William H. Corcoran

A Much-Honored Chemical Engineer

William H. Corcoran has collected enough honors during his career as a chemical engineer and educator to fill several pages on a resume. But the one that means most to him is a handsome plaque hanging beside the door of his office and inscribed, "To our fearless leader: We promise to love, honor, and obey mass, energy, and momentum balances throughout our lives. Class of '77."

This plaque, signed by all the members of Bill's senior course is, of course, a token of affection. It is also a kind of capsule comment on Bill's character. With his sincerely held and strongly enunciated beliefs and his firm commitment to advancing the causes to which he is dedicated, Bill is in many ways a fearless leader indeed. Fortunately, he also has a sense of humor that allows him to laugh at himself, and he never holds a grudge against those who don't see things his way.

The affection expressed by the plaque is probably one result of the pleasure Bill takes in teaching, but teaching is only one of the many roles he has filled during his 37 years as a chemical engineer — all with great enthusiasm. He has been president of the American Institute of Chemical Engineers (AIChE), Caltech's vice president for Institute relations and executive officer of its chemical engineering department, an executive in the biomedical engineering field, and a consultant to the biomedical industry. Now Caltech's Institute Professor of Chemical Engineering, Bill deserves his reputation for hard work and achievement.

Bill is one of those rather rare individuals in his generation who is actually a native of Los Angeles. His father, a California farmer, died when he was a year old, and he was raised by his mother, who worked as a credit manager for a wholesale grocery company, and his grandmother, a retired teacher. He attended Los Angeles public schools, including Norwood Grammar School and Fairfax High, where his fascination with the way things worked was stimulated by his biology and physiology teacher, Doris Siddall. Mrs. Siddall had the kind of pedagogical devotion that frequently led her to get up at 3 a.m. and travel by Pacific Electric car to San Pedro to collect fresh samples of sea life from the tide pools to illustrate her lectures. "Her style was a tremendous inspiration to me," says Bill.

Last year, after what he terms "40 years of thinking about it," he looked up Mrs. Siddall, now 87, and brought her to Caltech for a reunion, complete with lunch and a tour of the Institute's facilities. Meanwhile, he had other reasons to recall his high school days: In 1976 the Los Angeles School District honored him as one of its 50 outstanding graduates.

Back in the late 1930s, with college approaching, Bill weighed careers in medicine and chemical engineering, but believes now that he's fortunate in the decision he made. "If I'd become a doctor," he says, "I'd have lived and died with every patient."

In addition to studying at Caltech, Bill found time to write for the *California Tech*, play four years of intercollegiate baseball, and participate in all of the intramural sports, which meant spending almost every afternoon on the practice field. That was a matter of both pleasure and principle, and Bill continues to believe in the importance of keeping fit — a view he often expresses to his students.

From the day he enrolled, Bill found that "one of the great things about Caltech was its high density of interesting people," so he elected to stay on for graduate work after earning his BS degree in 1941. During his first year as a graduate student he met Martha Rogers, secretary to chemical engineering professor Bruce Sage. The couple became engaged six weeks after their first date, and they were married on Sadie Hawkins Day exactly a year later. Bill notes that among the many desirable traits Martha brought to the marriage — including, he happily proclaims, intelligence, wit, charm, beauty, and a love of all kinds of sports — she came equipped with a handy knowledge of chemical engineering terminology, thanks to her work in Sage's office.

The war interrupted Bill's graduate work, but beginning in the fall of 1942 he was on the campus as a research supervisor and development engineer for the National Defense Research Committee of the Office of Scientific Research and Development. He worked on interior ballistics and processing of propellant for artillery rockets and on the Manhattan Project for the firing mechanism of the atom bomb.

With the war at an end he returned to graduate studies,

completing his work in 1948 as one of the first two people to receive PhDs in chemical engineering from Caltech. He and Martha then left for Berkeley where he had a position as director of technical development for Cutter Labs.

Corcoran loved the atmosphere of industry. "It's creative," he says, "and there's a gratifying immediacy about the work. A chemical engineer in industry can go to the end of the production line and see the results of his efforts. Also, the hours, the pay, the support staff, and the equipment are usually better than at a university. To turn away from this requires a very special reason."

When he was asked to return to Caltech in 1952 as an associate professor, the very special reason prevailed — he couldn't pass up the opportunity to work with students. He also looked forward to the independence of an academic career. "I relish an opportunity to be myself," he explains. "In the industrial world, if a company has to make a 90-degree turn in direction, then its engineers have to turn 90 degrees with it or get out. At a university you have more freedom to choose your own direction."

The direction Bill chose has combined teaching, research, consulting, and commitment to the evolution of the chemical engineering profession. He has expressed his views and explained the results of his research via coauthorship of two books and more than 85 papers. His willingness to take on responsibility and hard work has led to his becoming, at various points in his career, a recognized leader in a dozen or more professional and educational organizations and committees. His contributions have won him numerous honors including the Lamme Award of the ASEE for excellence in his profession, the Western Electric Fund Award for excellence in teaching, the Founders Award from the AIChE for impact on his profession, and the Educational Achievement Award from the California Society of Professional Engineers. One other honor — and it ranks at the top with Bill — is the award from the Associated Students of Caltech for teaching excellence. Just recently he received the Engineer of the Year Award from the Institute for the Advancement of Engineering and was elected to the National Academy of Engineering.

In 1969, in addition to keeping a full load of teaching and research, he became vice president for Institute relations with responsibility for Caltech's development and public relations programs. That was no small commitment because it was a time when universities throughout the country were faced with skyrocketing costs and plunging incomes. Last July, after a decade in the fund-raising trenches, he relinquished that job to become Institute Professor of Chemical Engineering and to be responsible for examination of Caltech's and JPL's interactions in helping with the United States' energy program.

In his vice presidential role, Bill guided Caltech a long way toward the successful conclusion of a $130 million development program. A pedagogue all the way, he also did a lot of guiding of his staff on the need for clarity and precision in the use of the English language. "Please clean this up by getting to the point," "Please eliminate 'tangible' as an adjective in describing dollars," and "No self-respecting grammarian would ever start a sentence with 'it,' " were among his written directives. The staff preserved many of those memos and presented him with a scrapbook full of them when he retired from that position. It's a gift he treasures.

Handling two full-time careers, he also maintained two offices, one in Caltech's executive chambers on the third floor of Millikan and another in the chemical engineering building where he could be more easily accessible to the 30 or more students for whom he is adviser. "Don't ever try to con me by telling me you can't find me," he frequently told them. "I'm available all of the time." He meant it too. His staff soon learned that an appointment with an undergraduate ranked equally in importance with an appointment with a major donor, and that a trustee could be kept waiting if a student was undergoing a genuine personal crisis.

Whenever Bill has to be out of town, he leaves his students a telephone number where he can be reached. Call him collect, he says, if they have a problem that can't wait till he gets back. "Any time, day or night," he declares, adding, "but if you call after midnight, you'd better have a relatively good question."

Bill is known for his willingness to talk with his students about any problem from confusion over transport phenomena to a romance gone sour or how to budget their time. He advised one troubled young man to write down a schedule for how he planned to use his time during the coming week. When it revealed that the student was dating three girl friends, Bill suggested that he go the painful route of cutting down to one. Characteristically, Bill told him that his first priority was to stay healthy; his second was to attend to his studies; and extracurricular activities — even girls — would have to come third if he hoped to be successful at Caltech.

As a teacher, he dispenses prodigious amounts of work and tolerates no nonsense from procrastinators or goof-offs. But he also gives extensions of time when a student has a genuine problem, and he goes out of his way to help them find jobs. He has even served coffee and doughnuts on Friday mornings at an 8 o'clock class. "This isn't a

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bribe to get you here," he tells them. "I just want to wake you up."

Bill regularly reminds his students that, through their impact on energy, the environment, food production, medicine, and the like, they are going to play roles as leaders in society whether they want to or not. "I believe it's my responsibility to remind them that they don't live under a rock," he says, "that they can't simply concentrate on chemical engineering and ignore the rest of what's happening around them."

It was partly because of his desire to have students understand the economic and sociological aspects of engineering problems that in the late 1960s Bill developed an introductory course for sophomores that was built around the study of problems based on hemodialysis and artificial kidneys. The artificial kidney offers exceptionally fine examples of chemical engineering problems, Bill explains, and the costs of its maintenance and efficient use provide a good focus for the need to keep economics in mind while designing chemical systems. And finally, in dealing with human beings, students gain new insights into sociological needs and human problems.

In his current work with senior students, Bill stresses the importance of understanding the elements of design, which they apply through independent problems and case studies. In the third term the students simulate chemical processes, using Monsanto's FLOWTRAN programs. Bill doesn't give midterms or finals, considering them unproductive in a course devoted to problem-solving. He does expect that by the end of the year his students will understand the elements of design so thoroughly that they can explain the concepts in a clear, unambiguous way.

Bill's own PhD work was associated with heat transfer in fluids, and as a faculty member he has worked on the experimental measurement of the coefficients of diffusion for heat transfer and momentum and on applied chemical kinetics. He has conducted work on the pyrolysis of hydrocarbons and is now working on the reaction kinetics of desulfurization of fuel oil and coal. At the same time he has continued his interest in bioengineering and biomedical engineering and has been involved in the development of disposable hospital equipment, fermentation processes for penicillin and vaccines, and the development of mass parenteral solutions and peritoneal dialysis. Most recently he has done research on artificial heart valves.

There's no danger that all work and no play will make Bill a dull boy. He has, for example, found time for several excursions into musical comedy. He's been a regular in the Caltech Stock Company, a sturdy band of extroverted eggheads who masquerade as professors, faculty wives, and other members of the Institute community. The musicals have generally commemorated anniversaries, retirements, and the awarding of Nobel Prizes to Caltech luminaries, and Bill, picked for a solid baritone voice, has played such roles as a geologist, an illegal alien, a trustee, and a social worker.

"Some people think of Bill as an eminent educator," says Caltech's J. Kent Clark, professor of English, who has written the lyrics for all stock company productions. "But to me, Bill will always be a song and dance man. A tremendous talent was wasted when he went into fund raising."

In spite of the demands of his professional activities, Bill has always reserved time for his family. He and Martha have two children, Sally and Bill Jr., and four grandchildren. While his son was a teenager, Bill managed Senior League and Babe Ruth League baseball teams for boys. During the same period he and Martha taught a high-school-age Sunday school class at St. James Presbyterian Church, where they are members. They have also all worked together on the Corcorans' avocado and lemon ranch near Fallbrook, California. Bill enjoys farming as a hobby, but he is also seriously interested in the technology of agriculture.

Bill's own love for sports — as a spectator and participant — remains undiminished, and he follows USC football religiously. (One student, being stalked by Bill for an overdue paper, claims to have diverted him by launching into a discussion of the fine points of Saturday's game.) He can describe the contributions of a quarterback with the authority he would use to explain which free radical is essential in a chemical reaction.

On vacation in Hawaii for three weeks each September, he switches from sports spectator to participant, indulging himself in lots of golf and swimming over a mile in the ocean each day. At home he enjoys badminton and bicycling with Martha, and he recently experimented with the latest California fad — a pair of roller skates.

Although Bill's schedule is always brim full, there are lots more activities that he'd like to take on — mastering a musical instrument, for example, and becoming proficient in Spanish. He's already studied Latin, French, and German. Bill also loves to read and wishes he could do a lot more of it.

Does he feel frustrated at all the challenges and demands and lack of time to do what he wants to? Not at all. In the first place, he says, "I am doing exactly what I want to do at the age of 60. Everything that's happened to me has been good; I don't know why I've been so damn lucky!"

–by Winifred Veronda, editor of Caltech News