# Profile of a Field: CHEMISTRY

## Women Have Extra Hoops to Jump Through

by Ivan Amato

Chemist Mary L. Good has made it to the top of her profession. After 26 years climbing the professional ladder in Louisiana's state university system, she entered the chemical industry, where she is senior vice president for technology at Allied-Signal Inc. in New Jersey. In 1987 she served a term as president of the 144,000-member American Chemical Society (ACS). She frequently visits Washington to serve on high-powered committees that advise the executive branch on federal science and technology policies, most recently the 12-member President's Council of Advisors on Science and Technology. And if Mary Good had it her way, this article would not have been written.

"Articles like these are not useful," she warns, because "they bring up all of the old dogs of the past." For Mary Good, those aging canines include gender discrimination, which she thinks has become a minor issue for women. "Access [to the chemistry profession] is there," Good insists. The example of her own career would seem to clinch her point. The real challenge, she says, is not access to science—but the gender-blind challenge of becoming a top-notch researcher.

Is Mary Good correct? Has sexism virtually vanished and are women on their way to standing shoulder to shoulder with males in the traditionally male-dominated field of chemistry? Other well-known female luminaries of Good's generation who were interviewed for this article echo Good. Says Helen M. Free, a retired pharmaceutical researcher and research manager turned consultant at Miles Inc. and the 1993 president elect of the ACS: "It's a grand and glorious time to be a woman in chemistry or in science in general."

Some successful younger women, including 39-year-old Jacqueline K. Barton, a chemist at the California Institute of Technology, have the same optimistic outlook. "There are no obstacles if you work hard," says Barton, winner of a MacArthur Award last year and this year's recipient of the Garvan Award, which the ACS has been presenting yearly to exceptional women chemists—including both Good (in 1973) and Free (in 1980)—since 1936.

It may not be surprising that visible and successful female chemists who have made it to the upper ranks of the establishment tend to deemphasize negative gender-specific influences in their field. But some of the available statistics paint a less rosy picture. According to a 1988 National Science Foundation (NSF) survey of employed chemists in the United States, only 18% are women—

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**Rosy view.** Mary Good *(above)* and Jacqueline Barton think obstacles to women in chemistry are gone.

up from 11% in 1978. And a 1990 survey of women in chemistry—the latest in a series conducted by the ACS every 5 years—shows that stories like Good's, Free's, and Barton's are not yet by any means the norm in the discipline.

The ACS survey shows that at the upper levels of academia, most women still have a lonely lot: Most major chemistry departments have only one women on the tenure-track roster and that lone female is often the first woman the department has ever had in such a position. The ACS's women chemists committee finds that it can't yet stop publishing its intermittent list, known by some as the "Dirty Dozen," which identifies major chemistry departments, some with dozens of faculty members, that still have no women in tenure-track positions. The last list was published in 1987 and a spokesperson for the committee said the next Dirty Dozen is currently in preparation.

In industry, where roughly six in 10 chemists, male and female, work, there are fewer workplaces with almost no women. But in industry there are some other disparities: Only about one in 14 women have managerial positions, compared to one in five men. Women in industry also earn less than men do, though beginning salaries for young women are comparable to those for male neophytes. Still, according to a separate annual survey by the ACS, women chemists in 1991 earned on average only 88% of what their male counterparts earned, even with controls for age, experience, and degree. And even more discouraging for women with ambitions to reach the top is the fact that as a woman's professional experience in industry increases, the gap between her salary and that of her male counterparts grows.

Good and others acknowledge that things in chemistry aren't perfect for women—females have a long way to go to achieve parity with males. But they contend that current statistical trends, together with the quality of women currently coming through the educational pipeline, portend a pool of well-qualified women chemists who will brighten the statistical picture in the coming years. In 1988, the last year tracked in the ACS survey, nearly 40% of B.S. degrees awarded in chemistry went to women, up sharply from 18% in 1970. And the chemical industry in general has made it clear that it intends to put more women in managerial positions.

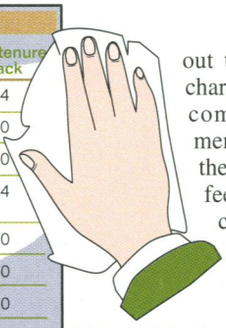
The problem with that argument, however, is that as in some other fields (*see article on neuroscience, p. 1366*), most women don't flow smoothly through the pipeline from school to the top levels of academia or industry. "Every step along the way, we're losing more women than men," concedes even the optimistic Barton. Interviews conducted by *Science* with women in chemistry, as well as the ACS survey of gender-related issues, suggest that two kinds of obstacles account for the diminishing proportion of women as one goes higher up the academic and professional ladder. One is the double burden of family and career. The other is sexism. Although overtly sexist practices are a thing of the past in most places, as Good contends, subtler forms of discrimination, such as stereotyping and woman-unfriendly environments, persist.

The career of Joanne M. Ravel—now an emeritus professor in the department of chemistry and biochemistry at the University of Texas, Austin—reflects the changes in male attitudes that are taking place, albeit slowly, in chemistry. Ravel got her Ph.D. in biochemistry at Texas in 1954, did a 2-year postdoc there, then spent 16 years as what she calls a "girl friday" working for a male research supervisor. "As long as I made enough money to pay my housekeeper and day care, I was happy," Ravel says now.

But as 1970 approached—and the wo-

**Cleaning Up Their Act**

| | Total faculty | Total female faculty | Tenure track | Non-tenure track |
|---|---|---|---|---|
| Utah | 53 | 5 | 1 | 4 |
| South Carolina | 26 | 0 | 0 | 0 |
| Oregon State | 25 | 0 | 0 | 0 |
| Virginia Polytechnic Institute | 43 | 4 | 0 | 4 |
| Wisconsin-Madison | 44 | 4 | 4 | 0 |
| San Diego State | 34 | 2 | 2 | 0 |
| Georgia Tech | 35 | 2 | 2 | 0 |
| Northwestern | 30 | 2 | 0 | 2 |
| Virginia | 23 | 0 | 0 | 0 |
| Georgia | 32 | 1 | 1 | 0 |
| Arizona State | 34 | 2 | 2 | 0 |
| Notre Dame | 28 | 2 | 2 | 0 |



**Not-so-dirty-dozen.** These schools had no female chemists in tenure-track positions in 1987; now seven of them do.

men's movement picked up steam—Ravel began feeling the sting of nonrecognition in her department, especially because she felt she was really running the lab and training students, while her supervisor meandered through once in the morning and again in the late afternoon. She seriously contemplated quitting. "What happened was—and this is interesting—the young men in the department said to the older men in the department, 'Why isn't Joanne a faculty member?'" In 1970, she leap-frogged to the associate professor level and 2 years later became a full professor.

But Ravel's cheering example doesn't mean that women are treated as equals of men in the hallways of chemistry departments across the nation. Speaking on the condition that she and her institution remain anonymous, one female chemist on an otherwise all-male faculty at a top-ranked research university feels women chemists often are "considered second-class citizens." For example, she notes, women chemists are grossly underrepresented when it comes to getting invited to give talks at meetings, which are organized largely by men. Then during tenure decisions, this lack of professional visibility can be held against the women.

One of the male attitudes that plagues women chemists—as it does women in all fields of science—is that the decision to marry and have children is taken as a token of a weak commitment to work. "Ludicrously, I was accused of not being serious about graduate school because I was having a family," says a female assistant professor at a large university, who prefers to remain anonymous. In fact, this woman argues that the truth is just the opposite of the way her male counterparts saw it; her efforts to remain a student despite family obligations testified to an unusually strong commitment to being a chemist.

The burden of family and career is an area where an objectively heavier load on women is made even more burdensome by the perceptions of male colleagues. Foremost is the issue of child care, says Gerri Richmond, a 39-year-old physical chemist at the University of Oregon at Eugene, who has both an infant and a 2-year-old on her hands. For academic scientists, time for having and raising children rules out the 70-hour weeks characteristic of highly competitive departments. Richmond says the regimen of breast-feeding, for example, can make life difficult—especially when male colleagues don't accept it. She and some other chemist-mothers said they felt excluded from professionally crucial discussions and networking during conferences and workshops. "I want to have lunch and dinner with everyone and still have my baby," Richmond says.

The double demands of being a mother and a chemist probably have something to do with the disproportionately high (although declining) number of female chemists who remain single, says Marge Kavanaugh, a program director in the NSF's chemistry division. According to the 1990 ACS survey, 38% of women chemists are single—compared to 18% of men. Remaining single allows a woman to avoid the difficulty of combining career and marriage. Of course, another way to avoid that dilemma is to put career aside—as some women in chemistry do, which is one reason why relatively few reach the top.

"I personally know a large number of competent women chemists who have followed their husbands and have remained underemployed or have dropped out [of the profession]," notes Kathleen Trahanovsky of Iowa State University in Ames, former head of ACS's women chemists committee. Having finally worked her way into an adjunct assistant professorship at Iowa State—where her husband is a full professor in the same department—Trahanovsky has firsthand experience of the tension between marriage and career.

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**Full house.** Physical chemist Gerri Richmond has a 2-year-old and an infant.

Certainly, solutions to these problems won't come easily. And one solution aimed at helping more women reach the top ranks of chemistry—affirmative action—was dismissed by almost every female chemist interviewed by *Science*, regardless of marital status or professional ambitions. "It will serve none of us well if weaker women end up tenured," says Barton of Caltech. Good and others argue that the potential solution to the small numbers of women at the top in chemistry and other scientific disciplines is already in place—in the form of young female students who are as competent and competitive as any male. The challenge, they say, is to increase the fraction of these women that make it all the way through the pipeline.

Instead of affirmative action, these top role models say, the answer is policies that, while maintaining the same qualitative standards for women, acknowledge the time-consuming demands life imposes on scientists who are also mothers. For example, several women chemists suggested that chemistry departments could alter the tenure clock for women: making it shorter (so they can get job security before their biological clocks make it more risky to have children) or longer (so they can build up their curriculum vitae enough while raising children). "Flex-time" and flexible leave policies, or provisions for adequate child care, they say, also would go a long way toward making the professional lives of women no more difficult than those of their male colleagues.

And, in fact, some gains are being made along these lines in the profession of chemistry. At this week's Pittcon, the enormous annual gathering of chemists and scientific instrument vendors, which was held this year in New Orleans, the conference organization offered on-site child care. That kind of effort is on the rise, Trahanovsky notes.

For now, though, women who want to pursue both a professional and a family life realistically are taking on a task that demands an almost superhuman effort. Until women and men become genuine equals in the responsibilities of homemaking, Trahanovsky wonders if some highly ambitious women chemists ought to shed the feminist myth that they can do everything. "Not every woman can—and they shouldn't have to," she says. She counsels ambitious women scientists who want a family to prune their professional aspirations temporarily, at least during their most intense years of mothering. But others, such as next year's ACS president, Free, don't see any reason to compromise. She advises young women to think big. "If you want it all, you'll find a way." For the time being those seem to be the options for women in chemistry: a bit of pruning or the intense effort to have it all.