

# Women in Science: Reshaping the Stereotypes

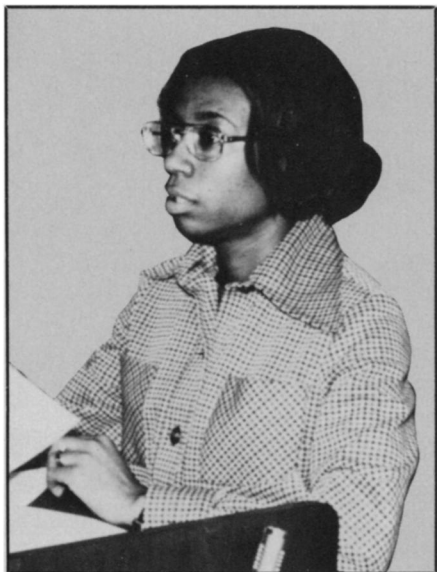
Gwendolyn Albert has made it. With a little help from teachers, friends and scholarships, she has become one of the youngest environmental engineers in the country. At 26 she's a water specialist for the Army Corps of Engineers, and her accomplishments as a scientist are just beginning. Unfortunately, too few women seem to have managed to travel that kind of professional path.

Albert somehow slipped through the stereotype bottleneck that slows down most scientifically inclined high-school and college women and, with the aid of a National Science Foundation grant, her story is being passed along to college students all over the country. With the advent of affirmative action last year many colleges and universities had to come to grips with the problem of keeping science students, especially women, in the field. It's been tough.

About two thirds of both men and women students entering college science programs stick with their original goals through four years. But of the remaining 30 percent who drop out, far fewer women than men quit their original programs because of bad grades. Science educators and large companies looking for women employees want to know what, if not grades, discourages the woman science major.

The problem has roots much deeper than dressing dolls and having tea parties, psychologists are discovering. Originally, elementary-school training and social stereotyping were blamed for the lack of interest young women show for science. But other misconceptions play a major role.

"Women perceive science as a conflict between an arduous career and the feminine demands of a long-range family commitment," Lynne H. Brown, a Purdue University academic adviser, says. University faculty tend to exaggerate the demands of a scientist, Virginia Walbot, an assistant professor of cell biology at Washington University in St. Louis, says. "Many girls," she adds, "believe the myth that scientists spend their lives in basements, working seven days a week, night and day." Walter S. Smith, associate dean of women at the University of Kansas, polled 110 high-scoring college freshmen women with science backgrounds, and found that most of those questioned



*Albert: Hurdles the stereotype.*

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## Misconceptions about science may discourage women from entering the field

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by Deedee Pendleton

were more concerned about avoiding conflicts between marriage and job than they were about discriminatory employment, wages and promotion. About 60 percent said they feel that pursuing a career could conflict with raising a family, and that if given a choice, motherhood would get first priority. Because many of the women expressed confidence in their ability to compete with male peers, and to secure a job, Smith says they are probably willing to modify their job aspirations, including accepting less prestigious jobs with lower salaries, to keep peace at home. They further feel that if any accommodation for caring for a family need be made, it is the woman's place to sacrifice her job to stay at home. Most women do not want jobs that require long hours away from home, and 42 percent of the women polled said their future husband's success in his job influenced their career goals. None of the women polled were married.

A large proportion of those women who declare an interest in science later choose fields of public service, and

many see themselves as voluntary servants of society. Nursing, teaching and social work are common vocational choices.

The problem is becoming so critical that without serious changes sociologists fear even fewer women will become full-time scientists. In an effort to curb the trend at Purdue, and decipher some of the contributing factors nationwide, several NSF-sponsored Purdue instructors are studying the problem. In an experiment conducted last fall, academic advisers spent about four times as many hours with a random group of Purdue freshmen science majors than had been allotted in the past. The results were encouraging: the attrition rate among those students receiving additional counseling was almost 50 percent less than for those who spent the regular time with an adviser. In addition, a role models course designed to introduce freshmen women to upperclass women in the school and to successful women scientists was offered on a voluntary basis. Female engineering students published a bound collection of their resumés and sold them to would-be corporate employers.

High-school students are regularly invited to attend an engineering workshop and orientation session, with hopes women college science majors will influence high-school students before they've made up their minds about college and career.

At the University of Kansas, and elsewhere, similar recruiting and educational programs designed to encourage scientifically gifted women are being financed both by NSF grants and companies anxious to employ qualified women as fast as the science schools can grind them out.

In a similar effort, under the auspices of NSF and under the direction of Dinah L. Moché, assistant professor of physics at Queensborough Community College in New York, outstanding professional women such as the aforementioned Gwendolyn Albert were photographed and interviewed for a six-part slide-cassette program designed to prove outdated stereotypes about women scientists wrong. "Too often girls visualize the cultural stereotype of the woman scientist as loud, aggressive and old," Brown says. Women

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### ... Women

scientists in the slide program, all attractive and successful, were photographed at home, in their offices and laboratories, and taped on subjects ranging from the excitement and frustration of their jobs to their personal lives. If Moché's packet proves effective, thousands of potential high-school and college science majors will see the series as a recruiting device.

Purdue has hired two women engineering students to act as advisers for incoming freshmen, and part-time scholarships are being offered to married women, who receive funds for tuition for one course per semester, and additional child care costs for the hours they are in class.

High schools, particularly specialized ones, are slowly falling into line. One New York City vocational school requires students to take 10 of 12 basic courses, including those previously separated by sex. While girls repair typewriters and light fixtures, boys learn stenography, cosmetology and trade dressmaking. Films about career decisions and the effects of sex roles are available to high schools, and some coeducational intramural programs are being initiated.

Getting in on the ground floor is essential to changing attitudes, scientists think. A series of polls taken in the early 1960's by Arline C. Erlick, editor of Purdue's *OPINION PANEL*, indicated an upswing in high-school students' interest in science. The trend hasn't changed since then, Erlick says, but women students still aren't interested in pursuing science careers. "In school after school we find no girls who want to go into science." Females in general

show less interest than males in science and mathematics, and more interest in English and business courses. From other studies, generalizations about those few high-school girls interested in science have emerged: They tend to make better grades in school than other students, participate in extra-curricular activities, and are often from families in which at least one parent is employed in a science-related field. They express aspirations for a college education and future high earnings, and a present need for career counseling.

But once the female scientist enters college, her chances of accomplishing her goal quickly diminish. Obstacles such as an absence of adequate model students, failure to question socialization forces which define and limit her aspirations, a dependency on the opinions of men and a desire to be socially accepted quickly get in the way of success in school. "Excellence in competitive achievement," Dora Helen Skypeck, associate professor of math education at Emory University, says, "is either consciously or unconsciously associated with a loss of femininity and the possibility of social rejection. . . ." Skypeck and her associate, Eugene C. Lee, discovered through a decade of research that while more than half of all male science majors decided to become scientists while still in high school, 70 percent of those women who became scientists did not decide on a career until after graduation from high school. Since science majors are usually required to have at least two years of pre-science training before acceptance into specialized programs, many sophomore college stu-

dents find themselves inadequately prepared to enter science departments with their male peers.

The number of freshmen women expecting to major in science hasn't changed much in the last decade, data collected by the American Council on Education indicates. In 1967 about 9 percent of the women entering college said they intended to major in the physical sciences, engineering, mathematics or life sciences; in 1973, 10 percent showed an interest in those science careers. About 30.7 percent of the freshmen males intended to major in those fields in 1973.

About four times as many freshmen women said they were interested in health professions than did males. Fewer than one in 100 women expressed interest in engineering, but 12 percent of the male freshmen polled said they plan to major in it. About one percent of both men and women students are interested in mathematics and statistics, but three times as many women study computer science as do men.

If a woman is dissatisfied with her initial major selection in science, Brown says, the source of the dissatisfaction will rarely be academic difficulty, and she is more likely to resolve the dissatisfaction by switching majors or schools than by leaving the university.

Some college administrators say scholarships specifically designed for women are the only answer to attracting equal numbers of women into the field, but Brown contends that bribes aren't the answer. "What we have to do is increase the pool of girls who have legitimate interests and are intent on hanging in there." □

### ... Calculators

room. I don't think availability will necessarily eliminate the need to be able to calculate by hand. However, the calculator may shift the emphasis away from proficiency in hand calculations to a greater emphasis on the meanings of the operations and when they can be appropriately applied." Grouws recommends using calculators in combination with basic arithmetic skills by, for example, providing them to students to check handworked problems.

But Horlick maintains that using the calculator for a combination of processes is essential. "You're defeating the purpose if you only used the calculator to check answers. The child wouldn't be learning to use the principles of the calculator."

The primary question, in her view, is, "Does the student know what he's doing?" Much more emphasis must be placed on, "What does it all mean?" than on "How fast can you get the

right answer?" Those most opposed to calculators have gone so far as to ban them from the classroom, fearing that the device could become a crutch and keep students from learning the basic mathematical skills. Another argument for calculators, though, is that they make complex and realistic teaching exercises possible (how many cubic centimeters would it take to fill this room?). First graders, Horlick says, love to plan a family vacation, calculating costs of gas, motels and food.

A survey of teachers, mathematicians and laymen by *MATHEMATICS TEACHER* magazine has revealed that 72 percent of those polled opposed giving every seventh-grade student a calculator to use during his secondary education, but 96 percent agreed that "availability of calculators will permit treatment of more realistic application of mathematics, thus increasing student motivation."

In Virginia's Fairfax County, math teachers voluntarily agreed to permit

high-school students to use calculators for homework and for some class assignments, but to forbid their use on tests unless every student in the class has one.

"With prices so low for calculators, it's no more a flight of the imagination to buy a calculator than it would be to buy a textbook," Springer says. When industry uses metrics and decimals exclusively, he adds, students taught to use calculators in school will be able to adapt quickly. There is one calculator for every nine Americans, and students who can't afford their own often borrow calculators from their parents. The device has become an essential part of training in statistics and computer science.

By 1976, the price of some calculators is expected to drop to as little as \$10. If it does, the possibility of supplying public schools with them, and consequently incorporating them into elementary- and high-school math programs, may become very real. □