The missing half of our technical potential: Can we motivate the girls?
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The missing half of our technical potential: Can we motivate the girls?

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Some tips on advising talented girls

It will come as no surprise to be reminded that there is plenty of room at the top in the current labor market. There is a gap between the number of people with a high degree of technical training and the number of positions waiting to be filled. The need is increasing; at the same time, the number of students enrolled in engineering schools is declining. It would seem that the number of boys entering the field is not going to change very much—we are tapping that pool of talent to the limit of its ability to respond—and that we must look elsewhere.

The National Science Foundation predicted several years ago that an average of 72,000 engineering graduates per year will be needed to meet the nation’s requirements for professional engineers by 1970 [1].* The total number of students currently enrolled in engineering falls substantially below that figure. We should note that only 1,486 girls were enrolled in engineering curricula in the year the survey was made.

Secretary of Labor Willard Wirtz has expressed concern. Writing in Engineer, the Secretary said, "It is essential that the nation adopt a more favorable attitude toward the presence of women in many traditionally male-dominated professions, of which engineering is a prime example."

The motivation of our qualified young women toward careers in engineering is a job for all of us—parents, schools, management, labor, and professional societies.”

It is not sufficient for us to register that the need exists “out there”; it is not really of primary concern to us as teachers, unless we believe that the girls themselves are missing something worthwhile. I am quite convinced that they are, and I shall indicate why I believe that and what its implications seem to be for the talented girls in your mathematics classes.

My observations are intended to apply only to those girls who are gifted mathematically. There are many opportunities for the girl who elects to stay with mathematics; e.g., computer programming. However, since my background is engineering, I will of necessity be directing much specific material toward the physical sciences. We are going to find, however, that many of my statements apply equally well to both boys and girls, and that they may be made about virtually any professional career without loss of meaning.

Engineering is certainly not for the majority—male or female. Neither is any other profession, of course. It is always true that only those whose performance ranks high in a particular field can be productive and happy there; only they should be encouraged to enter it. Only those students who show aptitude and interest

* Numerals in brackets refer to the references at the end of this article.
in the mathematics-based sciences should be encouraged to enter them. The real heart of the matter is this: The statement applies equally well to both boys and girls.

To examine its truth, we need to examine the scope of engineering as it is practiced today. Engineers are radio astronomers; theoretical aerodynamicists; experts in solid-state electronics, structural design, the design of digital computers, and many other exciting things involving a high degree of technical training and virtually no weight lifting. It is the fundamental goal of engineering to utilize the resources of nature and of human nature for the benefit of mankind. Probably 90 percent of today’s engineering jobs are done at a desk or by a computer or in the laboratory; they can be done equally well by either trained men or trained women.

Engineering itself has changed a great deal since the Second World War; it overlaps applied physics, mathematics, and chemistry more and more. It is unfortunate that the popular conception of the field (involving primarily heavy construction and railroading) has not yet caught up. The intensely masculine nature of the “old” engineering led inevitably to an unfortunate popular image of the rare woman who would identify herself with the profession. The image, which dooms the woman engineer to a lonely and intellectual life, supposes her to be mannish, aggressive, frustrated, and unpopular. It lives on, even though the field has changed.

It is appropriate for us, as teachers, to ask what the consequences may be of any career advice or encouragement we give to our students. In particular, the advising of girls, especially the talented ones, can be a puzzle to adults who are more aware of the realities and uncertainties of life.

What can we say about today’s young women and the world of tomorrow? How should a talented girl of 15, for example, be advised, if she has the ability for real professional accomplishment? Even at 15 there may be no time to lose in making a career decision. In order to realize her talent, she must start building a solid academic foundation in a curriculum really established to fit the life pattern of a man.

It is hard to approach her about careers at a time when her dream of the future includes only a husband, children, and a house in the suburbs. She can and should have these, but she needs to be helped to see beyond them to the day when her children are grown and she finds herself bored and restless. Almost certainly she does not consider the possibility that circumstance might force her into the position of wage earner for herself and her dependents. Without a proper education, her chances for meeting these challenges in a satisfactory way are very much reduced.

On the other hand, consider the mature woman who wants to return to school to complete an interrupted education. The colleges and universities are very much aware of her today. They are concerned with her needs; many are considering their own roles in meeting these needs. Today’s high school girl may someday find herself in this position.

It is no longer appropriate to ask whether women with children should work, or go to school, or try to combine marriage and profession. Women are already doing these things; they are not going back to the kitchen, if current trends are any indication. With their need for self-fulfillment, they are going to continue to reach out to the community around them in ever-increasing numbers. The mature woman with an empty nest has the potential to become a civic leader, a business executive or professional woman, an underpaid and dissatisfied sales clerk, an alcoholic housewife, or anything in between. She cannot be ignored in any discussion of career opportunities for women, whether we are talking about today’s teen-ager or tomorrow’s woman.

The Governor of the State of Washington was among the first to establish a Commission on the Status of Women, modeled on that of President Kennedy.
The Commission has published figures as a result of its recent study that show several important facts about the employment situation for women in this state [2]. Thirty-one percent of the married women (husband present) are currently working, as are 41 percent of the single women. Their earnings compare unfavorably with those of men, in spite of legislation to ensure equality; a difference in retirement benefits has been established. Eight million mothers employed in 1960 had children under 18; of these, 1,457,000 were the sole wage earners in their families. It is a fair assumption that their girlhood dreams revolved around a family and a home in the suburbs before fate took a hand. As teachers, we cannot ignore the implications of these figures for our students.

Women, by and large, are doing the routine “housekeeping” chores of industry; they are rarely found in the top categories of any job classification. The woman with a solid academic background in one of the professions can elevate herself from this general situation. In addition, she can have all the rewards of accomplishment in an area where she is especially talented. If her special talents lie in the field of mathematics, physical science, or engineering, how can we, in all conscience, deny her encouragement at all levels of achievement, from grade school through college?

Intelligence and special abilities are distributed approximately equally between the two sexes; this is a matter of record. Furthermore, where arithmetic reasoning ability is concerned, test scores of boys and girls have been plotted separately [3]. The result is two curves approximating the normal distribution; both are skewed, however, so that the means are somewhat different. The median score for boys is slightly higher than that for girls. A closer look shows that the curves are completely overlapping; there are nearly as many girls as boys at the high achievement end of the scale.

At the high school level, mixed groups of students have been given basic aptitude tests with the result that 6.3 percent of the boys and 4.2 percent of the girls showed an aptitude for engineering [4]. That means that we could have two women engineers for every three men, if engineering aptitude alone determined this career choice. It doesn’t, of course, with the result that less than 1 percent of all the engineers in this country are women. We must recognize that girls with engineering aptitude are rejecting this career choice, in spite of the fact that there are plenty of job opportunities for them. Engineering is probably one of the highest-paying careers open to women today; it seems that the only limitations are ability and willingness to accept responsibility.

I have just returned from the First International Conference of Women Engineers and Scientists, held in New York. There were women from 50 states and 40 nations, including Central and South America, the Middle East, and the Far East. Ireland’s only woman engineer was there. A sparkling and charming woman, she was left a widow quite suddenly, with five children to support. She was able to take up her profession of civil engineering after only a few days of briefings by colleagues. Now she is involved in the design of roads and highways for Dublin County; she and her children are secure.

Probably the most famous woman in the engineering field is Dr. Lillian M. Gilbreth, mother of twelve, who reached the public eye by way of the book “Cheaper by the Dozen.” Dr. Gilbreth and her husband were pioneers in the field of time and motion study from which the industrial engineering profession evolved. She carried on the work after his death, and among her many accomplishments are included the application of motion study and scientific work analysis to simplify and improve work methods and to aid the handicapped and disabled. The latter is a very warm and human application of scientific training. Doesn’t it seem appropriate that a woman was the first to see it?
A woman engineer in the San Francisco Bay area has put her background in mechanical engineering and machine design to work in an interesting way. She creates and produces equipment used by science teachers in the public schools.

Engineering teaching seems to me to be an excellent field for a woman. Working with students can be very gratifying, as you know; there are many opportunities for advancement in accordance with one's capabilities. Universities are actively seeking qualified engineers who want to teach. So far as I can find out, the number of women in the academic world is limited by the number with the necessary qualifications who apply. Unfortunately, few women seem to be getting the Ph.D. degree in engineering and the physical sciences. This degree has become almost necessary to achieve professorial rank in the universities.

Psychological studies suggest that the minority in a group has special contributions to make, simply because of its minority position [3]. That is, it tends to look at the problems somewhat differently. Surely we can apply this general finding to women engineers to predict that they can make special contributions to their technical fields, as the women I have already mentioned have done. This ability to see things differently is the cornerstone of creativity, a much-sought-after quality. Perhaps we should be thinking of the missing half of our technical potential in terms of the special contributions women may be able to make, in addition to their ability to do the work already waiting to be done.

It needs to be emphasized that women are making important technical contributions in the same areas as men, without conflict. Dr. Irmgard Flügge-Lotz, Professor of Engineering Mechanics and of Aeronautics and Astronautics at Stanford University, is internationally known in the field of theoretical aerodynamics and automatic control. She has made major contributions to modern aircraft design; currently, she and her graduate students are working on missile and satellite control problems and problems of heat transfer and drag of fast-moving vehicles [5].

Dr. Beatrice A. Hicks has been significant in the design, development, and manufacture of pressure and gas density controls for aircraft and missiles. She is the inventor of the gas density switch, a key component in systems using artificial atmospheres. She is also President and Director of Engineering of the Newark Controls Company in Bloomfield, New Jersey [5].

Rebecca Sparling of General Dynamics is a materials specialist who works in metallurgy and nondestructive testing. She coauthored the first paper on immersed ultrasonic testing, and pioneered the use of a dye penetrant inspection technique [5].

There are over 7,000 women engineers in this country, according to the Women's Bureau of the United States Department of Labor [6]. About 2,200 of these actually hold engineering degrees; the rest fall roughly into two categories: those who have worked their way up into the professional group from technician or drafting experience and those who have turned physics, chemistry, or mathematics into the related applied field of engineering. There are so many women doing interesting and important work that it is tempting to concentrate on them. I am going to bypass this, however, and simply leave the thought that women can be engineers, and very successful and creative ones at that.

More routine work occupies most women engineers, of course, just as it does most men in the field. If we hold back our encouragement for the rare girl who might operate at the level of Drs. Gilbreth, Flügge-Lotz, or Hicks, the percentage of women engineers will only decrease, and the best interests of the technical world will not be served, either. Women engineers, by and large, are real people doing real jobs that many of your students could...
do, too. A person whose true abilities are being used will be productive and happy at any level of accomplishment.

A Ph.D. is not required to do interesting and satisfying work, as it is in physics or chemistry. The bulk of engineering jobs are held by people with the bachelor’s degree. Their work is interesting, well paid, and responsible to the degree that the individual is mature and capable. Another year of study can result in the Master’s degree; more interesting jobs are available to the engineers at this level. The Ph.D. is for the strongly motivated person interested in teaching and research. There are a number of women engineers with doctorates who are leading full and well-rounded lives. Their personal sacrifices have probably been greater than those of the average male Ph.D.; on the other hand, they have opened doors for themselves in the areas where engineering, applied science, and applied mathematics overlap, and where true self-expression is possible within the technical framework.

Where the counseling of girls is concerned, teachers need to be aware of the role played by cultural influences, and of the fact that unconscious choices are made that affect girls and boys differently. Boys must be prepared to earn a living; girls know that they may never work at all. Some career choices are “masculine” and others are “feminine” in our culture. There are sex differences in interest, and several masculinity-femininity scales have been constructed on this basis. Men are generally more interested in scientific activities, mechanics, physical activity, etc., while women show the greater interest in people, social and clerical work, teaching, etc. [3]. Of course, these differences are of importance in making vocational choices. It is also true that the general results do not apply to all individuals in each category, and that these apparent sex differences are artifacts of a system of social training. Whether mechanical aptitude is inherently masculine or is the result of cultural conditioning, it is no longer the most important talent for the prospective engineer anyway. The successful engineering student of today is good at mathematics; he or she is near the top in intelligence and has almost exclusively intellectual hobbies.

Materials specialist Rebecca Sparling has crystallized her views on the masculinity-femininity question in the following way: “There’s nothing inherently feminine about mixing a given batch of materials, exposing it to a definite temperature for a definite time and producing a cake. There’s nothing inherently masculine in mixing a batch of materials, exposing it to a definite temperature for a given time and producing iron castings. I’ve done both, and find them satisfying occupations” [5, 7].

Dr. Ruth Hartly, Associate Professor of Psychology at Long Island University, has this to say: “Should a woman display interest in any activity traditionally considered masculine, she is sure to be accused of rejecting her ‘female role.’ Our data suggest that the contrary of this assumption is likely to be true. The girls that showed relatively high enthusiasm for the activities of the traditional female role also tended to show more liking for some traditionally male activities. This suggests that receptive and positive people are likely to be receptive and positive about many kinds of things, without regard to the artificial boundaries of traditional sex assignments” [8].

It has been my personal observation that the truly creative people I have known have possessed an unusual degree of access to both the masculine and feminine sides of their natures—and we all have both. Surely the woman engineer, almost by definition, has made a big step toward potential creative expression, simply by being what she is.

It is an important aspect of personal growth to ask oneself the question, “What kind of person am I?” The little girl dreams of her future in various ways at different ages, and identifies with different

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roles. She is always aware of her femininity, and of her probable future as a wife and mother, but in addition, she may from time to time see herself in glamorous and exciting roles—as a great surgeon, a concert artist, or a Marie Curie. She thinks of herself as a person who can achieve high goals in exciting ways. She is quite career-oriented before she becomes preoccupied with boys and marriage, and can be quite responsive to career information. Some counselors suggest that early adolescence is a time to introduce new career concepts and widen horizons; that girls are really career-oriented at this time in their lives [9]. They have marriage as their main goal later, during senior high school and early college years. Unfortunately, this is the time when the schools are concentrating on career information. It appears that we want to reach our talented girls in junior high school, and possibly even in the fifth and sixth grades, where they are already becoming aware of themselves and of their interests and aptitudes.

Children are quite susceptible to the attitudes of their teachers. I believe that girls are especially so. Your encouragement can have quite an influence, particularly in mathematics, where girls tend to be unsure of themselves. Furthermore, you get them quite early in their school lives, and you have the prime opportunity to know and encourage the talented ones. You follow them through, from the early school years through high school, and you influence them all the way. You are key people in the education of future engineers and scientists, as well as future mathematicians.

For some reason, it has been “in” for a girl to reject and suppress a talent for math. It isn’t feminine. Her parents believe that, perhaps, and so do her friends. And so she believes it, too, unless she is something of an independent thinker. I had an advantage here; my mother was a high school mathematics teacher before her marriage. I was not burdened with the idea that mathematics was only for boys, but even so I did not particularly care for it in high school.

I had a real clash with high school geometry; it simply didn’t get through to me, and I have since realized that it didn’t get through to my teacher, either. He was the track coach; that particular teaching duty was just a chore to him. I was concentrating on a future career in music at that time, so there was no conflict about it; I simply refused to take more mathematics on the grounds that I didn’t need it, didn’t care for it, and would expect to do poorly in more advanced courses.

There was, however, a science requirement, and so I chose chemistry. After an initial struggle with unfamiliar concepts, I found myself completely fascinated with the new world that had opened up. My chemistry teacher was good, as I recall, and although he projected no strong feelings about girls going into chemistry, he was certainly not discouraging about it.

I entered college as a chemistry major, and had an introductory course in physics in the natural order of things. Physics for me was a true adventure—guided by one of the most enthusiastic and creative teachers I have ever known. His love for physics, his teaching skill, and his constant encouragement provided the extra impetus for me to set my sights on physics. There were a few drawbacks, however. In those days (the early 1940’s), physics was not yet in vogue as it is now; it was rather academic, with one’s future apparently limited to the university. Then, as now, a Ph.D. was required to do good physics. At 17, I had no interest in so many years of schooling, or in an eventual teaching career, either. I had another look, selected the aspect of physics that interested me most—electricity and magnetism—and settled on a four-year curriculum in electrical engineering.

All along the route leading me to that choice, I was influenced by teachers. (We didn’t have counselors in those days.) Certainly, I had good teachers in such subjects as history and biology. It was some

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combination of my own aptitude and interest together with encouragement from a teacher that determined the choice.

A girl who has the interest and aptitude for a career in engineering must be willing to work hard and must be sure that she really likes the work. In high school, her feelings about problem-solving in mathematics and physics can be used as a realistic measure of interest. She must enjoy the challenge of such problems, and must find real satisfaction in solving them. The problems will become harder if she goes on into science or engineering; they will also become more interesting and more rewarding [5].

Almost all engineering schools admit girls, and they serve as a valuable testing ground for the student in many ways, including the technical. Here the coed will meet most of the problems of an engineering career and can decide without getting in too deep whether engineering is the best career for her. She either resolves the problems to her own satisfaction or decides to try another major. The dropout rate after the first year of engineering school is very high for students of both sexes, for various reasons. Student goals, for example, are not always realistic. It is also true that the freshman curriculum is limited in scope and cannot provide the excitement of higher-level engineering problems. Most students who change their minds do so before or during the sophomore year, and may do so without loss of credit. Those hours in science and mathematics can be transferred to other work and can fill elective requirements in any other curriculum. You cannot get in too deep too fast just by enrolling in engineering school. A girl, in particular, can withdraw quite gracefully when she chooses, and with no loss of face. How many of her friends are going to be surprised that she didn’t like it?

The coed in engineering will meet some problems. She will find herself an object of curiosity, just as she will when she goes to work. Although there are some girls who really enjoy being “spotlighted,” it is not always comfortable for most; it is rather lonely at times, even under the best circumstances. The girl who is going to be troubled by these aspects of the situation will meet and deal with them almost immediately after enrolling in engineering school. A girl at the University of Washington who has just completed her junior year in electrical engineering told me that the boys were pretty standoffish at first. After they realized that she was really serious about her studies, she became just an unusual member of the group.

Certainly, women engineers have met with alarmed opposition from male colleagues, particularly in their early days. The early trailblazer found it everywhere; nowadays we find it in some branches of engineering more than others, in some companies, in some supervisors. Attitudes have changed considerably during my working lifetime. I believe that discrimination will continue to decrease, particularly as the need for engineers continues to exceed the supply. Working women are well accepted in our society now, and will continue to be. The effect of this acceptance on the woman engineer will be significant. I am completely unaffected by prejudice in my position at the University of Washington; there is no difference in my salary, academic rank, acceptance, or work load because I am a woman.

It has been my observation through the years that real accomplishment in the world of technology is very concrete, and cannot be denied. Admiration for a job well done can be counted on to outweigh other possible attitudes from employers and colleagues; the resulting satisfaction can compensate for other feelings, if they exist. Interest in one’s work for its own sake can prevent preoccupation with possible problem areas. The well-adjusted person of either sex in any job classification can either accept some difficulties in his working situation and find his satisfactions away from the job, or else he will “adjust” himself into another office or laboratory where the climate is more favor-
able. There are so many choices as engineering expands and grows in scope, and so many job opportunities, that it seems unnecessary for any woman to remain long in an unfavorable situation [5].

Electronics is a good field for women. The problems usually lend themselves to mathematical analysis at all levels, from the simple to the very sophisticated. The fact that trained women can do theoretical work, in any field, as well as men is obvious, but much of the experimental work in this field is well suited to women. It tends to be precise, and the equipment is clean, small, and lightweight. Of 7,211 women employed as engineers in 1960, 1,474 were working in some branch of electrical engineering [6]. The field is quite broad in scope and very dynamic—its horizons are moving upward and outward all the time. Such diverse interests as radio propagation and astronomy, solid state electronics, plasmas, digital computer design and application, antennas and microwaves, control systems, telephone communications, radio broadcasting, electrical machinery, and electric power transmission and distribution are represented.

The largest group represented in this survey of women engineers was in industrial engineering—there were 2,069. Eight hundred eight were in aeronautical and astronautical engineering. Chemical engineering, another of the areas open to women, had 389 in 1960 [6]. Women are found in all branches of engineering, including mining and sales.

Civil engineering, the oldest and most historic of the engineering fields, is concerned with structures, bridges, dams, highways, and so forth. Unfeminine, you say? I thought so too, until rather recently. It was a real education to meet women from the rapidly developing countries of the world—the delegates to the International Conference of Women Engineers and Scientists from the Latin-American countries, Iran, Syria, Turkey, Afghanistan, and Pakistan. They were civil engineers, by and large, because that kind of skill is needed by their countries right now, and hence the job opportunities are in this field. They reported that they are encouraged, and even pushed in some cases, to go into engineering; they expect to help in the important task of raising the living standards of their countries and their people. Most of them were so feminine that they looked like flowers. What is masculine and what is feminine vocationally seems to have little objective basis; it is all in the eye of the beholder.

The fact that women bear and care for children has certainly affected hiring policies in all areas. Much has been made of the fact that women leave their jobs to care for their families, and relatively little of the fact that men leave jobs rather often, either for advancement or for change. Furthermore, women live longer than men, on the average. Little account seems to be taken of this statistic, but it would seem that it might receive more attention as regards the employment and training of women. With so many women working, these problems have to be dealt with by society no matter what careers women choose [5].

Promotion policies are usually more favorable for men than for women. One of my Seattle friends, a woman engineer who supervises 60 people at Boeing, believes that if a man and a woman of exactly equal qualifications were up for promotion to the same job, the man would win. She adds that she has never seen a situation that equal. Nevertheless, it is true that many women rise to executive positions, but more do not. It is quite likely that many women are making the choice themselves, consciously or unconsciously. It would seem to me that the situation will become more favorable in time, as more and more talented women enter and stay in the professional categories.

The Society of Women Engineers has surveyed its own membership in recent years, and has drawn a statistical profile of the woman engineer. The Society finds
“that most women engineers marry and raise happy active families—just as do most women everywhere. They do tend to marry late, often in the late twenties to early thirties, but once married, they also tend to stay married” [10]. This is of great importance to our teen-agers and to their parents. Perhaps more of the missing half of our technical potential will begin to come into the field if we can be confident in reassuring our students that this vital area of a woman’s life is also a part of the life of the average woman engineer.

Professional women tend to marry men with professions of their own—engineers, lawyers, physicians, etc. Many work a few years while their husbands are in graduate school; their salaries provide a better standard of living during this period than is usual.

Those who retire completely do so with a greater sense of security than the untrained, who rush into marriage without completing their schooling. The woman engineer has learned to do something interesting and worthwhile. It is difficult to learn and to do well. Her feelings of self-worth are very much enhanced, even though she is not currently practicing her profession. It is rare for the woman who has mastered the engineering curriculum to regret her training, whether or not she has ever used it [5]. A Seattle judge who has seen and heard the stories of many people in faltering and broken marriages says that she believes many marriages could be saved if the wives were able to take over and to carry on during periods of financial difficulty.

Those in temporary retirement are always concerned with the day they return to the labor market. It is tempting to try to keep up during the retirement period. This can be difficult, particularly in the rapidly advancing fields. Some women can do it, some cannot.

The woman whose training is out of date when she is ready to contribute again still has several avenues open to her. She may consider technical writing, a good field for women. She may be able to do it on a part-time basis, or free-lance, depending on the industrial area in which she lives. She can certainly plan to earn enough to take care of the cost of household help and baby sitters. Technical advertising is another possibility.

Computer programming is excellent for women with training in either pure mathematics or in engineering and science. The future here is very bright, either for the woman who has been out of school for awhile or for the recent graduate.

Problems of technical obsolescence are not confined to women. Men in many branches of engineering and science are also affected, even though they have been working right along in some area of their special fields. The so-called half-life of the engineer* is receiving much attention from educators, industry, and the engineers themselves. It seems reasonable to assume that whatever steps are taken to relieve the situation for men will also benefit the woman engineer whose training is out of date.

Partial retirement is sometimes possible, but is usually the province of the highly trained woman who is well established in her field. Consulting is not for the novice, but a number of the top professional women have done this from time to time, during periods when they were needed at home.

Part-time appointments are likely to be available to the women in teaching and research during the “young family” years. Lectures can be written at home, and sometimes research of a theoretical nature can be done there.

Some women hire housekeepers and continue to work while their children are small. It has been popular in the past to assume that this practice can only result in harm to the children. Evidence gathered by psychologists and sociologists does not support this conclusion, however. There appears to be no evidence that the profes-

* Said to be about ten years in some fields, and even less in those with rapidly advancing technologies.
sional woman would be a better mother if she stayed home. Dr. Ruth Hartly has this to say, "... we know that women who like their work are also likely to be warm and accepting to their families, that people who accept themselves are also accepting toward other people and toward the institutions of their culture. Interest and enthusiasm seem to expand with practice. In view of the unpredictability of the future, it seems most sensible to encourage the young individual, male or female, to stretch all capacities and horizons as far as possible" [8].

I would like to quote Seattle's Dr. Bernice Sachs on this point, too. She specializes in Psychosomatic Medicine and has had much experience with women and their problems. It is Dr. Sachs' observation that "many psychiatrists and social workers now feel that a number of women make better mothers and produce healthier children if they do not mother them full time. ... The woman who seeks all the meaning of life in motherhood places upon her children a burden their shoulders were never meant to bear—that of providing her with her happiness" [11].

My own feeling is that the professional woman who continues to work when the family is not in need of her income has a strong need for self-expression that is not met in her role as housewife. The woman who successfully manages home, motherhood, and career is doing so because she is intensely interested in her work and feels that she cannot do otherwise. Occupations are very important in our culture, because so many personal needs are satisfied by them. They give us status and feelings of personal esteem; they satisfy our needs for self-expression. If some women cannot fill these needs at home, they must work them out, each in her own way, with the cooperation of their husbands. The woman with professional training has a carefully cultivated outlet for these needs; the untrained woman with the same needs and motivations will very likely devote herself to club work or community service [5].

One of the interesting women I met in New York was Yvonne Clark, Associate Professor of Mechanical Engineering in a Tennessee university. She teaches full time, works in government-sponsored research in the summer, and has a husband in medical school and small son. Yvonne is an American Negro. She is positive and enthusiastic about engineering as a career for the Negro woman. She says that she would not hesitate to counsel the interested and talented girl into an engineering career, and observes that things are moving and opening up very fast right now, with many positions already available. One cannot talk to a ninth-grade girl in terms of jobs that may be had today; we must look ahead a good many years to the day when that girl has completed her professional training. Professor Clark is emphatic in her belief that only the talented should be encouraged, and that advice applies equally well to all students, without regard to sex or color.

No story about women in engineering is complete without a few words about Seattle's vivacious Patricia Corwin [5]. Pat has 7 children, a Master's degree in Ceramic Engineering, and a laboratory in her own home where she designs ceramic transducers on contract. She does the production and testing, while her husband, also a ceramic engineer, is away at his own job; he works at home in the evening. Their work has led to commercial products, on occasion, such as a fathometer transducer used by boats to detect rocks, schools of fish, etc. This is an electro-acoustic device that converts electrical to mechanical energy, and transmits pressure waves at audible frequencies to the water surrounding the ceramic element.

When Pat is working to meet a contract deadline, the whole family organizes to help. The oldest child does simple testing of the ceramic, other older children go on a pay scale for babysitting with the younger ones. The children keep their own accounts, and present their claims to Pat when the check arrives. She says that the

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children watch the mailbox avidly when a check is due, and that throughout the whole operation, there is a very strong feeling of working together for a common cause.

She feels that she could not possibly earn as much working outside her home, even if this were possible. Furthermore, she can work or not, as it is needed or convenient for the family. She believes, as so many women engineers do, that her training is a very effective insurance policy for her family. She is able to provide for them, if that should ever be necessary, and she is not out of touch with her field while the children are young.

Physical stamina is no limitation to the woman who wants to go into engineering; neither is mechanical aptitude, whether she has it or not. Certainly, salaries are attractive. Women have their full share of the intelligence distributed to the human race, and engineering does not require more of it than any other profession. Interest and aptitude are the most important features, just as they are for any other career, and just as they are for men.

The image problem seems to be the major deterrent to our talented girls. The only way that it can be brought into line with reality is by way of personal contact. Few woman engineers would refuse an opportunity to talk with interested girls and their parents and teachers. The Society of Women Engineers, with over 700 members, and chapters in 17 cities and 17 colleges, has the counseling and encouragement of students as one of its primary goals. Its members are their own best public relations experts. No statistics, logical arguments, or pages of persuasive writing can compare with the impact of a real woman engineer who is a normal human being, probably married, and probably well-adjusted and happy.

Teachers, too, can project a positive image in line with the concepts of our changing social climate. It can be an important contribution to a talented girl and to her future, just to be aware that a new woman is emerging in our culture, a woman who plays many roles and is capable of growth in a number of areas. Many branches of science and engineering are growing and changing rapidly; some are quite new. It seems appropriate that this "new woman" should help populate new career fields. Woman have done it in new branches of medicine. Psychiatry, for example, is not considered as masculine as surgery. Why should radio astronomy be masculine, or theoretical aerodynamics, even though the minority activities of construction and power machinery remain so?

The girl who is enthusiastic and creative will be welcomed by many professions and should be encouraged to give careful consideration to all the doors that may be open to her. If she likes mathematics and science, and has a real aptitude for them, encourage her to try out her abilities in these areas in college, with an eye toward an exciting and rewarding future. Encourage her to think of herself as a person who can reach high goals, who can grow and become anything she wants to become. She can be responsible, creative (in accordance with her special abilities), productive and satisfied even if she lacks that unusual spark of originality; she can meet interesting people, do fascinating and rewarding work, and even contribute to the world around her while fulfilling her own needs and ambitions. If she really wants to, she can be an engineer.

References

6. McConnell, Beatrice, Deputy Director,
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