offered by one respondent, herself a supervisor who allowed employees to work on a part-time basis, can be useful in understanding the advantages these policies promise: "I supervised probably [x number] people, and [a handful] of these were part-time. I just loved having them. I'd say, 'Hey, somebody's supposed to go home at 12, any chance you can work till 2:30 and still be home when the kinds come home?' Didn't have to pay overtime to them. You know, there they were. If this week is slow, then go home at 12. I thought it had great advantages," she explained, and then added: "But see, I was willing to do it. And I had worked part-time myself, so I felt like it was kind of my obligation, I guess, to give that advantage to some other woman." When, in a different context of questioning, we asked one woman if she believed science would change with increasing numbers of women, she offered this reply: "I think we would have a lot more part-time. If women had a choice in it, we would have a lot more part-time." Then she added: "And if they allowed more part-time, then they would have more women."

How can the numbers of women in science be increased? Given that long-term efforts to improve education and mentoring must take place, what can be done in the short term to bring more women into professional positions in science? Most of the women

who spoke about this matter felt that there might be ways to increase contact between practicing women scientists and women seeking positions in the profession. One respondent spoke of the "insulation" that keeps "professional women" and "young women" entering professions at a distance: "I think that overall there is this insulation and that the lab can do a lot to deal with it." There are "high school programs," she mentioned, that could work to foster more connections. Another respondent spoke of the need for more "internships," and offered as an example the case of her current supervisor "sponsoring a [female] undergraduate student" in the sciences. And yet another suggested that the lab could be "most effective" if it would "go out to younger women, target high school and college summer students and that kind of thing ... because if the women don't feel that they can come here and compete, they're not going to come." In addition to establishing these kinds of networks between established women scientists and those preparing to enter the scientific professions, several respondents felt that women in science continually need support from each other. While several disliked the idea of official "support groups," claiming that such groups only make it appear that women are less capable than men and that they cannot do things on their own, there was a sense, as one woman explained, "that women need to get together and talk about their difficulties at work more, rather than have a lot of programmatic things." Another put it this way: "I have arrived at the conclusion that women supporting each other is the way to

go."

On the specific issue of recruiting women to come to Los Alamos, several of the women we interviewed had useful, and at times cautionary, suggestions. One respondent told us about an existing "university recruitment program" in which she participated. She explained both the good intentions of such a program as well as the problems it presented: "I was on the women's committee and the one thing we wanted was to have a woman representative on each team." But, she continued, "We don't have enough women at this laboratory so that we can send one out on each recruiting team, or one that has the time to do that. I personally couldn't volunteer to do that with my activities here and my activities at home." Another respondent described her different tactics. Instead of focusing on recruitment teams and organized efforts, she is following her belief that "you tend to get people up from people you know." She explained: "How do you find them? Los Alamos has this program with M.I.T. and they have a program they're starting with the University of California for undergraduates. We have graduate research assistants that come and work with us." Several women spoke in general terms about affirmative action policies, which they tend to support in principle though not always in the details of implementation. Some women told us that they knew that they themselves were affirmative action hires, and that this did not bother them. Another told us that she thought "the community of women is very

split" on affirmative action: "Most of the women I know who are younger tend to think that equal employment opportunities are very important and that's where the thrust should be." Another, reflecting on misconceptions about affirmative action, offered these comments: "Affirmative action does not mean that you show favoritism. Affirmative action means that if you have two candidates who are equal for a job and one represents an affirmative action position, then you give that person the chance. It doesn't mean you hire someone who's less qualified over someone who is more qualified...." One unusual, though clearly useful, suggestion about recruitment was that Los Alamos should develop videos that would be specifically aimed at recruiting female graduate students. A respondent told us of her own experience with such videos at her former university, and described the process as "progressive recruitment."

Would Los Alamos attract more women scientists if it diversified its research agenda rather than devote most of its research effort to weapons-related science? Among the women who spoke about this issue, feelings were mixed, and many were simply unsure. "I would be surprised," one respondent told us, "if the image of Los Alamos was a big enough issue to a significant percentage of women scientists that it has, so far, kept them away." "I'm not sure," another reflected: "When Carter was President, the majority of our work was non-defense, non-weapons related. And I can't honestly say if that made a difference."

Others, however, felt that the perception that Los Alamos devoted its research agenda to nuclear weapons has in fact deterred some prospective employees. In response to the question, "If Los Alamos diversified its research agenda, would it attract more women and a more diverse population of scientists?" we received this reply: "Yes, yes ... I've run into people who've had problems with working at Los Alamos, so I would have to say yes." Another elaborated: "Oh, yes, I'm absolutely certain. At one time in the 70's we were a lot more diversified. We had programs in geothermal ... and solar. We had all these programs and they were cut off, the funding levels were cut to such a degree that there are hardly any staff working on them anymore." Several respondents pointed out that since many women in science are in the biological sciences, the lab would necessarily attract more women if its research agenda focused more on the life sciences. As one explained, "If you look at the graduates who come here, if you look at the degrees, I think you get a lot of physics majors and math majors and computer science.... Most women who get degrees in science get them in life sciences. So yes, maybe if [the lab] gets away from the hard physics and gets more into the life sciences...." Such moves, of course, inevitably entail large-scale changes and shifts in emphasis. Yet as one woman explained, scientists need to be part of this process. Claiming that it is necessary to view the "big picture," she offered this caution: "You can climb the ladder and have it be standing on the wrong wall if you don't even bother to look at which wall you

want to go to."

The formation and implementation of policies that would help bring and maintain more women in science obviously require vision about both the "ladder" and the "wall." As one respondent explained, "We have no alternative.... If you look at the statistics nationwide ... you're either not going to have anybody work for you, or you're going to have women and minorities." "And the problem," another added, "is more fundamental than how to get women. The problem that's more fundamental is how to make them feel welcome."

Cultural Matters:
Women Scientists in a White, Male, Weapons Culture

As we remarked at the beginning of "The Culture of Science" section in this report which deals with University of New Mexico women scientists, the profession of science possesses its own peculiar culture. Because science is a field of inquiry historically dominated by Anglo and European men, and because the construction of scientific thought has in many ways paralleled the development of masculinity itself, science can be said to constitute a masculine culture. As one of the Los Alamos women scientists we interviewed put it, "You always feel a little different.... It's a male fraternity." Another resigned herself to this situation: "I just got used to the fact that it's a male dominated field." And another offered this comment: "Science isn't sexy and science is definitely not feminine."

What happens when outsiders enter a largely hegemonic profession? More specifically, how do women scientists react to the predominately male environment at Los Alamos, especially this peculiar environment that has a long association with the atomic bomb and weapons research? The women we interviewed offered varied explanations of what it means to be an outsider in the lab. "Yes, I'm not fitting very well," one respondent told us. "I'm not one of the guys," another explained, "And it is interesting. I've observed that maybe there are half a dozen

women in my corridor, and most of them don't really seem like one of the guys either." Another respondent offered this contrast: "I may feel more of an identity with the secretarial staff than the men do." "I don't think I'm treated differently," another explained, "but on the other hand, I'm not one of the guys. I don't talk basketball. I don't talk about sports. I'm not really comfortable socializing with the men that I work with." In answer to a specific question about how she fits in, one respondent put it this way: "Mostly, I talk to the women. So mostly, I have the women's point of view. I don't know how the men perceive this." Others felt that more women in the sciences would simply improve their daily lives as practicing scientists. As one explained, "it would be a lot easier for me if 30% of the population here were female. So that when I have problems I could go in and talk to them, and they would understand, and maybe they could give me advice." Another explained how employee problems could be solved much more easily: "I think critical mass is right about 33%. And once you get over that point, and there's a [female] employee problem ... then you're darn well going to do something about it."

Several women felt that the roles traditionally ascribed to women often hampered their reputation as a scientist. "You can be a woman and be a scientist, but when you try to do it 'all' they give you a hard time, because they don't think your priorities are with your career," one respondent told us.

Another described her specific experience of being treated like a wife: "I worked with one man who said I reminded him of his ex-wife, and he would scream at me. I'm not a risk taker, and I logically think through things. He told me to quit thinking like an engineer." One respondent reflected philosophically on the different attributes ascribed to males and females: "Little boys get scripted from a very early age to react ... and little girls are scripted to act in a more nurturing sense rather than in an analytical sense.... There isn't anything socially that would script children into an androgynous role." A story told by a woman working at a nuclear test site offers an example of how these social scripts affect perceptions of women scientists. "I remember the first time I went out to the test site to do an experiment.... I go out there and I'm coordinating the stuff, and the supervisor comes up and says 'Who the hell are you?' And I go, 'Me?' and he goes, 'Yeah, you're telling people what to do!' And I said, 'Oh, that's because that's my job.' And he said, 'But what are you? Are you a scientist?' And I said, 'Yeah, I'm a [scientist].' And he said, 'You mean like Ph.D.?' And I said, "Yeah, like a Ph.D.' And he said 'Oh,' and then he walked away."

What exactly are the different characteristics of women in the sciences? Again, the women we interviewed offered a variety of explanations of how this difference manifests itself. One told us that science for her was a "job," not a "passion."

Another respondent struck a similar tone. Comparing herself to a male colleage, she said: "I work to live and he lives to work. That's the difference." And yet another explained the situation in terms of "communication difference": "Emotionally [women] are just different. Two males can talk to each other and that will be fine. But if they said the same thing to me, I might take it differently.... They might think I'm being emotional, and they just can't understand it." While one respondent described her own sense of difference in terms of her lack of assertiveness, another claimed that what characterized women was that they "do twice as much as necessary to justify themselves. It's terrible. Why do we do this to ourselves? A lot of women expect so much of themselves." Another respondent spoke similarly, noting that women also tend not to take credit for all that they do. She described this phenomenon as the "White Knight Syndrome": "The typical woman will go in and see how something's going down the road, and see that it's not working, and fix it. So it works. Everything's fine. What the white knight does is wait until everything goes to hell in a handbasket. Then he comes in and fixes it. And everybody says 'What a wonderful job you did.'" She added: "I think we [women] do not do a good job of publicizing ourselves to make ourselves visible, or do a good job of standing up and saying so."

Among the questions we asked some of the women interviewed were questions about their place in the nuclear heritage and

environment of Los Alamos. Since weapons and weapons work have traditionally been the domain of men, we wondered how these women viewed themselves as part of this culture. Virtually all of these respondents spoke of their part in such research in terms of larger goals of peace and stability. Many expressed conflicted feelings about the nuclear image of Los Alamos and the lab's emphasis on weapons-related research. "My first science fair project was on how to build a bomb shelter," one woman told us. "That stuff scared me to death. But I talk to the people around here and I really do believe that 99.9% of the people who've worked on weapons did so with the full belief that they would never be used." Another talked specifically about women's attitudes and roles in such research: "We've put a lot of emphasis on safety in explosives. And that's sort of a woman's thing. So I don't have any problems with it now." One respondent, who felt that weapons work at Los Alamos was a "diminishing part of our interest," pointed out that there is a definite distinction, including a gender distinction, marking those researchers who work in "behind-the-fence and outside-the-fence operations." She explained: "If you go and look at the groups you would call behind-the-fence groups ... I think you'll find a lot of that mentality that you might be thinking of when you talk about the weapons complex mentality. And that represents a whole different group of people than, for example, those in more research oriented divisions ... where most of the women are who are doing science at the lab. There are

probably much fewer [women] in those hard core, weapons oriented groups and divisions than there are outside of defense."

While some women wished that Los Alamos did not devote so much of its research agenda to weapons-related work, others said that they were not bothered by this emphasis, and still others had notably ambivalent feelings on this subject. One of the women we interviewed told us that she would be more inclined to leave if Los Alamos devoted increasing research to the "more nuclear oriented" science: "For me it would make a difference. I think that if they take all of the Livermore nuclear and Rocky Flats nuclear stuff and bring it here, it changes my attitude." Another expressed her feelings this way: "I guess I'm sorry that we have to make these kinds of weapons.... But I think that you do need to produce these weapons.... So I guess no, I don't have any problems." She quickly added: "I'm not really related with that at all in my work." One respondent complained that much weapons research disguised the "actual design work going on in physics." It is unfortunate, she explained, that the funding of weapons research is often "the way to fund science": "In the best of all possible worlds, these places wouldn't exist. As weapons laboratories." Others expressed similar feelings, claiming that there are "misconceptions" about Los Alamos and its nuclear research. As one respondent put it, "Just the word 'nuclear.' I mean you can't even say nuclear magnet ... because nuclear is so incredibly strange."

Comments offered by two of the women we interviewed seem to sum up many of the often conflicted feelings about weapons research that were expressed by these Los Alamos women scientists. The first put the situation this way: "You can't say that you aren't contributing to it. If you're here at the lab, you're contributing to it." She went on to elaborate her own experience and perceptions: "Like [my female colleague] and I are doing material science and we can often use money for weapons design or development. Of course, we would never want to put a bomb together. Or design a bomb.... Being a liberal person, and believing a lot of things that scientists usually don't believe--and I think that's because I'm a woman, too. Probably, that makes me different.... I wish they'd put all the weapons research in Siberia. Although who knows, Siberia's probably beautiful, too." The second respondent, explaining her own research at the lab, admitted that "sometimes I don't tell people I work here because people say stuff to you. You don't want them to know that you do nasty things." Of the laboratory research agenda, she says "75% is still weapons stuff. A lot of people in the group would rather work on others things. It's kind of weird.... You pull out this document and are looking at this thing, and my god, it's a bomb...." When we told her that most of the women we talked to about weapons work at the lab justified their work in terms of the larger issues of peace, she laughed and replied: "We're brainwashed well."

With rare exception, the women scientists we interviewed at Los Alamos were from Anglo or European backgrounds. The scientific culture there is predominately a white culture. How do women scientists at the lab respond to this homogeneous cultural environment? The few who commented on this situation expressed their awareness of how the white, male scientific culture sets the standards around the lab. "All our scientists are white Anglo-Saxon males. Clearly, they dominate." She continued to reflect on this predicament: "You have to ask yourself ... are you acting like an Anglo or are you acting like a professional scientist? And what's the distinction?... There's sort of this standard set up as to what a professional behaves like." Some respondents saw the roots of this white, male hegemony in our educational system. One described her own background: "Most of my classmates in the advanced program--90% of us went into science or business type advancement--we were 100% white, middle class, no poverty level at all." Another spoke of a recent educational program: "We put out a career fair for elementary school this spring. We did all women, it was great. But there was not a single minority woman in the mailing."

Given the cultural hegemony that exists at Los Alamos, one might wonder about the possibilities for furthering cultural diversity in this particular population. One woman we interviewed questioned whether this could happen: "I'm guessing

that if you're very good and female or a minority, and you are very good in your field, you can go anywhere you want. So why come here? I don't know." And another expressed her awareness of the troubling cultural and economic discrepancies between Los Alamos scientists and the surrounding community: "Espanola has a culture that is completely different. And so when you come up with your Los Alamos plates and hike in the Pecos wilderness and park in an area where native New Mexicans have been living for years, you think about Los Alamos, white, in a poor state like this--why should these people get paid ten times what they get paid?" Within the scientific community, there is certainly need to be concerned about the negotiations required of minority scientists who must confront daily a culture that is often so different from their own. One minority woman scientist we interviewed explained her own perceptions of this situation in this way: "See, whenever you come into a group of people where you're the minority and they're the majority, the initial way you get your foot in the door is to be like them. After you've been through the door and you're like them enough to be accepted by them, then you can start doing things your own way. But you still have to establish your credibility by being like them, because they are the ruling party." She then described this scenario, with respect to women's situation in the sciences: "So maybe, if there were more women, we wouldn't have to be like men...."

What indeed would happen to science if there were more women in the scientific professions? How might science be less of a male culture? Virtually all of the women we interviewed felt that the general scientific environment would be improved if there were larger numbers of women in science. While most thought that "science itself" would not change, they seemed to agree that methods and approaches would be notably different. "I think the environment would be better," one respondent elaborated: "Women have a different outlook in the way they approach problems." Several respondents focused on specific ways in which this "different outlook" might positively effect changes. "In a way, I think it would be less of ... everyone trying to climb the ladder." "Yes," another agreed, it would be "less competitive," more a "cooperative thing." Another offered this perspective: "I think there are different ways of looking at things. Men are real workaholics. A lot of the work I do is project oriented. There is a lot of cooperation.... Some of this is gender specific." Women's skills at both cooperation and communication were often cited as positive attributes they could bring to science. "There might be an awful lot more cooperation and attempts at communication because women are just better at that. They make more efforts at that." Another focused more directly on women's communications skills: "Well, we have enough women in our group for it to be different," she explained, "and that's why things are a little different.... It has to do with communicating better." Another talked about her own tendency to

be "expressive" in contrast to her "totalitarian, authorative boss." Asked if science would change if more women entered the scientific professions, she replied: "I don't think that true science itself would change, the methodology or anything. Maybe the management. The organization. Priorities might change."

Distinctions, however, between changes in "science itself" and the management, organization, and "process" of science often blurred. When we asked one woman, for instance, if she believed the "practice" of science would be different with more women in the scientific professions, she replied by working her way through various distinctions: "It would. I think it would make it different in the sense that, for one thing, there would be more, well, let me think about that. I may rethink that. I guess I see some differences." She paused, and continued. "Science would be science still. And the people who practice science would still be scientists. Yet, the approaches might be different, because the people themselves would have a different background.... Because the differences would give you strengths, would give you strengths that you didn't have before because everybody had the same mindset. So if you had some differences, you could probably draw on those and get the third and the fourth and the fifth ideas that we don't have now.... We'd have, well, we'd probably have a different workforce. And a different set of hours. The places would look different."

The question remains whether science "would be science still." Several respondents, focusing on changes in the actual thought process that drives science, would seem to reflect in their remarks the possibility that "science itself" would be transformed. "Men are very oriented toward getting the project done," one respondent told us, and continued: "Men always think there's one answer. I see that a lot. If they've done it before and it's worked, they almost always assume that's the way you should do it, even if the problem is different. Women tend to look at it more, um, more at the process than the answer." Another explained the situation in this way: "I think a lot of men hit problems head on. And I think a lot of women have a much better way of jumping over, skirting around, or whatever, because we have not been given power in our society.... Women have skills in coping with the society and a family, and that sort of thing gives you skills that aren't recognized by the male majority these days as valuable." Another contrasted the practice of science in the United States with the way it is practiced in other countries where there are more women in the sciences: "You can look at French science, for instance, where there are more women, and see a different, more creative and open way of dealing with it."

Some respondents offered specific examples of how science might change and redirect its energies with increased numbers of women. One woman, for instance, suggested that research in

"pattern recognition" could productively be focused on "recognizing a malignant tumor in a breast.... They recognize Soviet tanks and American tanks so well they can tell the difference from many moons in the air." Yet when the subject of redirecting such research is brought up, she explained, "it's a teasing thing." Women's traditional roles as mothers and nurturers might also change the direction of scientific research agendas. One respondent elaborated on this possibility, linking the concerns of "nurturing adults" to what actually gets studied in science. Her remarks offer an insightful commentary on how women, often perceived as less capable scientists because of their roles as mothers, can effect through this nurturing role some of the most far-reaching transformations in science. "When you have a child ... I think your focus changes because all of a sudden you're looking at this as my extension to mortality ... my child and the next generation and the generation after that. In the long run this proves to be the most productive change in group think processes.... It would be the most productive change in attitude that I think our culture could produce--in a business sense and in a science sense. Particularly in the science sense. And I can name those ... screw-ups that happen because you think of today's bottom line instead of output you can have for years down the road ... the cuts in the solar program, the cuts in the geothermal program, the cuts in the fusion program. All the things that are beneficial, environmental programs, lots of

things that will help the environment and the world and people's daily living."

Questionnaire Findings and Analysis

Method

Sample

The population for the study was drawn from women scientists at Los Alamos National Laboratory and faculty at University of New Mexico. Faculty at UNM were contacted by letter requesting their participation in the study, both by interview and questionnaire.

All women scientists at UNM with terminal degrees in their discipline (113) were sent a questionnaire and 74 responded--65%. Questionnaires (87) were sent to women scientists at LANL who had initially responded with interest to the study; 52 responded--60%.

We operationally defined scientists as persons working in the following disciplines: anthropology, biology, chemistry, computer science, geology, math, medicine, nursing, physics/astronomy, psychology, and other. A significant percent, 20.5% of our respondents, indicated "other" as their field; this reflects engineering, nutrition, metallurgy/materials science, anthrobiology, hydrology, meteorology, chemical physics, astrophysics, and environmental science--as indicated by the respondents' write-ins.

Measures

Fourteen UNM and forty-two LANL women scientists were interviewed once for an average of 45 minutes. The UNM scientists comprised the first phase of the interview process; we developed the questionnaire from preliminary analysis of those interviews. Five categories with a total of 39 questions comprised the questionnaire; background, education, professional employment, personal and professional negotiations, and suggestions/proposals. In addition we allowed for write-in comments.

Background questions focused on field, ethnicity, socioeconomic status, relationship status and academic degree achieved.

Education questions were designed for responses of always, often, rarely or never. The questions focused on mentoring, incidence of female professors, sexual discrimination/harassment, and experience with support groups for women.

Professional employment questions used the same scale from always to never and focused on issues of mentoring, professional opportunities, sexual harassment/discrimination, professional women's groups and experiences with differential treatment.

Personal and professional negotiations questions focused on children, family, and marital issues. These questions were designed for choices of yes, no, and not applicable.

Suggestions/Proposals were topical phrases that were

fig.1); middle to upper middle class (79% and 84%, fig. 2)[1]; married/partnered (67% and 78%, fig. 3); and hold terminal degrees (PhDs and MDs) in their fields (96% and 58%, fig. 4). It is important to note that the UNM sampling was restricted to PhD or MD respondents. We initially called for terminal degree respondents from LANL but were met with a strong response from women scientists who held masters and bachelors degrees. They were interested in participating in the study and objected to their exclusion by degree. We came to understand the significance of this particular cohort during the interviews at the lab. Several women told us that they were products of "Sputnik tracking," that is, their aptitude in math and science literally propelled them into graduate study. They were not, however, encouraged to pursue doctorates; rather, they were readily hired into positions with private or national labs requiring only BS or MS degrees. All of the LANL women that we interviewed who were in their thirties held PhDs; most of the women in their late forties and older did not.

Personal Status

Although both groups reported a majority with husbands/partners also in science, an important difference between the groups is not reflected in the questionnaire data.

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[1]. Several of the respondents indicated that the question was problematic because it did not specify what type of class background we were interested in--socioeconomic or cultural.

Career Choice and Mentoring

Both groups were nearly split in their responses to the query: Were they encouraged to enter science early on in their education?; 52% of UNM and 53% of LANL were rarely or never encouraged, whereas 48% UNM and 47% LANL were often or always encouraged (fig.5). The interviews indicated that the majority of this early encouragement, for those who received it, came from family and not educational sources.

The clear majority of responses indicated that it was a rare or nonexistent event for any of these women to have female teachers or professors in their science courses; 84% of UNM and 93% of LANL responded rarely or never (fig. 6). The interviews indicated that if and when female teachers were present, they had a greater impact at the secondary level than in higher education.

Mentoring emerged as a significant topic during the UNM interviews; therefore, several of the questions were designed to explore this area further. On the question of the importance of primary/secondary mentoring programs, the response was nearly unanimous--98% of all respondents indicated that such programs were important or essential (fig. 7). This response nearly held for the question regarding undergraduate mentoring programs. Both groups of UNM and LANL scientists overwhelmingly responded (97%) that such programs are essential or important (fig. 8). One woman wrote in on the questionnaire: "Mentoring is important....because of socialization of girls." Interestingly, 4% of the UNM

particularly at LANL; women believe that access to the "old boy network" is absolutely necessary for management positions and that women may well be discouraged from seeking such positions due to the difficulty of gaining this access. One woman wrote: "Women are promoted into management but then isolated from the good old boy network." Another said: "Exclusion from male 'casual' info system is a big handicap for women."

Professional Self Image

This section reflects the ambiguity of questionnaire data; we developed these questions in direct response to the interviews with UNM women, many of whom indicated that they had experienced isolation, "outsider" status, and fluctuating professional self-esteem as women scientists. The responses to the questions, however, indicate an ambivalence towards this topic. When asked if they felt like outsiders as students, 68% responded rarely or never on the questionnaire (fig. 12). This was not generally confirmed by the interviews. Many of the LANL interviewees echoed UNM experiences of isolation and outsider status.

When presented with essentially the same question regarding professional experiences, the number of women responding rarely or never drops to 56%. Inversely, the number of women reporting often or always now increases to 44% (fig. 13).

In further exploration of this topic, the responses were not consistent. In response to the question, "Have you ever felt less

Sexual Harassment and Discrimination

We presented two questions specifically regarding sexual harassment; one for education and the other for professional employment. Generally, 77% of both groups said that they rarely or never experienced explicit sexual harassment/discrimination in school (fig. 18); 85% said they rarely or never experienced harassment on the job (fig. 19). The interviews, however, brought another dimension to this question. Many of the women, although not personally reporting harassment experience, acknowledged that it does exist "not to me, but I saw it happen to others" or "no, no, never, but there was this one time...." One LANL woman wrote in on the questionnaire: "Discrimination is less blatant than in the 60s or 70s but still very real." Another noted: "Field determines experience of sexual harassment/discrimination in large part." Another wrote in: "Three instances of supervisors/management with anti-female bias in last four years. Only thing to do is to change jobs." These write-in comments indicate once again the ambiguity expressed by these women scientists about their professional situations. The incidence of adamant responses of rarely or never experiencing sexual harassment are not confirmed by the number of anecdotes relating some measure of bias, discrimination or harassment.

limited opportunities for student contact.

Although the majority of responses to these professional development questions indicate few, if any, problems for these women scientists, we must note that 16% of UNM respondents and 17% of LANL often or always have difficulty securing funding. Fewer respondents experience difficulty with conferences and publishing--11% of UNM and 5% of LANL. Difficulty with job advancement and tenure is a greater problem; UNM-22% and LANL-32% reported that they often or always experience difficulty. We must note that the university operates with a well-established promotion and tenure policy whereas, at LANL, several respondents told us that most career moves are lateral unless there is a move into management.

Personal Negotiations Regarding Career

The UNM interviews indicated that oftentimes women are required to make important choices for both their personal and professional lives. When asked if they ever changed or left a job for personal reasons, 43% of UNM and 51% of LANL said yes (fig. 27). When asked if they ever changed their personal status (divorced, married or relinquished child custody, for example) for professional reasons, 78% of both UNM and LANL said no (fig. 28). The most commonly reported event that required personal negotiations was interrupting career for children, either for childbirth or to stay home during the early years; 36% of UNM and

women, and importance of maternal/paternal leave with pay. (There were other policy questions that have already been discussed.)

Responses to the question of spousal/partner hiring policies were nearly identical in both groups; 78% of all respondents said it was important or essential and 22% responded that is was not important (fig. 32). One LANL respondent wrote: "The biggest stumbling block in recruiting women at LANL." As the majority of the respondents said that their husband was also in science (66% of UNM and 76% of LANL, fig. 33), it is understandable that the same majority would support hiring policies for spouses. Although LANL respondents are not subject to tenure review, the majority of them (fig. 34) believe extended probationary tenure for childbearing women to be essential (29%) or important (56%). The UNM respondents, who are presumably subject to tenure review, believe that extended probation is essential (49%) or important (41%). It is interesting to note that both groups, in responding as they did, must assume that women are the primary caretakers of newborn children. One LANL respondent did acknowledge the possibility of fathers sharing that responsibility: "Part time opportunities would be a good policy for parents of newborns/young children." Both groups responded that maternal/paternal leave with pay policies are essential (UNM--47% and LANL 37%) or important (UNM--47% and LANL 57%, fig. 35). One LANL respondent wrote: "Parental leave with pay is not the money as much as a time consideration vis a vis career." This question can be associated with the question on adequate access to

In conducting the statistical analyses, we used SAS for both t-test and chi-square.

T-tests

The following questions used a four level scale for reporting: from always at 1 to never at 4.

On testing for equal means between the two groups on the question of difficulty in job advancement/tenure promotion, a p value of .0379 significantly indicates that the means are different for these two populations: UNM mean is 3.234 (reporting a higher incidence of difficulty) and LANL is 2.878, with standard deviations of .8115 and .8999, respectively. We believe this could be a function of the different structures for advancement and promotion at these two institutions; UNM has defined policies and procedures for promotion and tenure whereas LANL operates on a more lateral system of advancement.

The question on active involvement with mentoring females yielded highly significant t-test findings. There is less than .0005 probability that these means are not equal by chance: UNM mean is 2.0 (reporting a higher incidence of active mentoring) and LANL is 2.85, with standard deviations of .9129 and .8022, respectively. We can assume that these findings reflect a greater opportunity for UNM scientists to mentor students.

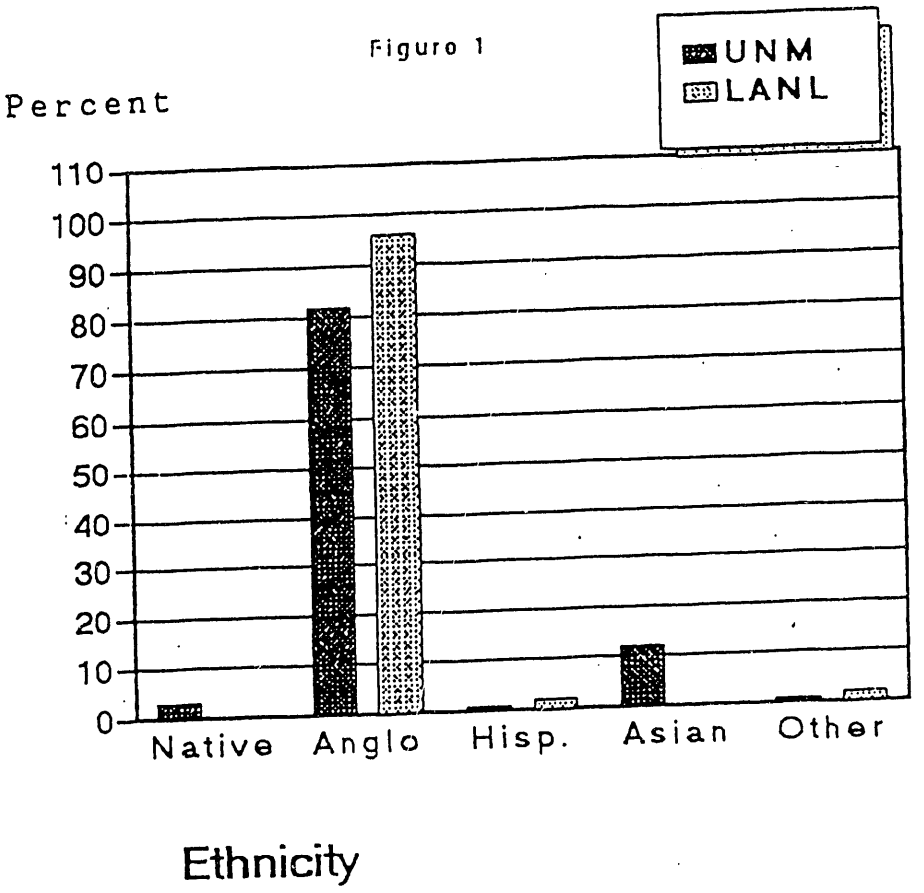
felt that extended probationary tenure is essential. At LANL, less women than expected felt that it is essential. This is a logical difference in populations considering that tenure is of extreme importance to the women at UNM and not so to the women at LANL. As with the t-test, the results of the chi-square test were not quite significant but could be with a larger sample size.

Chi-Square Tests

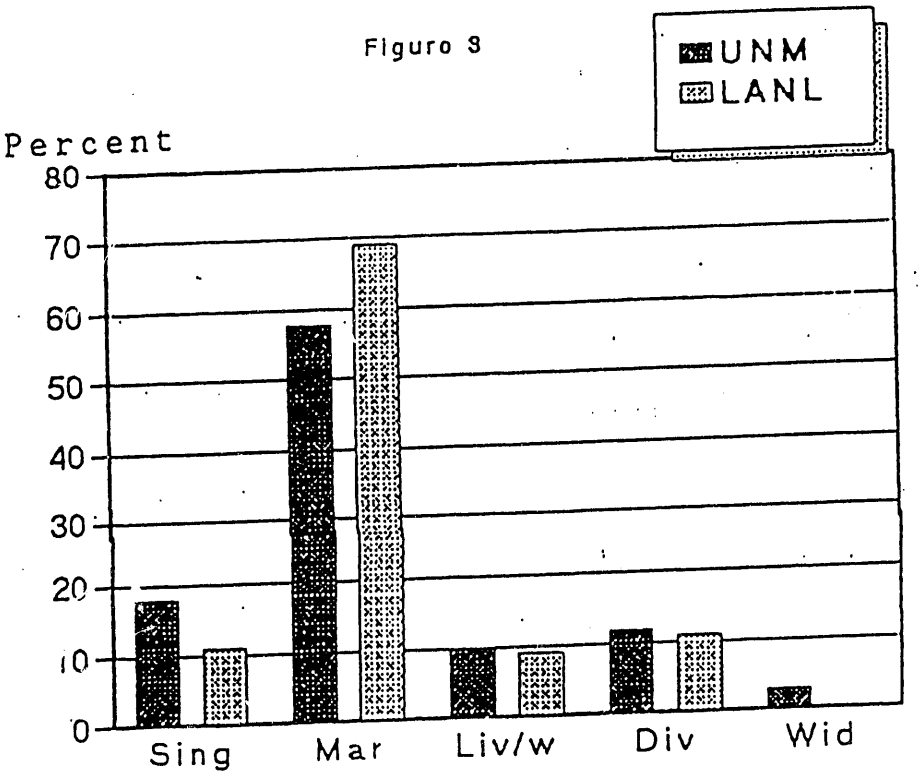
Chi-square tests of homogeneity were used on certain questions to determine whether the distributions of responses were independent of population (UNM or LANL). In addition to the questions reported on in the previous section, the following questions resulted in significant findings:

At LANL, fewer scientists than expected felt that affirmative action policies did not play a role in their being hired (21 actual reponses versus 25 expected) whereas more than expected replied that they did not know (14 actual versus 9 expected). The reverse was true at UNM where more than expected felt affirmative action did not play a role in their hire (45 actual, 41 expected) and less than expected did not know (9 actual, 14 expected). These answers resulted in a less than .05 probability that the responses were independent of population. Interestingly, the number of scientists in both groups who replied that affirmative action did play a role in their hire was

Figure 1

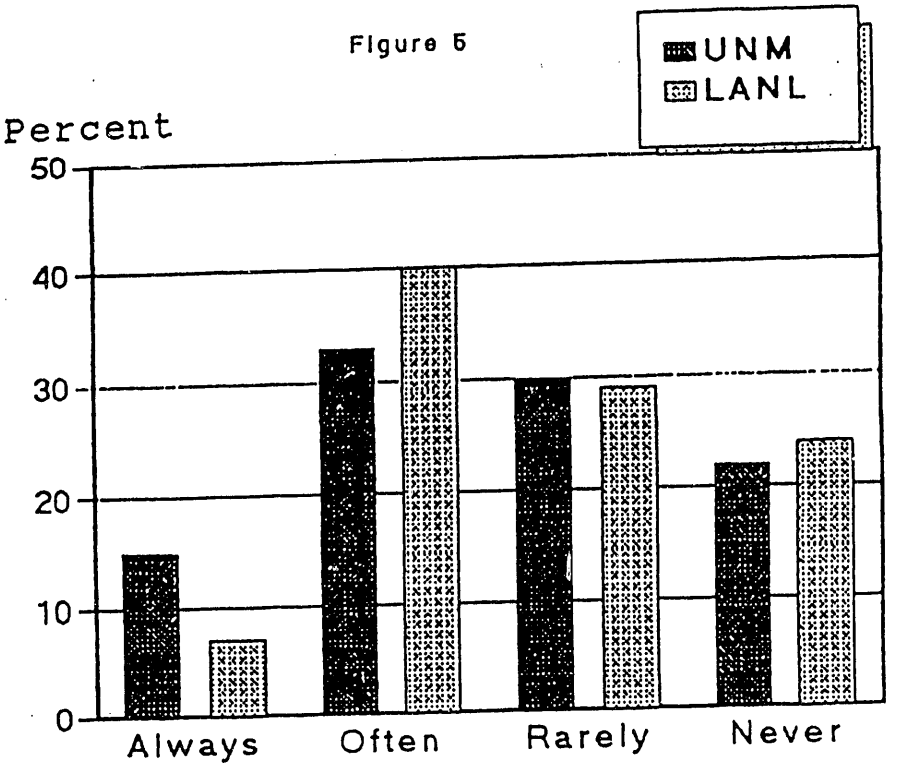

UNM
LANL
Percent
110
100
90
80
70
60
50
40
30
20
10
0
Native
Anglo
Hisp.
Asian
Other
Ethnicity

Figuro 3



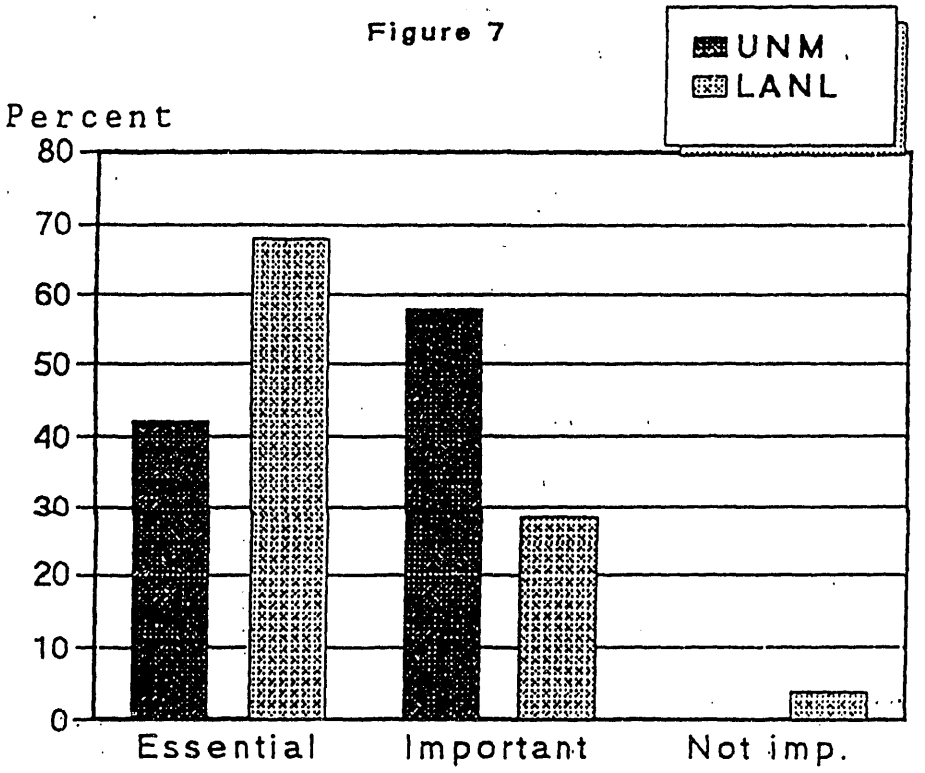
Personal status

Figure 5



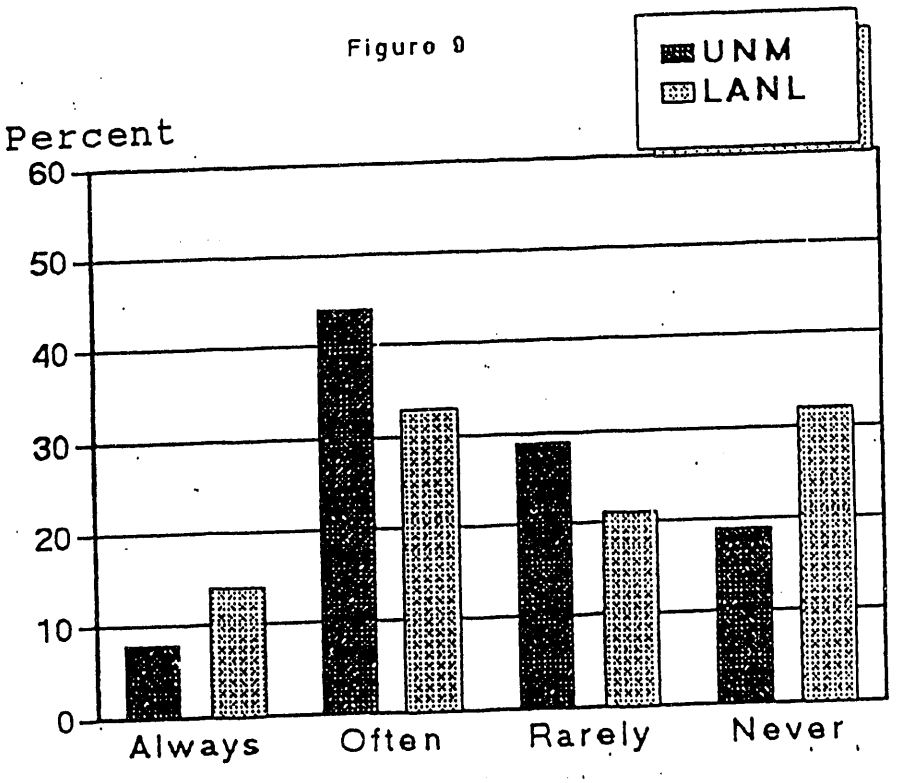
Encouraged to enter science

Figure 7



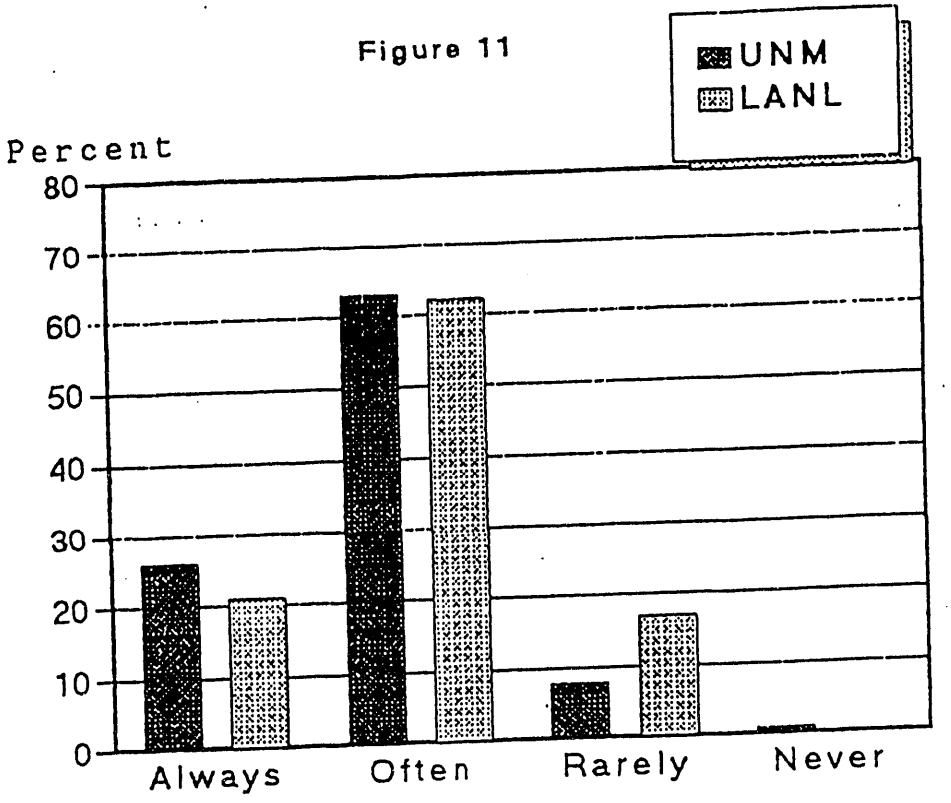
Importance of primary/secondary mentoring

Figuro 0



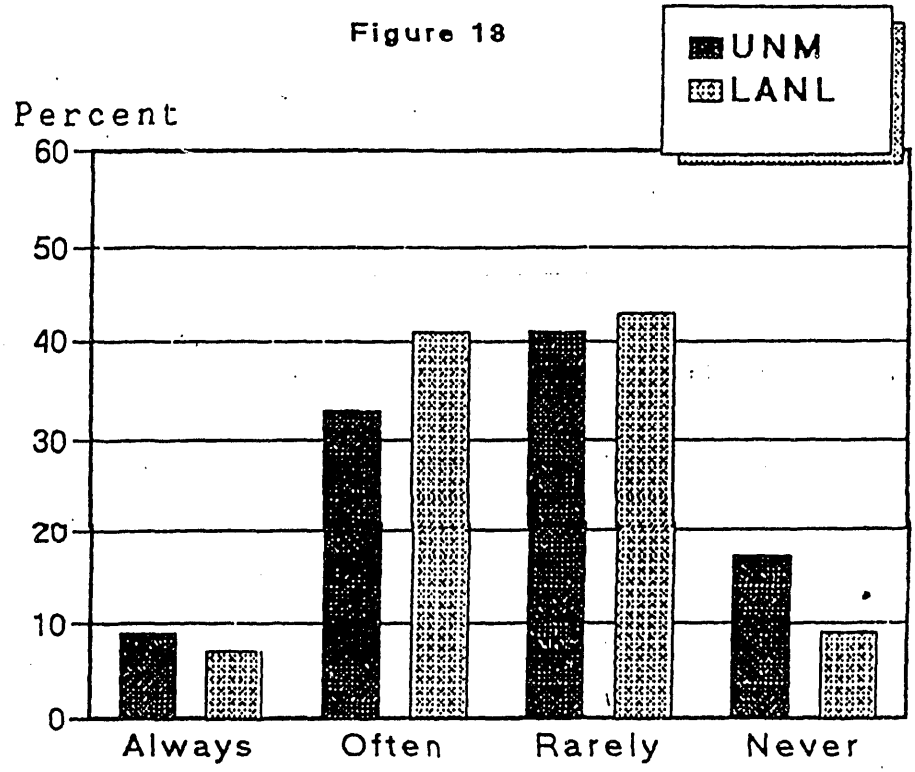
Received mentoring in undergrad/grad work

Figure 11



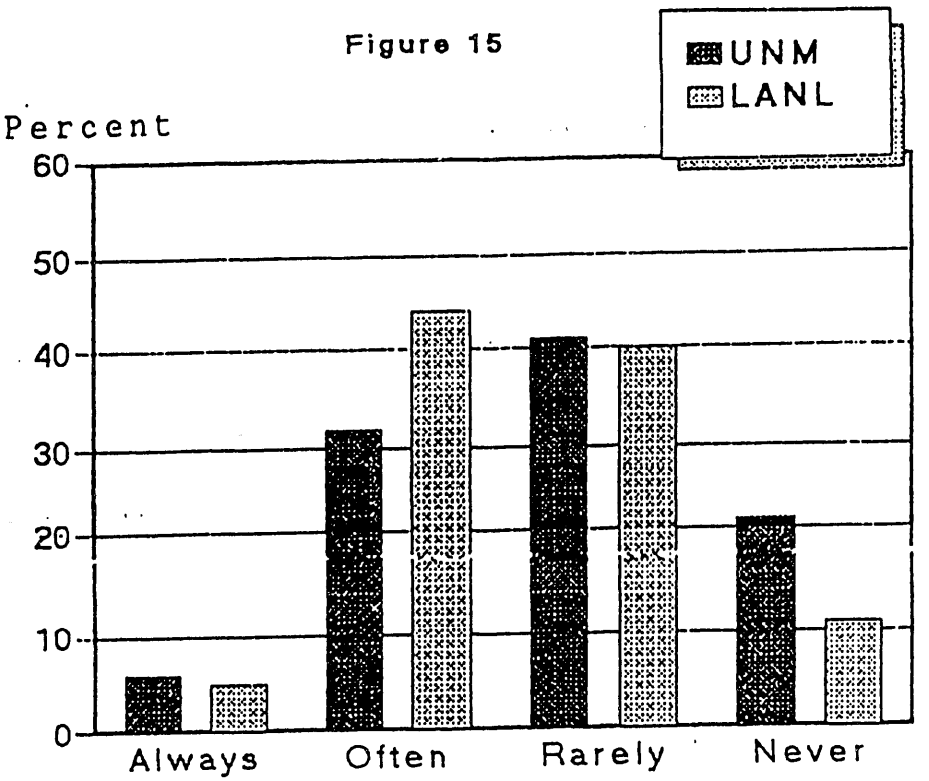
Male scientists likely to receive better mentoring

Figure 18



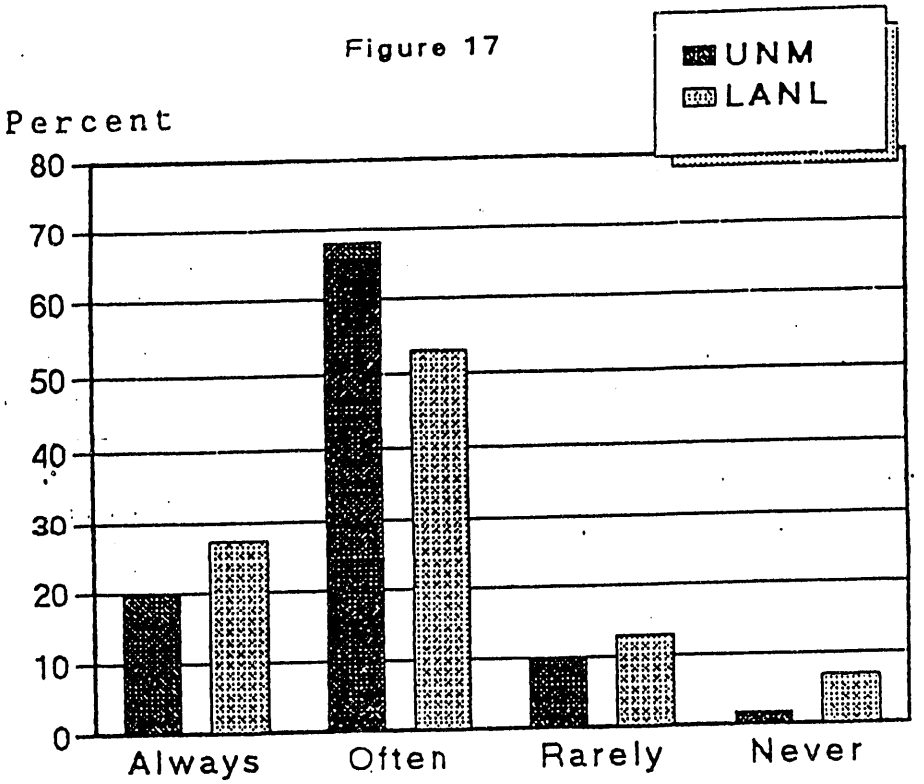
Ever feel like outsider in white male profession

Figure 15



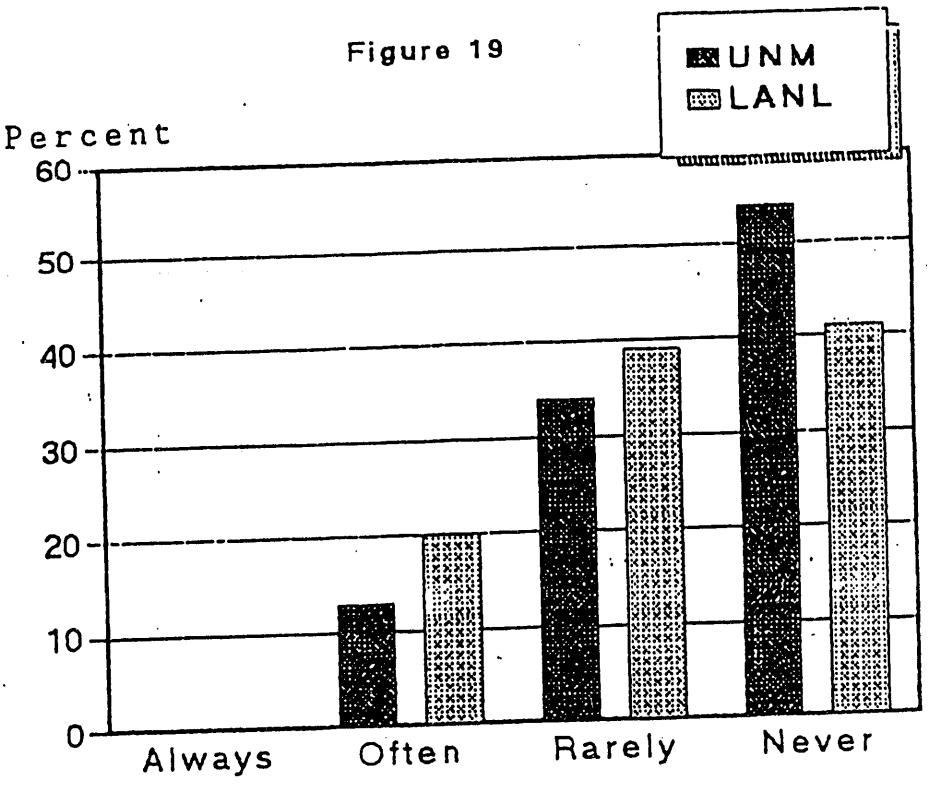
Felt isolated personally/professionally

Figure 17



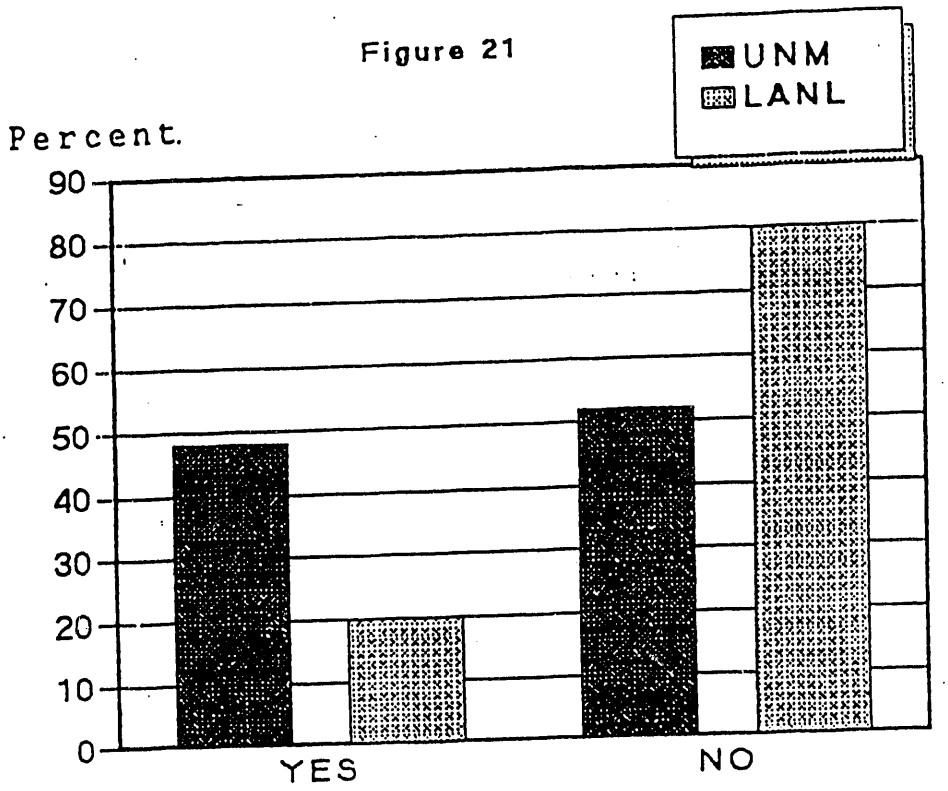
Supportive relations with male colleagues

Figure 19



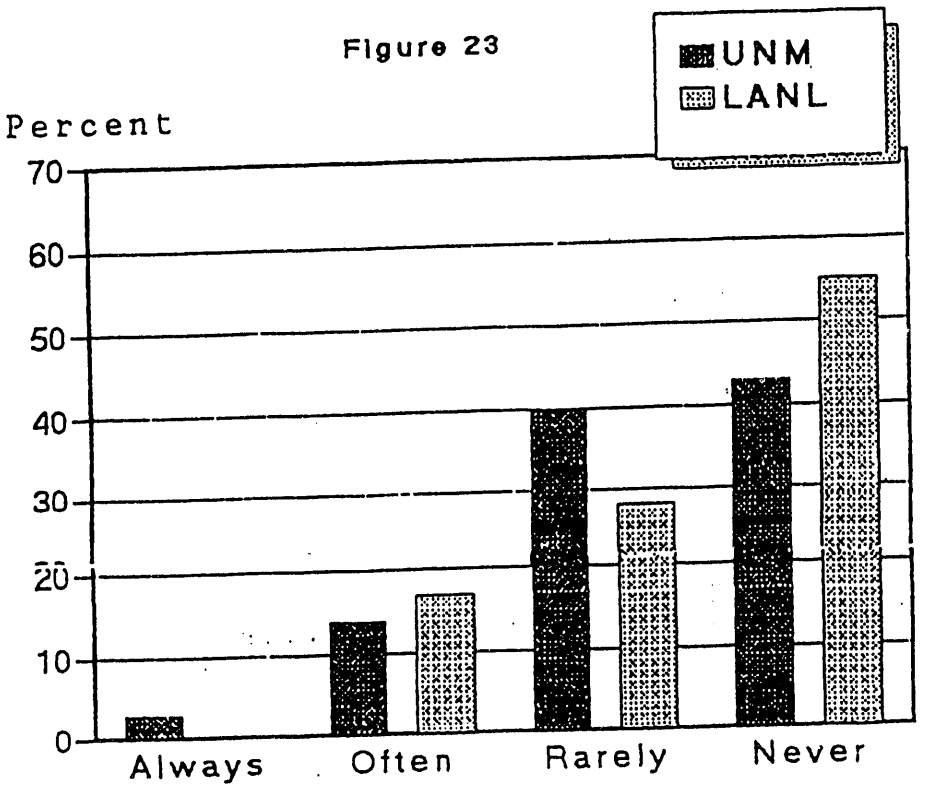
Experienced sexual harassment in job

Figure 21



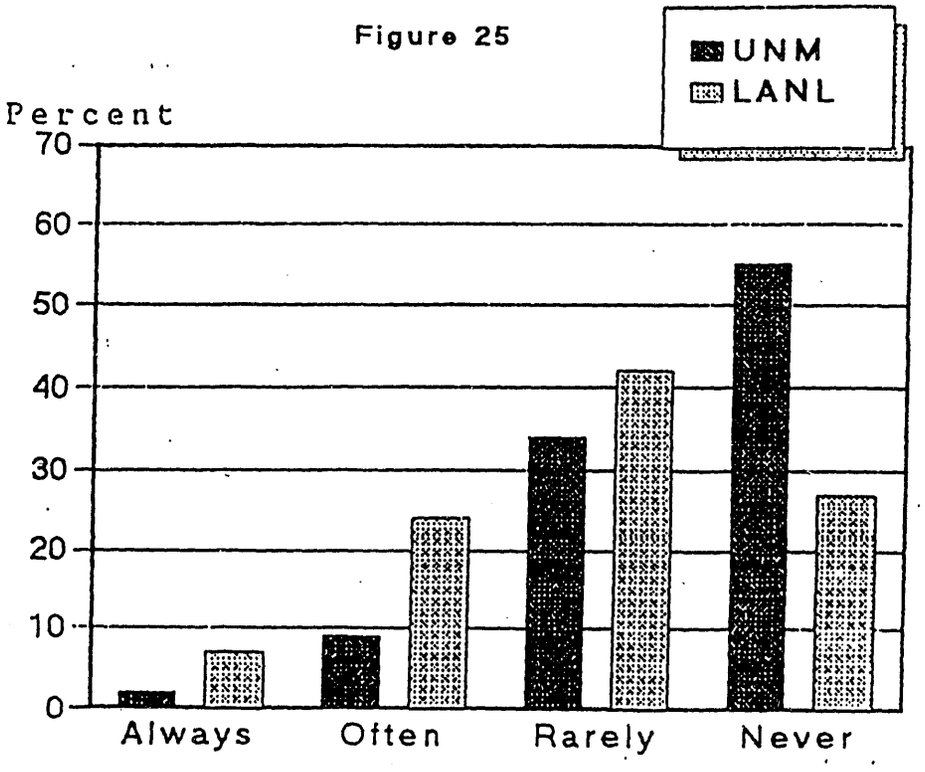
Affiliated with professional women's groups

Figure 23



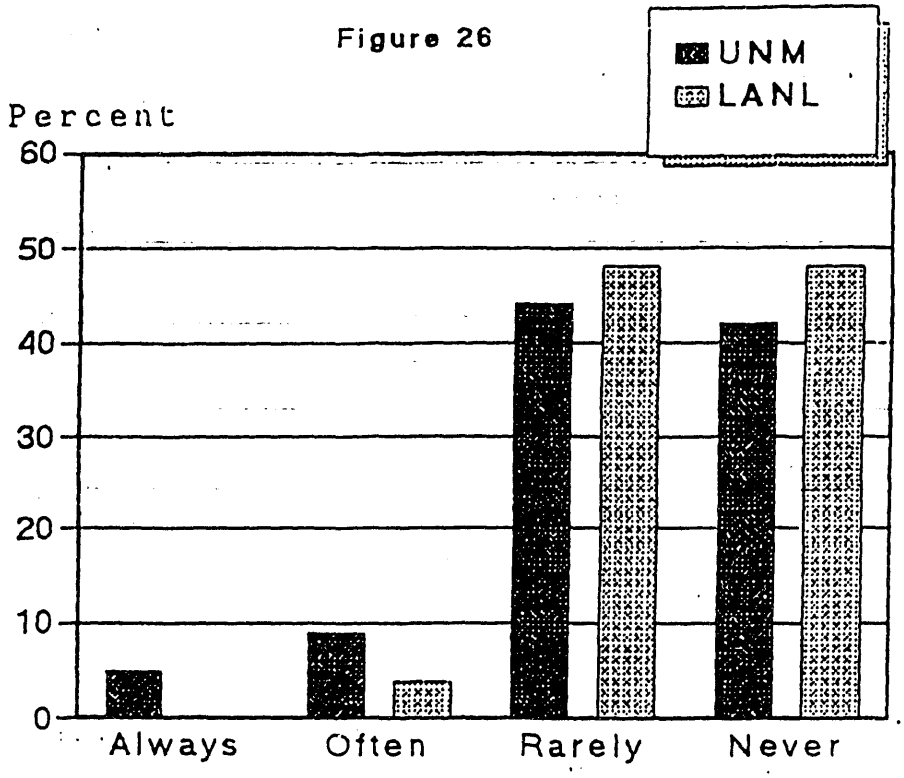
Difficulty securing funding/research support

Figure 25



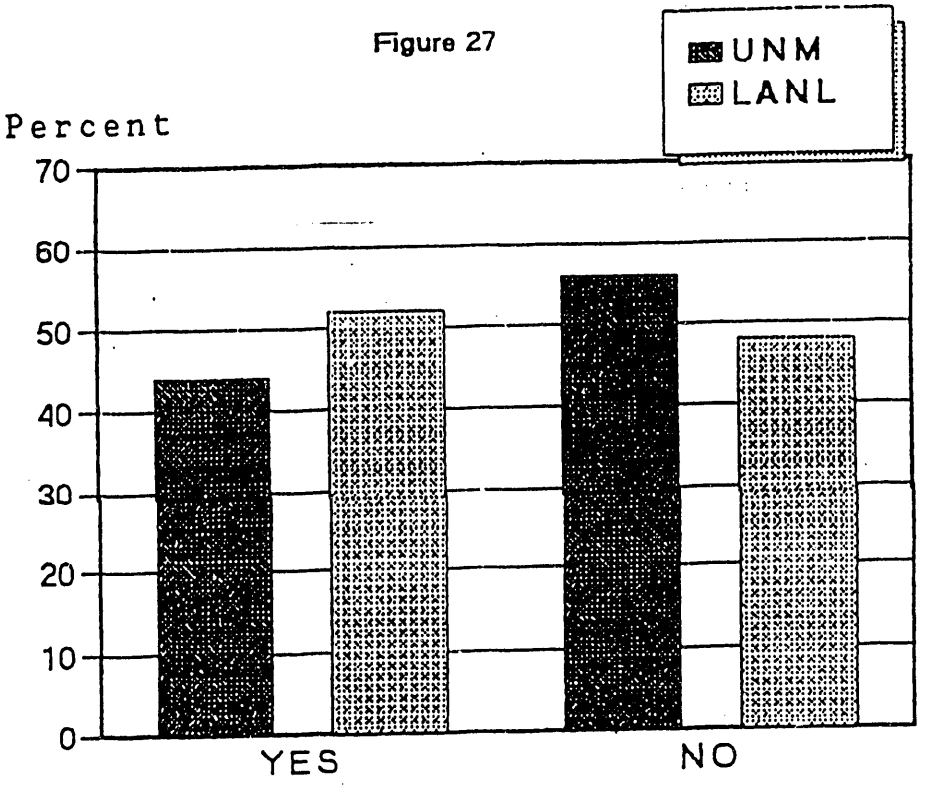
Difficulty with job advancement/tenure

Figure 26



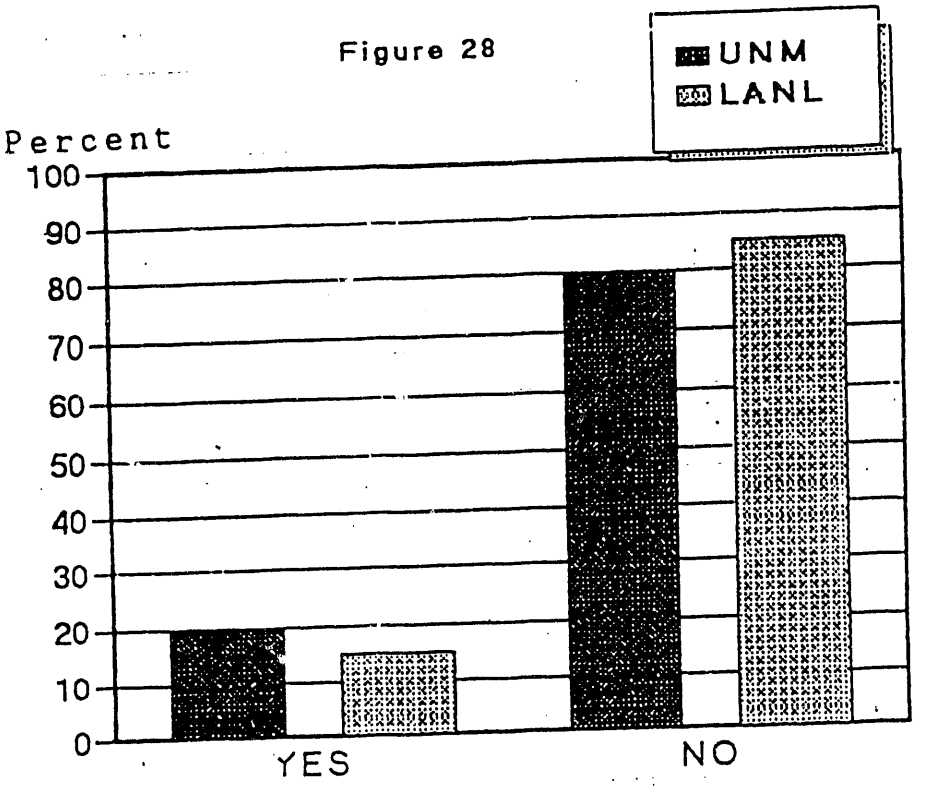
Students have diminished respect for you

Figure 27



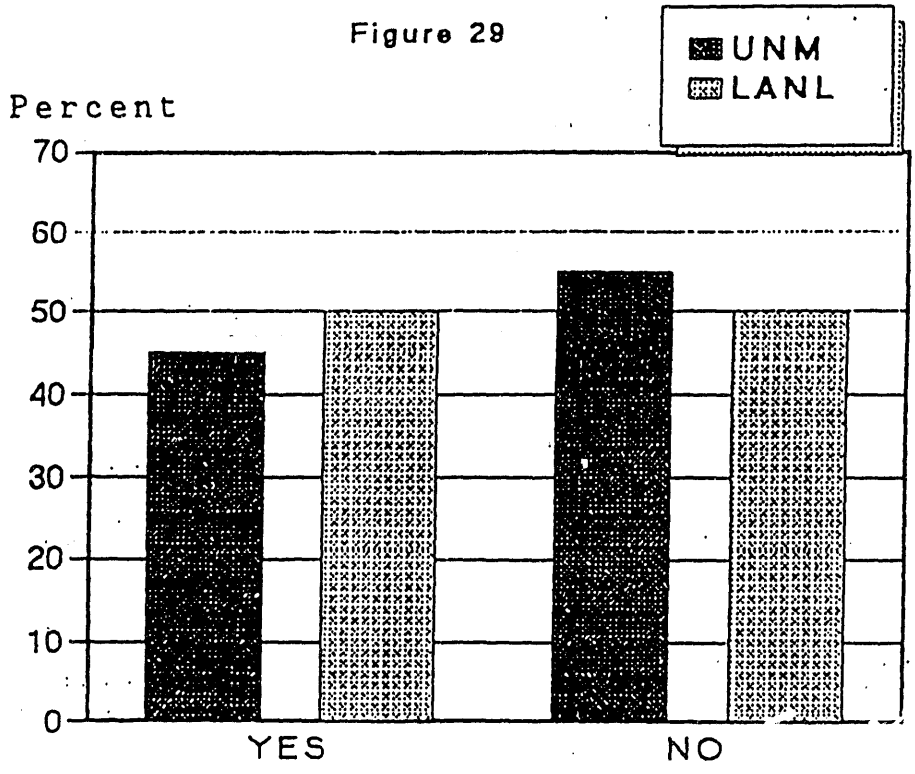
Changed or left job for personal reason

Figure 28



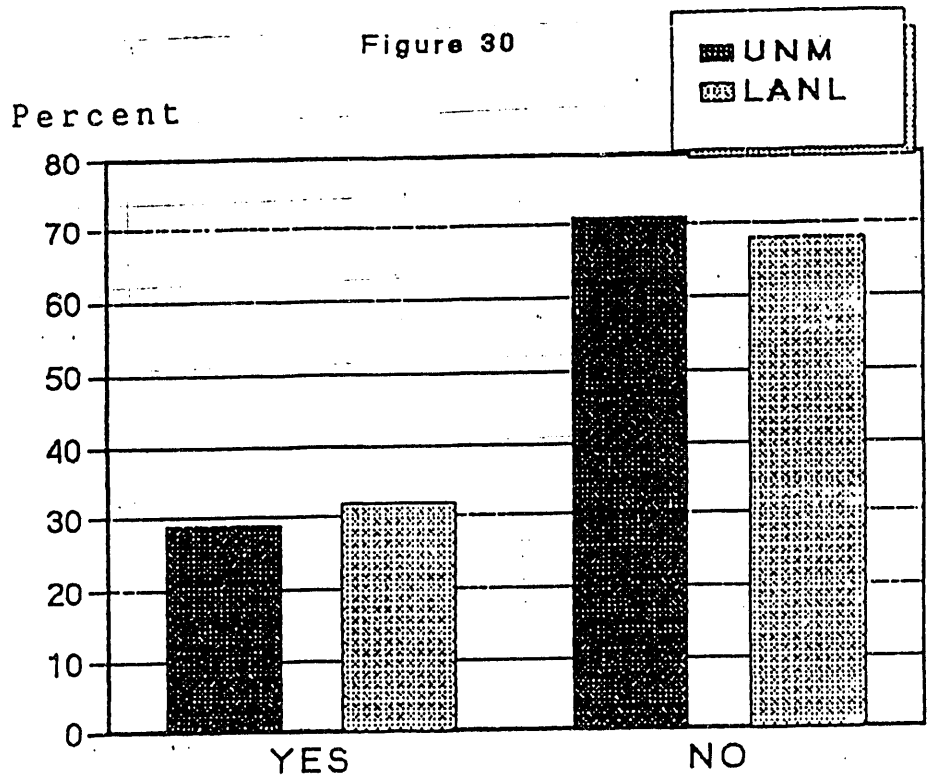
Changed personal status for professional reason

Figure 29



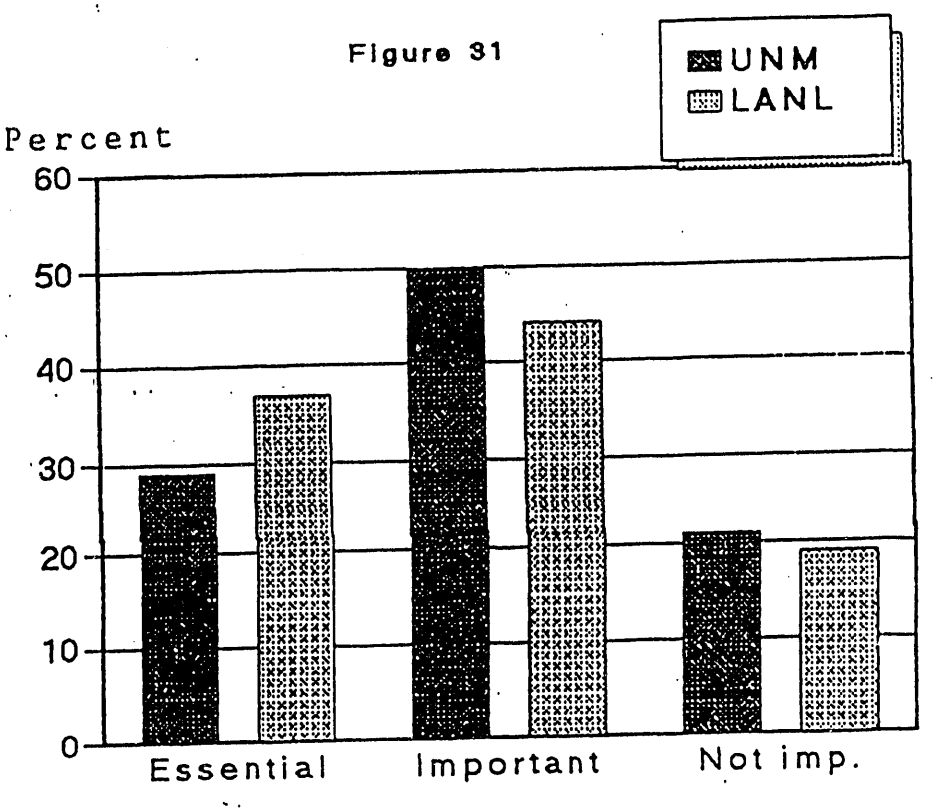
Interrupted career for children

Figure 30



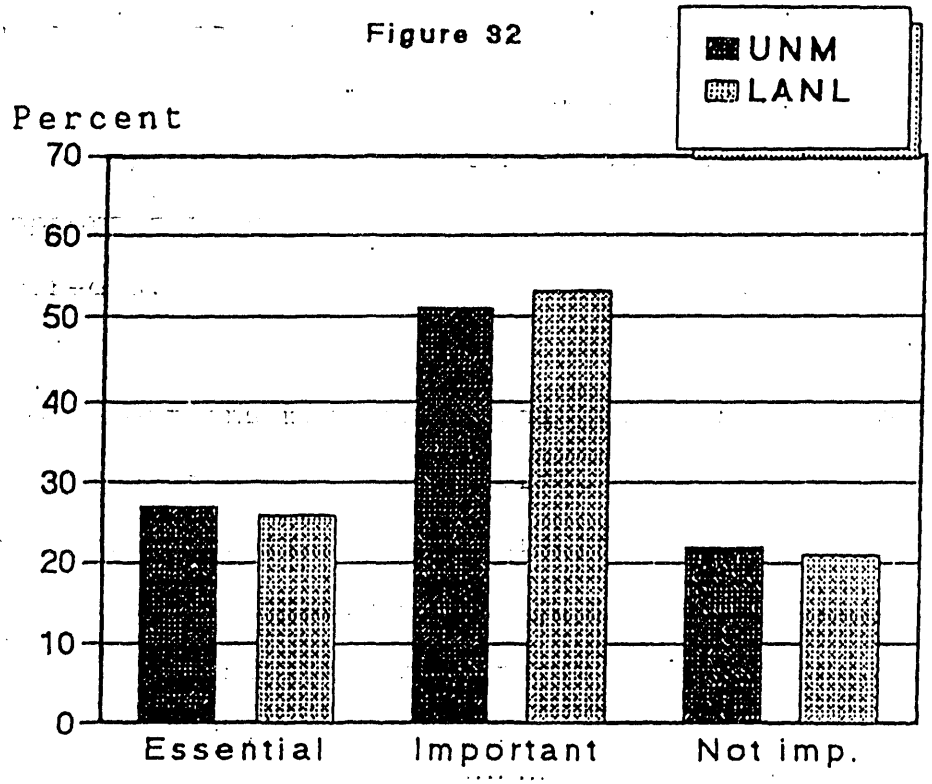
Affirmative action played role in your hire

Figure 31



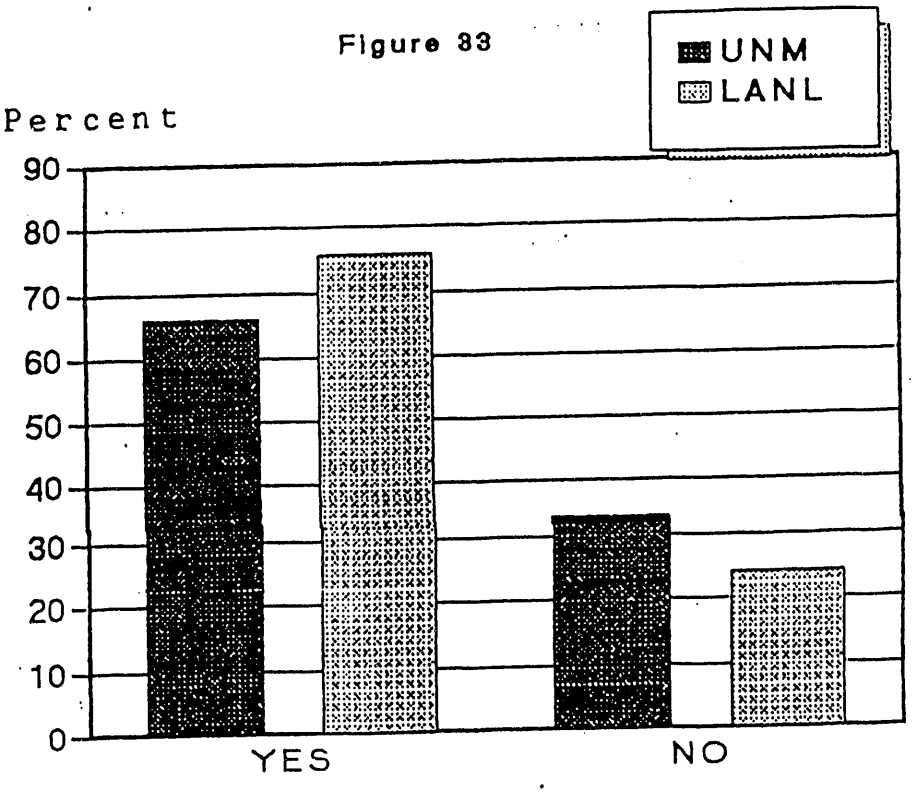
Importance of affirmative action policies

Figure 32



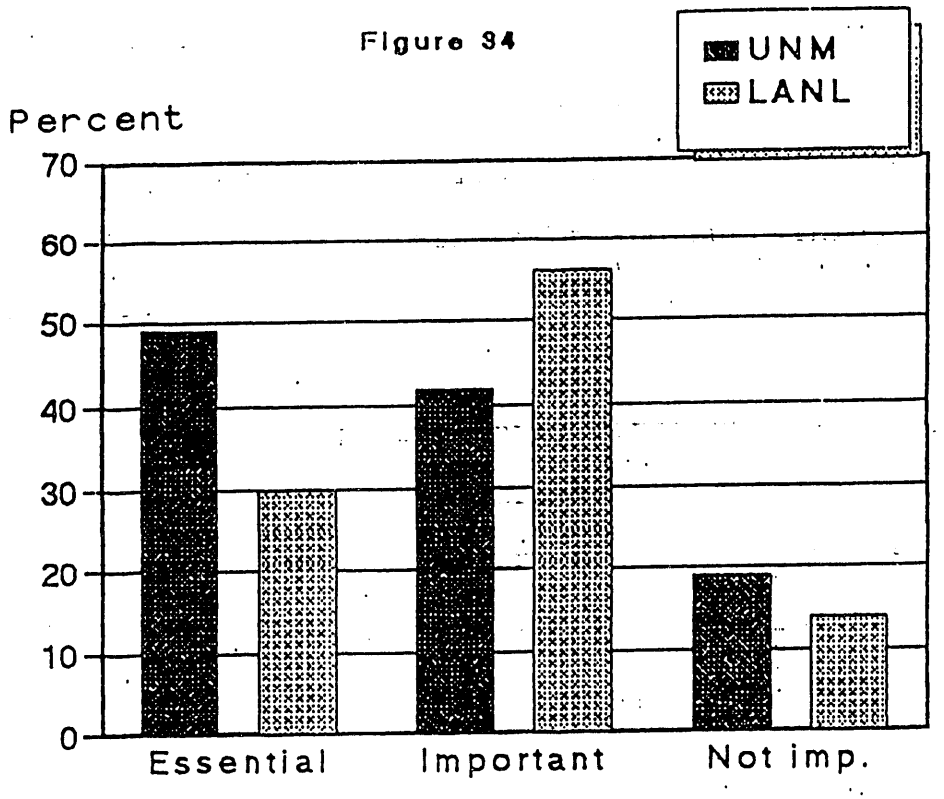
Importance of spouse/partner hiring policies

Figure 33



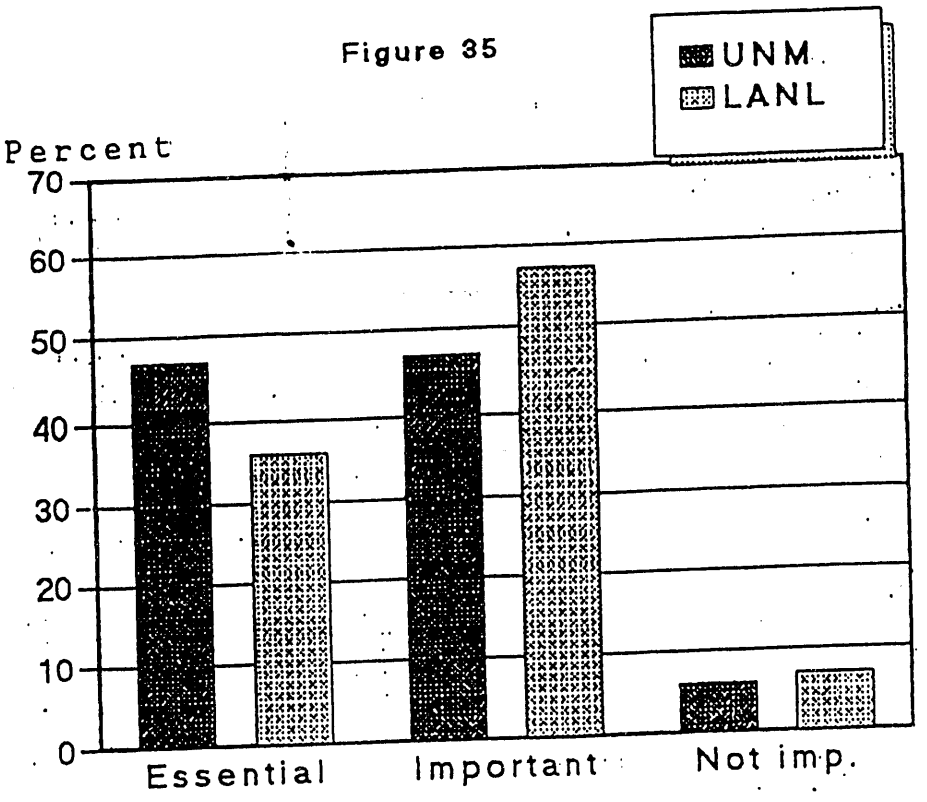
Husband/partner also in science

Figure 34



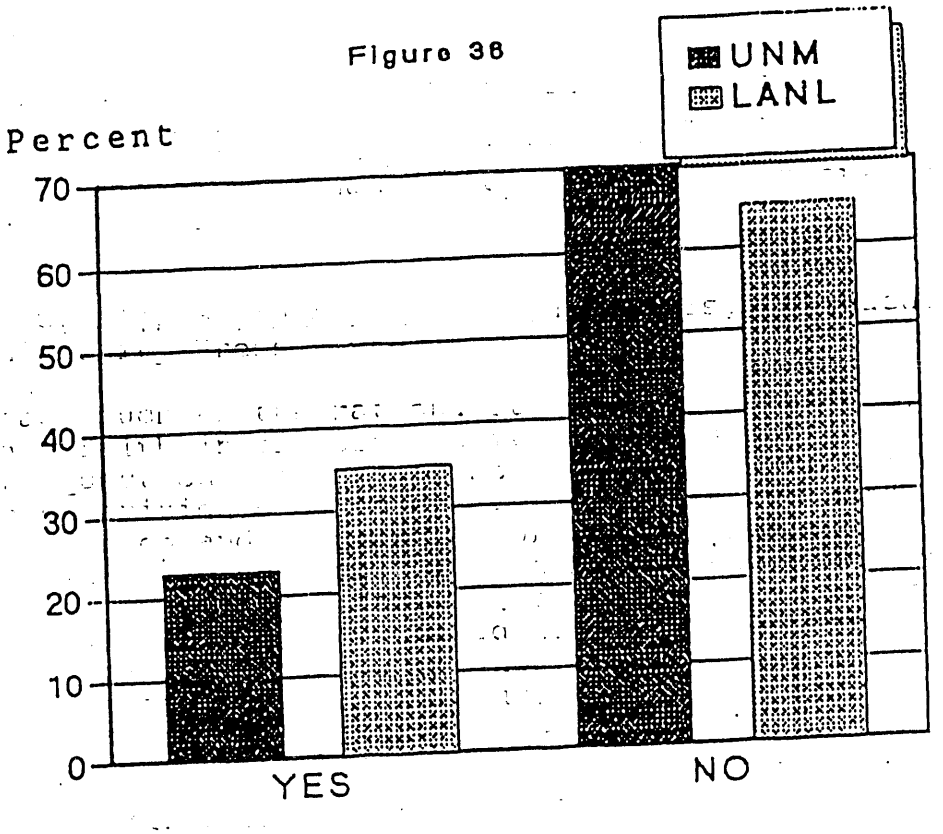
Extended probation/tenure for childbearing women

Figure 35



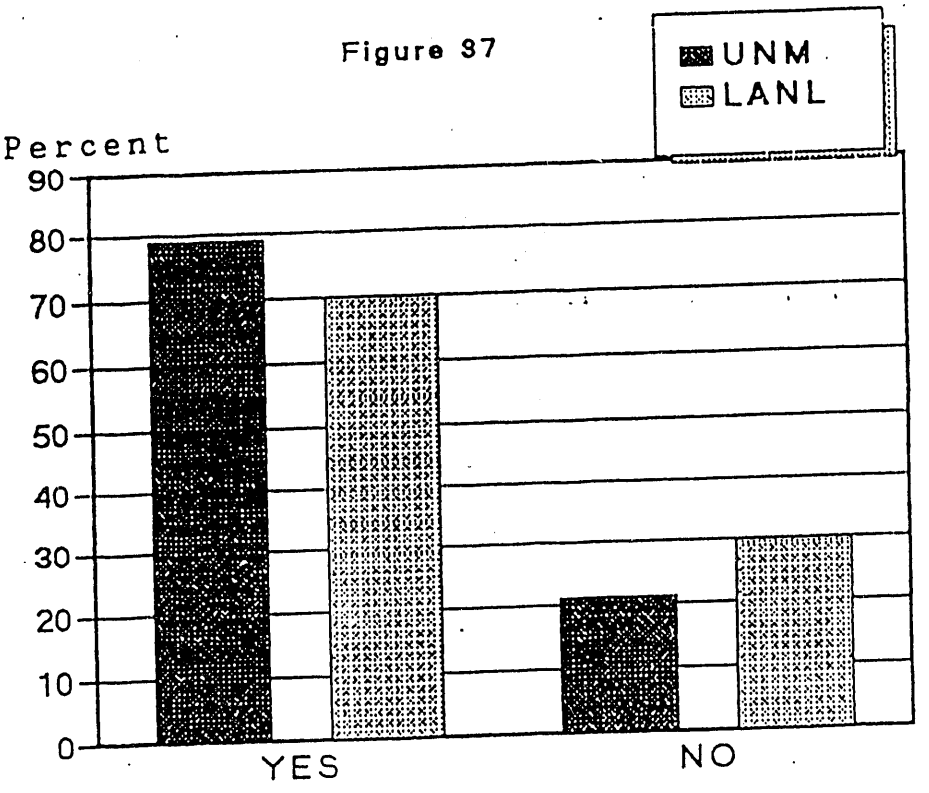
Importance of maternal/paternal leave

Figure 36



Adequate access to childcare

Figure 37



Different if science had more women

Conclusions and Recommendations

Based on both the interview and questionnaire data that we gained from women scientists at the University of New Mexico and Los Alamos National Laboratory, we can offer some general observations and specific recommendations that address the problems and challenges facing women in science. The observations and recommendations that we present here reflect both the opinions expressed by many women scientists as well as our own sense of the significant messages to emerge from concerns that were voiced repeatedly throughout this study.

-- Since most women who enter the scientific professions come from supportive family backgrounds, and since the overwhelming majority of women in the sciences come from Anglo or European backgrounds, efforts should be made to reach young girls from diverse heritages and classes, and generally to reach those who do not typically benefit from early encouragement and support.

-- Women pursuing scientific study at all levels lack role models. Any attempts to make existing women scientists more visible to young girls and to women throughout our education system would make science into a more welcoming environment for females.

-- Young girls and women do not receive the mentoring and special attention typically reserved for male students. Diverse efforts to increase and improve mentoring should be initiated at all educational levels, from primary through graduate education.

-- In sciences classes, more attention and recognition should be devoted to both women and minority students. Many complain that they feel absent and unnoticed. Many have problems sustaining a sense of self-esteem in a predominately male environment.

-- Sexual discrimination and harassment are most often experienced by women in the sciences when they are marginalized within or excluded from male networks in their profession. While many women do not generalize about sexual discrimination and harassment, specific instances are commonly recalled and elaborated in detail. EO/AA greivance procedures must be enforced to deal with serious complaints. Yet both discrimination and harassment will no doubt continue to thrive in male hegemonic environments. Effective long-term resolution of these problems may only occur with increased numbers of women in the sciences.

-- It is common for women in the sciences to be married or coupled with other scientists. At Los Alamos, in particular,

most of the women we interviewed came to the lab with their husbands and had to "retool" to find emplyment at the lab. Efforts to accommodate such dual-career couples will both increase the number of women in the sciences and allow them to enjoy the same opportunities for embarking on and sustaining their research careers.

-- Policy recommendations most frequently cited by UNM women science faculty include the need for maternal/parental leave policies and for more flexibility in tenure policies. At Los Alamos, the most frequently mentioned policy recommendations concerned child care and increased opportunities for part-time and flex-time work. One major recommendation of this report is that Los Alamos implement some sort of child care program. There is strong support as well at both institutions for spouse/partner accommodation efforts and for affirmative action policies.

-- Most women scientists feel that the practice of science would be different if more women entered the scientific professions. While "science itself" may not change, different approaches and methods would likely emerge. Science might well be a less competitive, combative, and aggressive undertaking; it might be more "process" oriented; it might foster more cooperation and better communication. Indeed, scientific research agendas might well change to reflect more ethical considerations about the value of particular scientific

endeavors.

In introducing this pilot project, we described its purpose as an attempt to understand the ways in which women scientists view themselves, their profession, and the scientific culture they inhabit. In this sense, what our report offers--in the details that emerge from both interviews and questionnaire data--exceeds any neat summary of its contents. Policies can and must effect changes in science, but cultures ultimately change when people share information, when they talk and listen to each other. We see the main value of our report in the opportunity it provides for this kind of exchange--among women in the sciences, and between women and men who are committed to productive changes within the practice of science.

Bibliographical Resources

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Nelson, Lynn. "Bibliography: Gender, Race, Class and Science." Transformations (Spring 1990): 43-51.

Searing, Susan. Women and Science: Issues and Resources. University of Wisconsin System, 1990.

Most of the following materials are available at the UNM Libraries. The UNM Centennial Science and Engineering Library has excellent holdings in the fields of women, gender, and science.

Annotated Bibliography

The following selection of annotations are from the Eldredge, Kimball, and Capron bibliography:

Berryman, Sue E. Who Will Do Science?: Minority and Female Attainment of Science and Mathematics Degrees: Trends and Causes. New York: Rockefeller Foundation, 1983.

A report describing the representation of women and ethnic minority groups at the B.A., M.A., and Ph.D. degree levels in the biological sciences, the physical sciences, computer sciences, mathematics, and engineering. The author then analyzes trends in the representation of women and minorities in the sciences and the causes of under-representation of those groups. The latest dates for most figures used in the statistical tables are from 1979 or 1980, but the information is still useful as background for analyzing current trends. Includes a list of references.

Bleier, Ruth, ed. Feminist Approaches to Science. New York: Pergamon Press, 1986.

A collection of papers, several of which were read at a symposium, Feminist Perspectives on Science, held at the University of Wisconsin in 1985. The central themes are an analysis of the nature of contemporary science and development of a new science that is different, better, feminist, and

emancipating.

Cole, Jonathan R. Fair Science: Women in the Scientific Community. New York and London: The Free Press, 1979.

Study of the social status of American women in scientific occupations. Emphasizes analysis of quantitative data. The author argues that the small proportion of women in science is due to a combination of "social" and "self-selection" processes. The self-selection process begins with those who do not enter the competition by enrolling in science courses and continues through to those who hold the doctorate and are employed by university science departments. Here, many "self-select" teaching over research and therefore exclude themselves from rewards in a system that values research over teaching. The author then turns his attention to social stratification processes in science and their effect on the careers of women scientists. Numerous tables, list of legal cases cited, and bibliography.

Crowley, Michael, and M. J. Lane. Women and Minorities in Science and Engineering. Washington, D.C.: National Science Foundation, 1986.

Surveys the employment of women and minorities in science and engineering, labor market indicators, and education and training. Confirms that the participation of women and minorities in these fields is low; stresses importance of education at the lower levels to assure full use of the nation's human resources. Numerous statistical tables.

Fausto-Sterling, Anne. Myths of Gender: Biological Theories About Women and Men. New York: Basic Books, 1985.

An examination of mainstream scientific investigations of gender by a scientist who is also a feminist.

Gornick, Vivian. Women in Science: Portraits from a World in Transition. New York: Simon and Schuster, 1983.

Journalistic account of interviews held with a variety of women scientists. Names and institutional affiliations are changed to protect the anonymity of those interviewed.

Haas, Violet B., and C. C. Perrucci, eds. Women in Scientific and Engineering Professions. Ann Arbor: University of Michigan, 1984.

Selected papers read at the Conference on Women in the

Professions: Science, Social Science, Engineering; held at Purdue University in 1981. Papers are divided into four sections: women in science-based professions; women scientists and engineers in academe; alternative science-based careers; and women's views of scientific views of women.

Harding, Sandra G. The Science Question in Feminism. Ithaca: Cornell University Press, 1986.

Traditional ideas, such as the rationality and "rightness" of androcentrism and faith in the progressiveness of scientific rationality, are questioned as the author examines important trends in feminist critiques of science. The first two chapters provide an introduction and an overview of current feminist thinking as it relates to science. In the next three chapters, connections between the various feminist critiques of science are explored, and gaps and contradictions identified. Further chapters examine feminist theories of knowledge as they relate to science, analyze the traditional structure of the history of science, and describe how the deterioration of socially progressive knowledge-seeking has occurred. The final chapter identifies weaknesses in feminist critiques of science and poses questions that have not been answered by feminist thinkers.

Harding, Sandra, and M. B. Hintikka, eds. Discovering Reality: Feminist Perspectives on Epistemology, Metaphysics, Methodology, and Philosophy of Science. Studies in Epistemology, Logic, Methodology and Philosophy of Science, 161. Dordrecht: D. Reidel, 1983.

Contributors explore two themes: how distinctively masculine perspectives on masculine experience have shaped systematic thought in the social and natural sciences, which are assumed to be gender-neutral; and how distinctive aspects of women's experiences can provide resources for the construction of a more genuinely human understanding of reality. Bibliographic notes accompany each essay.

Harding, Sandra, and J. F. O'Barr, eds. Sex and Scientific Inquiry. Chicago: University of Chicago Press, 1987.

A collection of articles published in Signs: Journal of Women in Culture and Society from 1975 through 1987. Areas on which the collection focusses are: the social structure of science; misuses and abuses of science and technology; bias in the sciences; the sexual meaning of science; and epistemology and metatheory. Includes bibliographical notes on the contributors and a list of articles of related interest that have been published in Signs.

Hubbard, Ruth S. M. S. Henifin and B. Fried, eds. Biological Woman - The Convenient Myth: A Collection of Feminist Essays and a Comprehensive Bibliography. Cambridge: Schenkman, 1982.

"While many people have long acknowledged an unavoidable subjectivity in perceptions of reality, most continue to attribute objectivity to scientists and science. But science is the result of a process in which nature is filtered . . . only items that scientists consider worthy of notice are retained. Since scientists are . . . mostly economically and socially privileged, university-educated Caucasians, and predominantly male there is every reason to assume that, like other human productions, science reflects the outlook and interests of its producers." These articles present a different view.

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Women and minorities have traditionally been discouraged from entering scientific and mathematical fields. This book surveys the current level of female and minority participation in these fields, identifies existing barriers to increased involvement, and outlines several strategies for successful intervention programs.

Kahle, Jane Butler, ed. Women in Science: A Report form the Field. London, Philadelphia: Falmer Press, 1985.

Results of a study undertaken by the Role and Status Committee of Women in Biology Education of the National Association of Biology Teachers. Traces the historical and current role of women, especially in the biological sciences, and identifies progress made and areas in which further changes are needed. The focus is on educational and employment factors. Contributors believe that the attitudes of educators may determine the success of women in science, and it is toward that audience that the book is directed.

Keller, Evelyn Fox. Reflections on Gender and Science. New Haven: Yale University Press, 1985.

A collection of nine essays by a mathematical biophysicist on the relation between gender and science based on the premise that both are socially constructed categories. Each essay explores the network of gender associations in the language of science and questions its validity. The first group of essays explores historical couplings of mind and nature; the second group approaches the matter from a psychoanalytical point of view. The final section analyzes the language of science from a scientific and philosophical perspective and recommends changes in our

thinking about the nature of science and its place in our society. Includes bibliography.

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A collection of theoretical essays, research studies and personal accounts relating to science education for female students in secondary schools in Britain. Explores the origins of female underachievement in science and makes suggestions for successful intervention for improved performance. Short lists of references follow each chapter.

Kelly, Alison, ed. Science for Girls? Philadelphia: Open University Press, 1987.

Papers by American and British contributors on girls and science education. Papers in the first section focus on the problematic relationship that girls have had with science in school. In Part II, contributors look at what actually occurs in science teaching in schools and classrooms. The third part of the book argues for changes to make science more "girl-friendly," while the final section describes some recent intervention programs to encourage more girls to study science and related subjects.

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Papers center around six themes: individual life experiences; family attitudes and relationships; impact of education; economic factors as determinants; determinants in individual life experiences; and significant related problems of professional women.

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Report of a group of minority women scientists who met under the auspices of the American Association for the Advancement of Science to identify barriers to minority women who wish to pursue scientific careers, and to recommend changes that would increase their numbers and help to improve their status.

Merchant, Carolyn. The Death of Nature: Women, Ecology and the Scientific Revolution. San Francisco: Harper and Row, 1980.

A critical reassessment of the scientific revolution of the 16th and 17th centuries utilizing today's feminist and ecological consciousness about the age-old association between women and nature. The author states that we must reexamine the formation of a world view and a science that, by reconceptualizing reality as a machine rather than a living organism, sanctioned the domination of both nature and women.

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The present report updates an earlier study and examines changes in the status of women faculty between 1977 and 1981. Drawing on more limited data, it also considers their situation in industry. Since 1977 - the survey year on which the first report was based - an additional 13,000 doctoral women scientists and engineers have joined the labor force, bringing their number to 41,000 of a total of 341,000 for both sexes. The characteristics of the new entrants and their affect on the overall status of women in academe and industry are examined. Includes bibliography.

National Research Council (U.S.), Committee on the Education and Employment of Women in Science and Engineering. Women Scientists in Industry and Government: How Much Progress in the 1970's?: An Interim Report to the Office of Science and Technology Policy from the Committee on the Education and Employment of Women in Science and Engineering. Washington, D.C.: National Academy of Sciences (Office of Publications), 1980.

Examines the extent to which the employment situation and status of women scientists and engineers has improved since the advent of affirmative action mandates. Finds some gains but much room for improvement.

Ott, Mary D., and N. A. Reese, eds. Women in Engineering: Beyond Recruitment. Proceedings of the Conference held at Cornell University, June 22-25, 1975. Ithaca: Cornell University Press, 1975.

Papers center around the following themes: research on freshman engineers; barriers to achievement for academic women; the social scene: isolation and frustration; women in the laboratory; career decisions; women graduate students in engineering; and, women - the new engineers.

Ramaly, Judith A., ed. Covert Discrimination and Women in the Sciences. AAAS Selected Symposium, 14. Boulder, Colorado: Westview Press, 1978.

Based on a symposium held at the annual meeting of the American Academy for the Advancement of Science. Five issues are discussed within the context of women in the sciences: the definition of discrimination and federal and local programs implemented to remove it; and investigation of practices that hinder the professional development of women scientists; barriers that discourage women from choosing scientific careers; the interaction between individuals and institutions in the advancement process; and, differences in evaluating male and female performance and how these can be changed. Bibliography with each paper.

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A discussion of how intimidation, myth, misunderstanding, and missed opportunities have produced a fear of mathematics in women that has denied them access to a variety of careers and to the pleasures and power that competence in mathematics and science can provide.

Select Additional Readings

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