

# The changes of one lifetime

by Elsie Eaves, SWE Fellow member, pioneer in cost engineering

I can't resist the urge to remind you of how uncomplicated life once was and how many changes develop in one lifetime. Also I'd like to deal if I may with the questions I get that I find least applicable to me — those that stem from the assumption that I must have encountered road-blocks of masculine resistance at every step of the way. The actual situation is the opposite.

I was the only one in my Idaho Springs, Colorado, high school class of 22 students who liked algebra, the only "advanced math" on the school curriculum. Mr. Fenton was so pleased to have *someone* enjoy his math that he added trigonometry to my regular algebra assignment. That spring a mining engineer and surveyor, Walter Funk, asked the school to send the best "trig" student to see him. Patenting of gold or silver claims was still going on, but the new ones usually overlapped previous patents. He needed someone to calculate intersections and areas and exclude all previously patented areas, then make up the report for the surveyor general in Denver to support the application for a patent on the new claim. I got the job. The work was all manual: no slide rule, calculator or precalculated tables.

When I graduated, the Colorado School of Mines at Golden offered me a scholarship. But my English watchmaker father, who had no objection to engineering, *did* object to an all-men's school. (Today women make up 18 per

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(Editor's note: Elsie Eaves, "First Lady of Engineering" to McGraw-Hill Publishing Co., first woman member of the American Society of Civil Engineers, first Fellow member of SWE, died in March 1983, 20 years following her retirement after 37 years with the *Engineering News-Record*. When I met her at a SWE convention, I found out immediately why she was much-loved within the organizations to which she belonged. She was savvy, thoughtful, direct and friendly; I regarded her as "a neat lady". In my last conversation with her, she was nudging me to nudge convention-planners to provide child-care for young engineer-mothers coming to the Seattle convention, which Elsie planned to attend. People in AACE felt the same way about her. This article appeared in the May issue of *Cost Engineering* magazine. It's Elsie's talk as part of a panel discussion on "Women in Cost Engineering" during the 1982 AACE annual meeting. The article is reprinted with permission. — Barbara Krohn)



Elsie Eaves at a SWE convention

cent of the student body at the Colorado School of Mines and win 50 per cent of the academic honors.)

So I wound up at the University of Colorado in Boulder. When Dean Ketchum handed me my registration cards in civil engineering he said, "Now, Miss Eaves, you and I might as well understand each other. I believe in equal rights for women, but most women want *unequal* rights!"

I swore I'd never, under any circumstance, ask him for a favor of any kind! And I never did, nor did I need to. One example of how he was always ahead of me in making obstacles surmountable occurred at the beginning of my junior year. My father was seriously injured in an automobile accident and Mother phoned for me to come home to keep the jewelry store open. Idaho Springs had no hospital or nurses. The men formed a committee to take turns sitting up nights with Father to give Mother a chance to rest.

Dean Ketchum thought I would have no trouble making up lecture courses but graphic statics, a drafting course, would be difficult. He phoned James Underhill, the other mining engineer in Idaho Springs, and asked if I could do my graphic statics in his drafting room. Underhill was a gadgets nut; he bought everything that was new, including a universal drafting machine, which we hadn't even seen in Boulder, and broke me in on that. So while my poor classmates were struggling along with T-square,

triangles, measuring scales and compass, I was whipping off my graphic statics in a fraction of their time.

Along with assignments, the school sent quizzes and tests directly to Underhill. I'd lock up the jewelry store at 6 p.m. and head straight for his office. By the end of the quarter, Father was sufficiently better that Mother could take over the store and I was able to go back to school just in time to take finals.

Dean Ketchum had developed a great need for a faculty stenographer and had a job ready for me if I wanted it. I did. It meant that if I took three years to get two years worth of credits, I could earn my keep. He also told me not to buy textbooks for that week's crop of finals, but to use his personal copies in his office. That week before each final, at four o'clock in the morning, I went over to the dean's office and concentrated — with no distractions. But I've always felt uneasy over an unfair advantage. The dean's control textbooks were all underlined to show what he thought was essential for the instructor to emphasize.

The big general public objection to my taking engineering was that "engineers use such rough language" — this in a wide-open mining town with a saloon on every block! My first encounter with this was in engineering drafting class. (Keep in mind that this was in the blueprint age, before photo-reproduction or Xerox.) Blueprints required an exquisite drawing made on heavy drawing paper with hard pencils sharpened to the correct point on a fine sandpaper pad. The finished drawing had to be overlaid by tracing cloth, secured by thumb-tacks, and copied in India ink using special pens. Only the tiniest inconspicuous correction could be made on tracing cloth. Any larger correction meant redoing the whole tracing.

The drafting class was buzzing along as usual when an ominous silence took over. The whole class could see the catastrophe: a big blot of India ink had spilled on a large, finished tracing! The victim gave me a quick glance and exploded, "From one to 32 — *inclusive!*"

My next near-encounter with rough language (I guess) was as the only woman at a big engineers' luncheon in New York. The speaker asked me if I would mind leaving for a couple of minutes so he could tell a joke. I thought *that* was probably funnier than his joke. Anyway, I cooperated cheerfully and was soon escorted back to hear his speech.

The speaker proved to be a walking computer on unit prices of building parts and components in depth beyond the overall/sq. ft. or/cu. ft. I had been trying for quite a while to get a really good in-depth building unit price report for *Engineering News-Record*, with no success. Obviously the speaker had my best interests at heart, so I tackled him for such an article. He did a superb one. With this breakthrough I was able to get others.

What locked in my future was a summer job as draftsman for the valuation department of the Denver & Rio Grande Railroad. Every time Arthur Ridgway, chief engineer, came through the department, he stopped at my table and asked, "Do you think you understand what you are doing?"

Being temporary and a student, I got the odd jobs, some interesting — like designing a flow chart of the corporate structure, a few regular big tracings. These were to be an inventory of how D&RGRR right-of-way in Utah had been acquired in the days when Mormons had multiple wives and family names had to be checked very carefully. The report to the Interstate Commerce Commission had to be in by a set date, with heavy penalties charged for delays or errors. Everything was on schedule and in such good order that the chief draftsman left on vacation. All tracings were up for blueprinting and many blueprints had been delivered. The men had been assigned to the next project. I had the job of assembling the sets of blueprints for ICC.

On one blueprint I noticed a discrepancy between the codes on the right-of-way parcels and what should have been corresponding codes in the big lettered tabulation in the corner of the sheet that contained all the data for each parcel. The valuation engineer was in southern Colorado on business. I had to call Ridgway. A complete check showed switched tables on three tracings — all had to be redone from scratch. The blueprint boy was sent home to come back at 4 a.m.; three

men worked into the night on new tracings.

Another problem was the department's big, new "mechanization." Metal type had been cast to look exactly like hand lettering and a small hand press developed so that repetitions like *Continued on sheet Y, Continued from sheet X, Station 100+*, etc. could be "pressed" in. The chief draftsman was so pleased with this great improvement that he was the only one who had worked it.

I knew how to set type because a high school friend's father was publisher of the *Idaho Springs Gazette* and she always had to set type for the next week's issue when I wanted her to do something. So she taught me and we got going sooner. But I had never inked the D&RG hand press or tried to get the print into the right position. I got some old tracings, practiced and was able to position and put in the "mechanized" lines on the three new tracings. The blueprint boy came back, the tracings went up, the blueprints came down, the men pitched in and helped me finish up the sets, check them and get them to the mail room on time. Then we all went home for the day.

No comments, one way or another, were made about the emergency. But there were three big bonuses for me: never again did Ridgway ask me if I thought I understood what I was doing; in my final check there was an extra \$50 (now don't scoff at that, escalated by the Construction Cost Index for May 13, 1982, that would be \$1,000.64); and Ridgway took personal charge of getting me the job he thought I deserved when I graduated.



Ada Pressman (left) presented Elsie Eaves (right) the first Fellow membership of the Society. In background: Sharon Loeffler.

Col. Herbert S. Crocker, one of the most distinguished civil engineers in the country, who had been constructing quartermaster on the Brooklyn Army Supply Base and piers, was due to return to Denver. When he did, his friend Ridgway started working on him to hire me. I had taken a job with the State Highway Department. But Colonel Crocker (to get Ridgway off his back) had me come in to see him. He hired me but it wouldn't be effective until he had "someone else to charge me to." He would reestablish his old consulting practice and in addition, as *Crocker and Fisher*, start a separate construction contracting business. I would be office everything: specifications, cost control, bidding and contract documents, correspondence — anything that turned up.

Colonel Crocker had only one fixed rule and was constantly admonishing me to "Remember Rule 5." Rule 5 was — *Don't take yourself too seriously!*

Our office was headquarters for visiting engineers and especially for W.W. DeBerard, western editor for *Engineering News-Record*. He was in Denver when Colonel Crocker was the engineer for reconstructing the 16th Street viaduct using the old girders for floor beams and prestressing the new girders to hold the camber. DeBerard asked Crocker for an article on it for *ENR*. The Colonel said, "OK, Miss will have it ready for you in a month." Poor Mr. DeBerard! That was not exactly what he had in mind, and there was nothing he could do about it! I sent text, tables, drawings and photographs to him on schedule and the article was published with my byline. (Years later when he was city engineer of Chicago, I stopped while en route to Colorado to see him. He told me then that he had tried to get a big enough budget from *ENR* to hire me as his assistant in Chicago, but never got it.)

In 1926 new business had slacked off in the Rocky Mountain area and I wanted to try my wings in New York. So Colonel Crocker equipped me with letters to friends: the editor of *ENR*; Colonel Chevalier, the business manager; H.C. Turner, president of Turner Construction Company, contractor for the Brooklyn Army Supply Base; J. Waldo Smith, chief engineer, New York City Board of Water Supply, and Robert Ridgway, chief engineer, New York City Board of Transportation.

I started with the editor of *ENR*.

(Hadn't they given me a byline?). He was wonderfully considerate and helpful and eager to prevent me from getting off to the wrong start. He advised me that woman's place was in the department store and he recommended Macy's.

I then tackled Colonel Chevalier, who asked about Colonel Crocker and had a good laugh over my account of some of the traps Colonel Crocker had set to keep me fully alert as to what was happening on his assorted projects. Chevalier had no openings but asked if I could give him a week to see what he could do. He had just promoted Robert Tomlin, managing editor of *ENR*, to be director of market surveys, an entirely new department. When I checked back, he hired me as Tomlin's assistant.

But I resigned the next morning on the grounds that I did not want any job that was measured by a time clock. (The McGraw-Hill Personnel Department had put me on the time clock and I had to wait while a bright little messenger girl clocked in about 12 of her associates who had not yet arrived.) Colonel Chevalier said he'd fix that and did! I was off the time clock after one punch. He also got a desk for me. The first week I drifted around using whatever desk belonged to an editor out on a field trip. McGraw-Hill soon bought *Successful Methods*, made Tomlin its chief editor under the title of *Construction Methods*, and made me director of market surveys.

When I had a "responsible charge" job in New York, Colonel Crocker and Dean Ketchum got together in Colorado and asked me if I would be willing to risk a test case to break through the American Society of Civil Engineers' opposition to women members. Nora Stanton Barney, Cornell 1905 *cum laude*, Sigma Xi honorary scientific society, and recipient of the highest praise for her professional abilities, had been a junior member of ASCE and like her grandmother, Elizabeth Cady Stanton, was a woman's suffrage leader and a vigorous crusader for equal rights for women. At the end of the 12-year limit on junior membership, she applied for transfer to associate member and was turned down, presumably because ASCE did not want to be used or involved in the women's rights activities. She sued them, but it was one of the few battles she ever lost.

Associate member then was the

equivalent of member today and carried full voting privileges. I applied for associate membership and Dean Ketchum and Colonel Crocker followed through.

The chairman of the first committee I was on in the Metropolitan Section of ASCE called to tell me that the first meeting would be at lunch at the Engineers Club. I said, "Sorry, you will have to park me in the ladies' waiting lounge just before you get to the lobby and pick me up when you leave."

"That's nonsense," said he. He phoned back that I was to report in at the lobby door. There a member of the club staff was waiting for me. He escorted me to the elevator, emptied it of the passengers already in it and took me to the committee's dining room on the eighth floor. The procedure was reversed when the committee broke up and the staff member escorted me all the way to the street door. On both trips I had a tough time keeping a straight face.

In the Depression, all survivors in McGraw-Hill got four 10 per cent pay cuts, one right on the heels of the other. The Business News Department of *ENR* was decimated. The manager and statistician were both laid off, as were eight of the 15 women on the production staff. I was made manager of what was left — in addition to the market surveys — and the construction editor took on costs, prices and statistics, which he hated. When things settled down, the market surveys went over to the business department and the costs, prices and statistics came to me. I loved them. The department grew to 25 on the office staff, more than 100 field construction project reporters and 20 price reporters.

Many *ENR* readers came in to consult the editors when they needed special information fast. Of course, the receptionist called me when costs and statistics were involved. In the beginning I could see the caller's face fall when I turned up and he thought he was being pushed off on a clerk. So I always explained that everyone at *ENR* was highly specialized — if he would tell me what information he needed I would get him to exactly the right person. Then I'd answer his first question, his second, sometimes a third and he'd brighten up and ask, "You aren't an engineer, are you?" Each enjoyed his discovery and I had a good friend who gave me more information than I gave him.

AACE has been generous to me: an invitation to speak on construction cost indices at the first annual meeting, the opening of membership to me "on the strength of my skill in eating lobster;" the Award of Merit with John Hackney covering for me in Cleveland and AACE arranging with the Associated Engineers in Dublin to present the award to me on the same date in a special ceremony at their dinner for members of the Second International Conference of Women Engineers who were touring Ireland; then honorary life membership when I could translate the cable in Gaelic that I had sent to Cleveland from Dublin. "A hundred million thank yous" (borrowing the Irish gift for expressing things graciously); and your recommendation of me to the delightful Dr. D.H. Allen, Department of Chemical Engineering, University of Nottingham, Great Britain, editor of *Engineering and Process Economics*.

My automatic retirement from *ENR* (1963) came just before the second wave of vigorous crusaders for women's rights rolled in with their discovery of that great masculine resistance labyrinth that has been so lavishly publicized.

By a stroke of luck I just missed both the first and the recent activist drives for women's rights, also the many workshops on how to get ahead by being assertive. Somehow, in engineering, the most constructive of all professions, opposing forces are valuable mainly to stop or slow each other. Directed forces, with differences of opinion negotiated, score higher than adversarial or confrontation tactics and name-calling on the productivity scales — and with both more wit and more wisdom.

I am delighted with the growing number of women in cost engineering. My belief that they have special insight and add complementary talents to the profession is strengthened by the bigger and bigger jobs and the important AACE offices they hold.

Having lived in less complicated times and survived many, to me, big changes, I am overwhelmed at the complexity of today's technical world in general and of cost engineering in particular. I am also breathless at the accelerated rate of change. In addition, I am envious of the exhilaration you mainliners earn and must thoroughly enjoy as you conquer both.