Obstructed Careers

Women Scientists in America. Struggles and Strategies to 1940. MARGARET W. ROSSITER. Johns Hopkins University Press, Baltimore, 1982, xx, 440 pp., illus. $27.50.

In this important book on the history of women in American science, Margaret Rossiter accomplishes what is usually a two-generational task. First, she finds and identifies—in the hidden archival records of individuals and scientific societies and in the public record—thousands of women scientists who have gone unrecognized by historians of science. Second, she analyzes the aspirations, careers, struggles, and accomplishments of these scientists within the context of the larger male scientific community, which, she concludes, set severe limits on women's participation in the field. By 1940, the end date of this study (Rossiter will bring it up to the present in a subsequent volume), the number of women in science had grown considerably, but discrimination and sex-typing still restricted their employment. Rossiter describes the chronological development of women's pursuit of science and carefully documents the struggles of this group whose status has responded to external events and pressures.

Historically the woman scientist has been caught between two mutually exclusive images: on the one hand, 19th-century American culture defined a narrow range of acceptable female activities, seen as delicate, emotional, and noncompetitive in character, and, on the other hand, science developing in the same period became identified as tough, rigorous, competitive, and unemotional. These antithetical representations put women who wanted to pursue their scientific interests in a psychologically conflicted position and added to the stresses of their lives.

Rossiter divides the history of women in science before 1940 into three stages: before 1880; from 1880 to 1910; and from 1910 to 1940. Before 1880 women gained entrance into higher education, which paved the way for careers in scientific fields. Although the purpose of college education remained in the popular mind the production of better wives and mothers, the science professors in the new women's colleges formed the entering wedge for women's careers in the sciences. The second period, up to 1910, saw expansion for women in science, but at the same time the professionalization of science led to restrictions on women's employment and to sex-related divisions within the field. Women won the opportunity to earn doctorates—half of those awarded between 1877 and 1900 coming from Yale, the University of Chicago, Cornell, and New York University—yet the universities that agreed to grant women Ph.D.'s refused to hire them for their faculties. At the turn of the century, with increasing numbers of women educating themselves for careers in the scientific fields, specific "women's work" evolved in the low-paying and low-ranking jobs such as astronomy observatory assistant or museum staff member. In coeducational universities women scientists found themselves segregated in home economics or hygiene departments or isolated as deans of women. Only in women's colleges did women scientists have access to chairs and professorships in chemistry, mathematics, or physics. Between 1910 and 1940, women's place in science assumed a further rigidity, according to Rossiter's analysis. Women made considerable gains in numbers at the price of accepting the continuing pattern of segregated employment and underrecognition.

The burgeoning professional societies in the 19th century did not eagerly welcome women to membership and generally contributed to the peripherality of women scientists. The American Association for the Advancement of Science, for example, admitted three women to membership in the 1850's, but did not extend a general invitation to women as it did to men interested in science. By the 1870's the AAAS formed a special category of membership—"fellows"—for those professionally engaged in science, which effectively excluded those women who could not obtain professional jobs and relegated the few admitted women to the lower-status general membership. The American Chemical Society did not even adopt this compromise strategy of secondary membership but strove to maintain its male social club atmosphere. For example, at its 1880 annual meeting the society held a "Misogynist Dinner," which led to the resignation of its only female member (p. 78). Not until the 1890's did the society invite another woman to membership, but by then most female chemists had aligned themselves within the more receptive field of home economics.

After the confrontation tactics that had toppled the barriers to doctorates and society memberships, women adopted a more conservative acceptance of the double standard. Second and third generations of women in science did not continue the levels of activity that had been necessary to gain a foothold; rather they settled down to make the best of what even the most conservative among them realized was second place.

To document the segregation of women in science and the effects of the double standard on their lives and careers, Rossiter examined various editions of *American Men of Science* (which included women) in 15 scientific fields. The three most populous fields for male scientists were chemistry, medical sciences, and engineering; the three for female scientists were botany, zoology, and psychology. According to *AMS*, women scientists earned more doctorates earlier in their careers than men, a fact Rossiter attributes to what she calls the Madame Curie effect: women deliberately overqualified themselves as the first step in the life-long struggle to compensate for being women in a male occupation.

Three-quarters of the women scientists who worked before 1940 found employment within universities and colleges. Most women in coeducational institutions faced low-status jobs—research associate, for example, in a professor's laboratory—or jobs in segregated fields like home economics, nutrition, or child psychology. Promotions came to women who stayed in the women's fields; otherwise advancement remained negligible unless linked to the active support of a powerful male patron. The extent to which this was true is revealed in the personal correspondence about the promotion at Duke University of Hertha Sponer to a professorship in physics in 1936, a situation Rossiter examines in some detail (pp. 190–194). The president of the university appointed Sponer because he thought her to be the third greatest woman physicist of the time, but his correspondents believed him in error and pointed out that he should have "picked one or two of the most outstanding younger men." One correspondent concluded, "Women instructors in physics in the long run might react unfavorably upon the prestige of

the department." The president stood behind his choice and defied general opinion.

Women scientists in the universities found themselves unwelcome even at campus scientific meetings, because the meetings frequently took place at all-male faculty clubs. One nutritionist reported that she was forbidden to eat dinner at the Michigan faculty club when she was the after-dinner speaker, and elsewhere she was refused admission when she was an invited honored guest (p. 215). Despite the difficulties and the prejudice against them, women scientists retained a place for themselves in colleges and universities and made considerable progress in increasing their numbers before 1940.

As in academe, women scientists employed in local, state, or federal governmental agencies increased in number in the 20th century but remained clustered at lower levels or in specific areas of "women's work," where they were underpaid and underpromoted. One manifestation of the government's attitudes occurred after the 1923 Reclassification Act, the intent of which was to institute the policy of equal pay for equal work. In response to the directive, agencies downgraded some job titles to fit women's already low salaries rather than increased their salaries (p. 222). Sex-typing within government, as within the academy, relegated women predominantly to those agencies, in this case related to public health and social welfare, in which low-paying and low-status jobs abounded. The exceptions were those agencies headed by men who were personally willing to risk hiring women.

In industry, the third place of employment for women scientists, women fared considerably worse than in the university or in government. Women employed in the private sector faced overt hostility and found themselves relegated not just to a women's place within science but to science-related work on the periphery. Women who held advanced degrees in scientific fields became chemical librarians or scientific secretaries, and most of them paid a high psychological price for trying to do "men's work." The only exceptions to this bleak outlook were in food and home products industries, which, as in the case of Betty Crocker Kitchens, hired and promoted numerous women scientists.

Rossiter provides abundant evidence to substantiate her view that most of the women who tried to pursue scientific careers before 1940 received fewer honors, had lower status, maintained themselves on lower salaries, and endured greater restrictions on their employment than similarly educated men. Some individual women won recognition and had successful careers in science, but in general women scientists struggled within a cultural context in which they were believed inferior and in a world in which they were judged on factors other than merit. The book chronicles the careers of generations of women, who like their brothers were intellectually stimulated by scientific questions but who had a higher personal and professional price to pay to follow their interests and to reach their goals. Beginning from a stance that is sympathetic to the plight of women, Rossiter has done comprehensive research and will convince many who do not approach the subject from the same point of view. Excellent photographs and informative tables fill out the text. This book will be necessary reading for all who seek to understand the sexual politics of science today. It illuminates how gender has influenced the development of science in this country and how and why our cultural values have followed us into the laboratory. I look forward to Rossiter's volume bringing the analysis into the 1980's.

JUDITH WALZER LEAVITT
Department of the History of Medicine, University of Wisconsin, Madison 53706

Inference in Practice

Judgment under Uncertainty. Heuristics and Biases. DANIEL KAHNEMAN, PAUL SLOVIC, and AMOS TVERSKY, Eds. Cambridge University Press, New York, 1982. xiv, 556 pp., illus. Cloth, $44.50; paper, $14.95.

This important and generally accessible book contains 35 papers (mostly reprints or revisions of previously published papers) all of which explore some aspect of human judgment in circumstances with incomplete information. During the last ten years or so the editors and their co-workers have produced a body of research that has changed profoundly the way we view and study human judgmental processes. It has become apparent that in many instances human judgments are quite at odds with "good practice" or with predictions based upon statistical theories of inference. Were the conclusions from these studies simply that people do not have very good judgment or that their judgments deviate willy-nilly from some predicted reference points, the conclusions would certainly deserve attention. But what has been found is far more interesting and challenging.

In making inferences where uncertainty is present many people adopt a set of identified heuristics or rules of thumb as aids or shortcuts. These heuristics generally lead to systematic, predictable biases in judgments. The judgments referred to are intuitive reactions as opposed to trained responses. It appears that with appropriate training individuals can produce more accurate judgments. For example, generally people express overconfidence relating to skill-based tasks (part 6, chapters 20 through 23). I may be 80 percent sure I can hit a certain target with a dart, even though experience shows I only hit it about half the time. Weather forecasters who routinely provide estimates of the likelihood of various meteorological phenomena are quite well "calibrated." For example, of the days for which they predict a 40 percent chance of rain, on roughly 40 percent there will indeed be some rain. It would, however, be a mistake to infer that it is only the untutored whose judgmental procedures lead to systematically distorted opinions. In fact, much of the work reported has involved the opinions of experts: clinicians, advanced graduate students, other researchers. The book begins with a survey of the heuristics, which appeared in *Science* (**185**, 1124 [1974]).

The following section of the book (chapters 2 through 6) is devoted to the "representativeness heuristic," that is, judging the likelihood that an object belongs to a certain population by noting the extent to which it "represents" or appears typical of the population. The trouble with such judgments is that they ignore or downplay base rate information and sample size. For example, you estimate that it is highly likely that someone is an architect because the description "just sounds like an architect" in spite of the fact that there were virtually no architects in the population being considered.

Availability is the term the authors give to rules by which likelihood is assessed by relative ease of recall or imagining similar events. For example, it is generally easier to think of a word beginning with *r* than a word whose third letter is *r*, and in fact most people seem to feel the former case is the more likely of the two. In fact, in English *r* occurs more often in the third position (as does *k*) than in the first. This heuristic and its implications are examined in part 4 (chapters 11 through 14).

Part 3 (chapters 7 through 10) of the book discusses the role of heuristics in