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Why Won't Jane Go to Engineering School

(Hint: Jane is not dumb)

BY MOSHE KAM

The campaign to attract women to American law schools had really taken off in the early 1970s. The American Bar Association and state legislatures in the 10 largest states took it upon themselves to double the percentage of female lawyers in a decade. The slogan for the campaign was "20 Percent by 1980."

Civil leaders, entertainers, and politicians took part in the well-financed campaign to inform girls and young women about the virtues of the legal profession. They highlighted the contributions made by lawyers, judges, and legal scholars to programs involving equality, social justice, and welfare. They publicized the professional and economic rewards of becoming a patent lawyer or a judge. The long-running TV series "Defender of the Damned" highlighted the life and times of Gladys Towles Root, the controversial 1920s Los Angeles lawyer. It was a runaway hit during the 1974 to 1978 seasons, and gave rise to the equally successful TV series on the life of the first black female lawyer in the United States, Charlotte E. Ray.

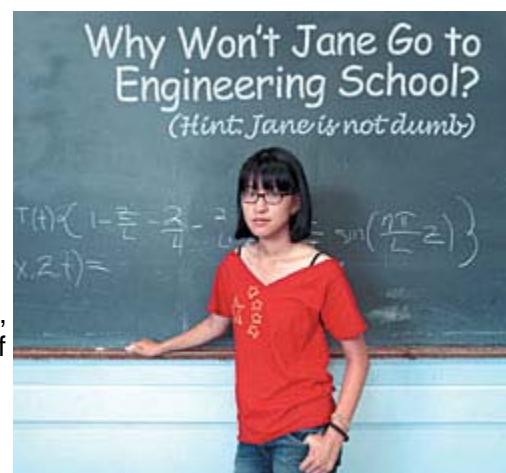
There were numerous lectures in schools, and public events were held in large and small towns alike. Lawyers and judges descended on schools in their local communities to make presentations to eager female students and to provide the ever-so-needed "human side" of the story. Governors declared "Woman Jurist Day" in state after state. Bus, newspaper, radio, and TV ads promoted "legal summer camps" for girls, heavily subsidized by local bar associations and large corporations. By the time U.S. President Reagan introduced Sandra Day O'Connor to the nation in 1981 as the first woman to be appointed to the U.S. Supreme Court, the leaders of the campaign could point to great successes everywhere.

The percentage of female lawyers doubled in three years (from 9.5 percent in 1971 to 20.1 percent in 1974). By 1981 it was 35.8 percent, certainly better than the original plan of "20 Percent by 1980." By 1996, the percentage climbed to 44.4. Strong gains for women were recorded in the leadership of the legal profession—the percentage of women among the ranks of federal judges, law school full professors, and law firm partners has been rising steadily. Although some claims about discrimination and a salary gap between men and women in the law persist, there is no doubt that the scene has changed dramatically since the beginning of the public crusade.

If, after reading this, you are puzzled about some of my facts or have somehow missed the reruns of the ever-popular "Defender of the Damned," I have a good explanation: the numbers I quoted on the percentages of women professionals in the legal profession are correct, and Gladys Root and Charlotte Ray were indeed significant historical figures; however, the rest of the story is fabricated.

There was no ABA campaign, no bus ads, no summer camps, and no "Woman Jurist Days." In the legal and medical professions, the phenomenal rise of women to prominence (if not yet equality with men) occurred with very little institutional inducement. It was the result of social change, the rise of new political movements, increased political freedom, new legal rights, economic pressures, and changes in technology. Women identified opportunities in these fields and fought to be admitted. No degree of conservatism expressed by the Old Boys network or artificial barriers to admission proved to be real obstacles.

When female graduates of law schools were refused entry to the bar in the late 19th century, they created their



own support groups and arranged political campaigns to fight rejection. There were battles in the legislatures of Massachusetts, Minnesota, and many other states. Societies of “sisters-in-law” sprung up everywhere, and intense action by activists has continued for more than a century. The number of women in medicine and law is projected to stabilize in about a decade, at close to 50 percent.

ENGINEERING STANDSTILL Which brings us to our profession: engineering. The participation of women in engineering, in spite of some increases in the last two decades, continues to be anemic. Between 1983 and 2000 the percentage of female engineers in the U.S. workforce rose from 5.8 percent to just 10.9 percent. The percentage of women receiving bachelor’s and master’s degrees in engineering has hovered at around 20 percent for several years (the Ph.D. fraction is about 17 percent). No matter how we look at these numbers and at related statistics, the conclusion is that we are not moving toward parity; by and large, we are not moving at all.

Not that we aren’t trying. The efforts to understand why young women do not choose engineering as a career path and the various programs designed to reverse the course are numerous. Between 1993 and 2003 the U.S. National Science Foundation awarded 211 grants under the Diversity in Science and Education program. Most of the grants addressed the disinclination of young women to choose engineering. A summary of the NSF-sponsored studies is said to include “helpful tips...about how to best encourage girls in pursuing science and engineering education and careers.” Yet those tips did not make any fundamental change. On average, 10 new Ph.D. dissertations are devoted to this subject every year.

One would expect that with such a growing volume of new work in this area, we would already have discovered some convincing explanations and one or two useful remedies. It has not happened. Quite a few organizations—including the IEEE Women in Engineering group, the American Society of Engineering Education, and the National Academy of Engineering—are devoted in full or in part to attracting girls and young women to engineering, and these organizations maintain a healthy number of Web sites and other programs.

The annual “Introduce a Girl to Engineering Day” was born in 2001. A major Public Broadcasting System station, Boston’s WGBH, has joined the effort and developed thoughtful public television documentaries and hands-on campaigns on engineering aimed at girls. All major engineering associations, including the American Society of Mechanical Engineers, the American Society of Civil Engineers, and the IEEE have launched or participated in similarly motivated efforts. If we are still failing, it is not for lack of programs, Web sites, goodwill, research, or budgets. Something else is amiss.

ARE WE WRONG? Let me propose a hypothesis: our basic assumptions on the intelligence and perception of girls and young women are wrong. With very few exceptions, the enthusiastic planners of campaigns to attract women to engineering (and the associated literature) all assume that what we really need is to make these uninformed females “see the light.” In other words, like missionaries who know that only one religion (theirs) is right, we reach out to the pagans to save them from their collective folly. If we could only show these women how important/humane/economically rewarding or intellectually satisfying it is to be an engineer, they will understand that their future is in, say, bridge design or microwave amplifiers. If we could only persuade young ladies who now enroll happily in law schools and medical schools, in programs in accounting, pharmacology, and dentistry, to enter the much more valuable occupations of civil and electrical engineering, then our sacred mission would be accomplished.

It is not difficult to discover what is wrong with that picture. As wage differentials erode and discrimination recedes, women enjoy a much wider range of opportunities. If a woman has the intellectual ability and persistence required in engineering school, she is also welcome in other challenging programs. Unlike the engineering classroom that has preserved many of its 1950s qualities, the alternative programs often offer a friendly and inviting atmosphere, modern teaching methods, and a much more immediate connection to real-world applications.

VANISHING APPEAL Reform attempts notwithstanding, engineering school continues to be a dreary and stressful affair. Typical curricula still struggle to include “all that is important,” and as a result they are

overstuffed and unattractive. More study subjects are likely to be crammed into the heavy course list; fewer obsolete old favorites are likely to be retired. The post-university workplace is not much better. Compared with the fields of education or health care, the ethos of the engineering workplace—long hours, high stress, competitiveness, a “one size fits all” mind-set—is uninviting. This is especially true for women, who still carry child-rearing duties in our society much more heavily than men.

The lackluster engineering education experience and the often unaccommodating (and increasingly unstable) engineering workplace have affected men as well as women. During the last 20 years, enrollment in U.S. engineering programs has lagged significantly behind the overall growth in college and university enrollments. There were demographic changes as well—engineering students in the United States are increasingly recruited from communities that struggle to lift themselves into the middle class (most notably, first-generation college attendees and first- and second-generation immigrants). The news about offshoring of engineering jobs, whether accurate or not, has not helped.

Clearly, some of the appeal of engineering as a key to upward mobility has vanished, and it is not surprising that young successful women, even those who have taken the right classes and are prepared for engineering schools, are not that impressed with the opportunity. When we also tell them (as we do) that in order to be an engineer one must be “a fan of science and math” and “juggle projects, lab exercises, and reading assignments” they take one last look at us and flee. In the table below I show how the popular CollegeBoard Web site describes several college study majors. The lawyer-to-be will “engage in intense discussion of thorny legal problems.” The computer engineer? She will “spend lots of time solving tough math problems.” Take your pick.

Young women are not dumb. The problem is not that they need to change. The problem is that we need to change. In the view of many young people, women especially, engineering represents a collection of majors that promise hard work during college, often in a tense and demanding atmosphere, with the prospect of ultimately gaining a stressful job of questionable permanence. What will help us most is not to say that this ain’t so, but to make it so that it ain’t.

COURSE CHANGE We have put enough money and effort into ads and Web sites. We have a cabinet full of trend studies that made very little difference, and lists upon lists of unhelpful tips from carefully written dissertations and long observational treatises. It is time to change direction.

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Here are two ideas to start the process: whether we like it or not, the current engineering curriculum has demonstrated itself to be strongly oriented toward males. As unfashionable and unseemly as it may sound, the time may have come to try consciously to develop an engineering curriculum aimed deliberately at young women. This may sound heretic. However, when everything else fails (and I would argue that everything else has indeed failed), it may be time to address the curriculum problem directly rather than ignore it and try to hide it in glitzy propaganda campaigns (which women do not fall for anyway). One likely outcome may be that this new reengineered curriculum would also appeal to many talented men who are repelled by the same deficiencies of the current curriculum that have driven most women away.

Second, we need to work with industry and experts in occupational choices, labor, economy, psychology, and popular culture to develop new engineering workplace models. These models would be designed to be in better harmony with the tastes, sensitivities, lifestyle, and family obligations of the modern, educated middle-class woman. I realize this too may sound a bit out of style; after all, we are supposed to enjoy full equality and exhibit unquestionable sameness by now. However, the reality is that with only 10 percent of engineers who are women, the engineering workplace is anything but equal. In other professions and occupations the workplace evolution has occurred naturally, shaped by market forces and social pressures. In engineering we may have to give it a little push.

If we (professional organizations, federal funding agencies, research institutions, colleges and universities, the engineering industry) insist on trying again and again the same formulas, studies, and campaigns that have disappointed us for 30 years, we are certain to get exactly the same unsatisfactory results. In that case it would

be much more practical to acknowledge that engineering is for men only, and move on to the next problem.

CAREER RUNDOWNS AT WWW.COLLEGEBOARD.COM

SUBJECT	IT HELPS TO BE	ARE YOU READY TO?
Law	Fascinated by the relationship between law and society	<ul style="list-style-type: none"> • Engage in intense discussion of thorny legal problems • Study actual court cases • Join your school's legal studies association
Broadcast Journalism	Quick of mind and sharp of tongue	<ul style="list-style-type: none"> • Learn how to find and interview sources • Write radio and TV scripts • Record and edit sound
Computer Engineering	A problem solver and a team player who is able to work independently. You'll spend hours solving problems on your own and as part of a team.	<ul style="list-style-type: none"> • Spend lots of time solving tough math problems • Take courses in electricity, circuitry, and electronic materials early on to prepare for engineering courses • Intern off campus
Electrical Engineering	A fan of science and math who is curious about the way things work	<ul style="list-style-type: none"> • Juggle projects, lab exercises, and reading assignments • Spend hours building detailed, complicated systems • Design your own gadgets or software • Try, try, and try again when at first a project doesn't succeed

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