Memories and Beyond 2008

By the

Graduating Class of Chemical Engineers of 1953

Class members recall life in Olin Hall and what they did afterwards.
Last summer I had some correspondence with Director Paulette Clancy. I mentioned that I had many memories of my days in Olin Hall, and she asked me to jot some of them down. Shortly thereafter, the October issue of the *Olin News* had a nice history (“The History and Future of Olin Hall”) from the beginnings of construction to the present time, but that centered on the bricks-and-mortar aspects, not about the personal experiences of the students. In 1988, Professor Julian Smith wrote a much more comprehensive history of the first fifty years of the School.

The *Olin News* article carried an invitation to alumni to send in their memories. I mentioned this to Jim Ling and Irwin Margiloff, and both volunteered to jot down some of theirs. This past June, our class (Alumni Class of 1952, but we actually graduated in 1953) celebrated its 55th Reunion. Reunions are for recollections. I thought, “Why not contact all of our classmates for their memories?”

There were 25 in Chemical Engineering. Eight were known to have passed on. I sent out 17 letters and received 14 responses. I also requested brief “bios” regarding what they’ve done since graduation, a current picture, and any other memorabilia they might have.

It should be noted that there was a parallel program in Metallurgical Engineering in Olin Hall. The “flavor” of that program was considerably different from that in Chemical Engineering, and that program is not covered here.

Special thanks go to Jim Ling, Irwin Margiloff, and Lloyd Forstall for their help. Jim came up with some items that I didn’t have – in particular, the picture taken at the Hercules Powder Company on the Plant Inspection Trip in March of 1952, and the copy of the program for our Senior Banquet. Irwin furnished the picture of Jim and him in their Senior Research Laboratory. Lloyd provided some pictures of our 50th Reunion in 2002.

I would be remiss if I did not pay tribute to my father, William A Weber. He graduated in Electrical Engineering from the University of Iowa in 1918. After serving in World War I in the Navy, his early professional career was in the East and he was an avid fan of college football. No doubt Cornell’s team and the Cornell-Penn rivalry captured his interest. Perhaps he also had friends or colleagues who went to Cornell. In any event, when I came into the picture, I was destined for Cornell. My father’s only real hobby was scrapbooking. He squirreled away virtually everything I received or came into contact with during my undergraduate and graduate years at Cornell. Such “pack-ratting” is familial, so much of his collection was still extant in my basement. Currently in the process of down-sizing for a move, our first in 41 years, I came across much of the material in this monograph. My father was saving all that “stuff” for some reason – it must have been for this.

To the extent possible, I have used pictures appropriate to the times. For some of the faculty pictures, I had to use more current ones.

Thomas W. Weber
Some History

Our class entered Chemical Engineering in 1948, each of us personally selected by Fred Hoffman ("Dusty") Rhodes. The October 15, 1948 issue of the Cornell Alumni News listed 29 Freshman McMullen Scholars, broken down as follows: 14 ChE, 8 ME, 4 EE, 2 CE, and 1 in Engineering Physics. Thus, the entering ChE class had many McMullen Scholars and many other scholarships as well.

There is a slight uncertainty as to the number – I thought it was 106, but Irwin Margiloff thinks it was 108. Five years later, 25 of us graduated. Surprisingly, the actual commencement program lists only 22 as graduating, but the Senior Class Commencement Booklet lists 25, as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Hometown</th>
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<tr>
<td>James Frost Ackerman, Jr.</td>
<td>New Haven, CT</td>
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<tr>
<td>Robert Eugene Baker</td>
<td>Middletown, PA</td>
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<td>Edward William Callahan</td>
<td>Mt Vernon, NY</td>
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<td>Meneleo Juan Carlos, Jr.</td>
<td>Manila, PI</td>
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<tr>
<td>James Clarke</td>
<td>Biloxi, MS</td>
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<td>Walter Edwin Cox, Jr.</td>
<td>Laconia, NH</td>
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<td>James Waldo Dillenbeck*</td>
<td>Ithaca, NY</td>
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<tr>
<td>Clifford Hixson Dunn*</td>
<td>Birmingham, MI</td>
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<tr>
<td>Lloyd McCrum Forstall</td>
<td>Montclair, NJ</td>
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<td>John Francis Gallen*</td>
<td>Arlington, VA</td>
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<td>Charles Anthony Geyh*</td>
<td>Hartsdale, NY</td>
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<td>Thomas Edward Gilbert*</td>
<td>Wilton, CT</td>
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<td>Earle Fredrick Ginter, Jr.*</td>
<td>Nanticoke, PA</td>
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<td>John S Gordon</td>
<td>Arlington, VA</td>
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<td>Arnold Ray Huntress</td>
<td>Gouverneur, NY</td>
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<td>James Gi-Ming Ling</td>
<td>Westfield, NJ</td>
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<td>Richard Clarence Lofberg</td>
<td>Teaneck, NJ</td>
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<td>Irwin Bodee Margiloff</td>
<td>Queens, NY</td>
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<td>Arthur William Mellen, III</td>
<td>Orange, NJ</td>
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<td>Robert Manfred Messner</td>
<td>Great Neck, NY</td>
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<td>Kenneth William Powers</td>
<td>Ridgewood, NJ</td>
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<td>Martin Samuel Simon</td>
<td>Paterson, NJ</td>
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<tr>
<td>James Carlton Villwock*</td>
<td>Toledo, OH</td>
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<td>Thomas William Weber</td>
<td>Hinsdale, IL</td>
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<tr>
<td>Lemuel Bell Wingard, Jr.*</td>
<td>Pittsburgh, PA</td>
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*Deceased

Some went to the Cornell University Men’s Freshman Camp sponsored by Cornell United Religious Work at Lake Arrowhead, Little Meadows, PA, from September 13th to 16th. Registration followed on September 20th and 21st. Classes began on September 22nd at 1 pm. If we weren’t busy before that, we were from then on.

Dean S. C. Hollister
It is a pleasure to welcome you to Cornell as members of the Class of 1953 in Engineering. As you know, it has been possible for us to accept only a limited number of all those who have applied for admission to Cornell. The fact that you are here is indicative of a confidence on our part that you have the type of academic ability and personal aptitudes upon which a successful career in engineering can be built. Our whole purpose here is to work with you toward the development of the knowledge, the judgment, and the breadth of intellectual interest that will shape your future. This we offer to all of you without favor, but it is for each of you individually to determine, through your own application and strength of purpose, the extent to which you will gain from all that is here for you.

In effect, you are now entering the profession of engineering and your record from this point forward will have a bearing upon your future in the profession. Even though you have a distant goal in mind, it is important to realize that ultimate achievement is the summation of your progress, day by day. Each day’s work well done cannot help but bring success.

Many of those who have been here before you have gone onward to distinction as engineers and citizens. It is my great wish that each of you may find in these years at Cornell the path to a bright future.

I congratulate you on the opportunity that is before you. The College and its Faculty will watch your progress with warm interest and will help in every way to assist you to achieve a full measure of success.

Dusty’s pride in the School was well described by him on the page devoted to Chemical Engineering in the 1953 Cornellian:

Chemical Engineering became an integral part of the University back in 1931, and since then has grown very rapidly. It now includes a full curriculum in Metallurgical Engineering. The five-year undergraduate program, which was soon adopted by all of the other engineering schools, began with the Chemical Engineering School. Although he is required to take 189 credit hours, more than any of the other prospective engineers, and must maintain a 75 cumulative average, the Chem E should feel that he is well rewarded in the form of Olin Hall. This brick home of the Chem E’s is the ultramodern nucleus of the engineering campus-to-be, and houses the Unit Op Lab, the pride of many an engineer.

[Note Dusty’s reference to “he” above. All of his memoranda and instructional notes assume that there were only male students. This is somewhat surprising because there had been at least one female graduate before us.]
The Chemical Engineering faculty consisted of Professors:

Fred Hoffman Rhodes, Director, School of Chemical Engineering
J. “Jay” Eldred Hedrick
Clyde Walter Mason
Charles C. Winding
Julian “Ted” C. Smith
Robert “Bob” L. VonBerg
Herbert F Wiegandt

We began Inorganic Chemistry with Professor Albert W. Laubengayer. One of my fraternity brothers in Metallurgical Engineering found the eight o’clock lectures difficult to get to, and one morning actually walked up the hill and went to the lecture in his pajamas. I had Michael J. Sienko for recitation, and I recall that he was very dynamic and enthusiastic.

I recall that our very first prelim was in “Lauby’s” course.

Certainly the most unforgettable lectures were those of Professor Guy E. Grantham. We all looked forward to his lectures and demonstrations, two of which are shown here.

In the Fall Semester of the Junior Year, we took a course in Chemical Microscopy with Professor Mason. That’s when some of us found out we’d never be microscopists.
The fourth year brought us to what we’d all been waiting for – the Unit Ops Lab. I think it turned out to be everything we’d been led to believe it would be. It started off simply enough with the calibration of an orifice meter with water. We went on to study fluid flow through brass pipes and fittings, flow through a packed column, and then the flow of air through orifice and venturi meters at high velocities. The pace was fast, and sometimes you had trouble catching your breath. Then we did a series of experiments in heat transfer where we studied such things as a double-pipe heat exchanger, heat transfer in a trombone cooler, heat transfer to air and to condensing steam, and finally, heat transfer to boiling liquids. The second semester began with an experiment in evaporation that was rather involved – first there was single-effect evaporation, and then double-effect. Who could forget the drying experiment with Homosote board that just went on and on….? (Were we going to have to stay overnight?)

Somewhere along the line, I think there was an experiment on crushing and grinding. The last experiments concerned mass transfer – distillation and absorption. It was a great feeling when that course was over!

Unit Ops probably occupied three-quarters of our time that semester. There was some relief from all of the technical courses with a required one on the History of Science with Professor Henry Guerlac. A number of people really liked this and continued their interest in the subject after graduation.

In the Second Semester of the Fourth Year, we began a series of three courses on “EE for Non-EE’s”. This convinced a number of people that they had made the right choice in going into Chemical Engineering. The professor in charge was Professor Simpson (“Sam”) Linke. I think he realized that some Chemical Engineers found those circuits and lab experiments a bit difficult to comprehend and showed some leniency. It’s fair to say that such a detailed and comprehensive course such as this has been long gone from the Chemical Engineering curriculum.
As the semester wound down, we celebrated at the “Second Annual Senior Banquet” at Taughannock Farms. Jim Ling still had a copy of the program!
French Onion Soup
Assorted Relishes Hot Rolls and Butter
Hearts of Lettuce Salad with Roquefort Cheese Dressing
Roast Prime Rib of Beef au Jus
Carrots with Chives Broccoli with Hollandaise Sauce
Parsley-Buttered New Potatoes
Strawberry Parfait
Coffee Tea Milk

STUDENTS

Name and Company
James F. Ackerman
Procter and Gamble
Port Ivory
Robert E. Baker
Hooker Electrochemical
Niagara Falls
Edward W. Callahan
Solvy Process
Syracuse, N.Y.
Meneloc J. Carlos
James Clarkes
du Pont Company
Calden, S.C.
Walter E. Cox, Jr.
Dow-Corning Corp.
Midland, Mich.
James W. Dillenbeck
B.W. Goodrich Chem. Co.
Cleveland, Ohio
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Paulsboro, N.J.
Arnold R. Huntress
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Midland, Mich.
James G. Ling
U.S. Air Force
Richard C. Lobberg
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Virginia
26 John St.
Gouverneur, N.Y.
1207 Birch Pl.
Westfield, N.J.
599 S. Forest Dr.
Englewood, N.J.
7666 N. Sheridan Rd.
Chicago, Ill.
399 Tremont Pl.
Orange, N.J.
R. D. 2
Frampton, N.Y.
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Schenectady, N.Y.

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Fred H. Rhodes
Julian C. Smith
Robert L. Von Berg
Herbert F. Wiegandt
Charles C. Winding

Chemical Engineering Professors

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Bellemore Apts., Ithaca
711 The Parkway, Ithaca
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Hampton Road, Ithaca
167 Oak Hill Pl., Ithaca

Metallurgical Engineering Professors

Malcolm S. Burton
James L. Gregg
Peter E. Kyle
Clyde W. Mason
Raymond G. Thorpe

Electrical Engineering Professor

Simpson Linke

Mechanical Engineering Professor

Robert Allen

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Name and Company          Home Address
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New Kensington, Pa.

Kenneth W. Powers
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Union Oil Company
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Our five years in Olin Hall officially ended with Commencement on Monday, June 15, 1953 in Barton Hall. The address was given by President Malott. I suppose no one remembers what he said. In any case, it was a pretty great five-year period in our lives.

Last August 4, 2007, I watched the speech of Thurmond Thomas, a key running back for the Buffalo Bills during their four Super Bowl years in the 90s. Jerry Sullivan, a sportswriter for “The Buffalo News,” remarked that the secret wish of every Bills fan is to go back in time and relive those Super Bowl years, to see it one more time. As he ended his talk, Thurmond turned towards his Buffalo fans in the audience and said, “We can’t have that ride again, but we’ll always have those memories.” Sullivan remarked that Thurmond could not have said it any better. And I think we’ll all agree that Thurmond’s last words apply to us. Hence, the idea behind this compilation of memories that follows.
I grew up in Pennsylvania. Through the 7th grade we lived in the Pittsburgh area where my family had been for many generations. In my 8th grade we moved to the Harrisburg area. My folks had no money, having just paid off the debts they accumulated during the depression. My Dad insisted that I would get to college, an opportunity denied him, AND that I would study something which would enable me to make a decent living. I was bright in high school, liked chemistry, and was terrible at mechanical drawing. Chemical Engineering seemed to be a natural fit.

I checked out 42 colleges, obtained and read the catalogues of 21 and applied to seven good ones. I took every scholarship exam of which I was aware and had numerous small awards and near misses. Finally a John McMullen scholarship at Cornell came through. It provided full tuition, about one-third of the total cost. My parents and I each made up half of the difference. The scholarship made it possible for me to study engineering, for there was no engineering school within driving distance of home.

My memories on campus begin with the trauma of seeing 75% of my classmates fall by the wayside by the end of the second year. I thought a number of them were a lot smarter than I was. I worked the remaining three years trying to balance my studies with a modicum of college life. It was a constant worry, as there were no alternatives for me.

My most vivid memories of the study program were of Clyde Walter Mason in Microscopy and Physical Metallurgy, Dusty Rhodes in Unit Operations, and the Plant Design project. I also remember the Chem E policy of exam monitoring. None – it was expected that collaboration and cheating would not occur, but if it did, the guilty would be expelled. By and large there was little cheating in my view. Once, during a thermo exam, Prof. Wiegandt left the answers to the exam questions in a set of steam tables which we borrowed for the test. Three of us saw them and none used them, although two of us nearly failed the exam.

My general view as I look back was the rigorous program and tough grading system. I found the courses difficult, primarily due to the quantity of work, not the difficulty in mastering it. When I view it in relation to the experience of my granddaughter who is now attending a good eastern college, or my own MBA studies in Buffalo in 1970, it’s no wonder that so few of us survived.

**Beyond**

Graduation was held on a Monday early in June in 1953. I was not able to attend. That Friday night I married my sweetheart from high school days, and reported to work at Hooker Chemical in Niagara Falls the following Wednesday. We were in a hurry because we were broke and I faced a call to active duty in the US Army on August first. About a month prior to graduation those orders were cancelled, but too late to change any plans.

Three weeks short of 40 years later I retired from Occidental Chemical, successor to Hooker. Although I remained technically with one company for my entire career, I worked for many different companies as the managements of the chemical company and its parent, Occidental Petroleum, were constantly being replaced.
I started in a pool of young chemical engineers assigned to study technical problems at the Niagara plant. A year later I transferred to the Corporate Engineering Department where I worked for 18 years. I began as a process engineer and exited as manager of the major projects section. Following that tour of duty, I bounced around manufacturing divisions as technical and engineering manager. Finally I spent ten years as Corporate Energy manager, a job which involved negotiating major energy contracts, pursuing our legal remedies in the courts or regulating bureaucracies, and planning to build our own power generation facilities. It was a mix of legal, business, and technical activity which was a very satisfying way to finish my career.

Three assignments remain in my memory as most enjoyable:

My first major technical assignment was to expand the capacity of a chlorine processing system which was 50 years old and for which there were no real records. I was alone in the assignment and it was a memorable two years.

In the late 60s, nearly all of the engineers in our department were assigned to design and build a large chlor-alkali plant in Louisiana. I was segregated from the herd to provide a brine supply, a solution mining plant, and a 42-mile pipeline. The neat part was that I had to do it with no help from my company who were otherwise worried about the Louisiana plant. That was a real fun year and a half.

Later in my career I was able to conceive and sell to my company a plan to build an energy-from-waste facility to provide steam to the plant and power for the grid. It was a very rewarding experience.

I was fortunate enough not to be transferred while my family was growing up, only to move three times in the last 10 years as managements changed. I retired from Dallas, Texas, still married to and in love with my high school sweetheart. We now live in Hendersonville, NC, a lovely place which has become a retirement Mecca for some very interesting people. Our two daughters still live in New York State.
Dusty Rhodes enjoyed parties, pool and chemical engineering students who had the inherent ability to envision molecules flowing through chemical processes. He also loved the English language, its correct usage and spelling. Remember, Dusty was originally a professor of English.

Dusty liked beer parties. On certain evenings, he would roll a cold keg from his car into the recreation room. Then he would walk the halls and invite everyone from Olin’s labs and offices to join him. We would gather around the piano and sing Cornell songs and finish off the keg. It was great fun, but he always planned it for the night before a tough prelim!

Not many people knew that Dusty loved to play pool and at lunchtime he would often go across the street to Willard Straight Hall to play. He was a good player and gladly pocketed his winnings from like-minded faculty.

One year I was delayed starting school on time and missed several thermodynamics classes. It was a difficult topic and our professor had a tough time clearly explaining theory to the students. I, having fortunately missed classes, got the best grade on the first prelim and was nominated to tell Dusty about the “poor” instruction we were receiving. He listened quietly and then told me in no uncertain terms that my study efforts, lab work and dedication to Chem E were so “poor” that he was considering taking away my National Merit Scholarship. I emerged humbled, but a better person, from that tongue lashing. The class settled down after hearing of my experience with Dusty, and we all did well on the final exam.

Can anyone forget Unit Operations, the all-nighters, running calculations, making graphs and charts, and typing all morning to make the deadline? In my case, Dusty would return my reports with five to 10 pages of handwritten corrections. Data are (plural). I still dream about this.

We all bitched about the work load, but we all knew that Dusty was spending 20 to 40 hours a week just correcting our reports. No one complained to him. Remember: 80 for content and 80 for English multiplied together gave a 64 for your Unit Ops report. Working for a living was easy after working for Dusty.

I loved Physical Chemistry. For instance, does anyone else remember J. Willard Gibbs’ Phase Rule and the degrees of freedom a material has in changing between a gas/liquid/solid as temperature and pressure were modified? It opened up a whole new understanding of the physical world to me as to why ice skates work and why ice floats on water.

I met Carr Ferguson at Frosh Camp, and we became friends. We decided to attend the freshman mixer dance at the Straight, find two of the best-looking girls, take them downtown drinking, impress them as “big college men” and really enjoy our freshman year. Everything went well until the bartender downtown asked us what we wanted to drink, and it was obvious not one of us had ever ordered a drink before. The girls finally asked for Southern Comfort, and he poured a thick, sweet-smelling liquor into four cocktail glasses. After several drinks each, we crawled up the hill, got sick, and threw up. Those two beautiful girls never spoke to us again, never recognized us on campus, and made us invisible in their world forever!
Upon graduation, I went to work for the Allied Chemical and Dye Corporation and stayed for 42 years, ending up in New York City and Morristown, New Jersey. Hard for me to believe, but I stayed at the same firm my entire career and never wrote a resume. Since I held many different positions in engineering, production, marketing and research, life was always interesting. I was a Vice President and Corporate Officer for ten years before my retirement in 1995.

In the 1970s I was Assistant to the President of Allied. Then, Rachel Carson wrote “Silent Spring” and the environmental revolution began. I was given environmental responsibility at Allied, which led to work with many other manufacturing companies and government agencies. It was exciting to be involved in the early years of a revolutionary new movement.

I currently have homes in New York City, Palm Beach, and Quogue, Long Island, and move around as the seasons change. I have two grown children. My daughter graduated from Duke and has an MBA from the University of Chicago, and my son went to the University of Richmond and has an MBA from Cornell, Class of 2000.

I have a wonderful young wife, am in excellent health, play golf, travel, and still enjoy parties (drinking only beer, which I learned from Dusty). I attend Cornell reunions every five years where I always see Tom Weber, but unfortunately not many other Chem E classmates. On the other hand, over half of my Phi Kappa Psi pledge class was at our 55th reunion this year. It’s wonderful to share friendships for 60 years. It’s a good life!
The first thing I learned during the first week at Olin Hall is that the mortality rate was traditionally high. I recall the statistics being discussed then were in the range of about 25 to 30 percent making the grade. Sure enough, by the time we graduated in June, 1953, we had a survival rate close to 25%. Many had shifted to other courses early on, or dropped out. For those who stayed on, it was tough all the way to the finish line – and more interesting as we became exposed to the more senior professors, especially ones with actual industry experience. Dusty Rhodes taught us several very important lessons from industry:

In report writing, he graded us on the basis of content and style or delivery by multiplying the percent scores of each element to obtain the final score. Thus, he explained, if one gets 60% for content and 70% for style, his grade would be 42%. He emphasized that even if the content merited 100%, if the message was only 50% effective, then the report would only merit a score of 50%. I am certain many engineers benefited from this advice in the preparation of their reports, a principle that applies everywhere a report has to be written.

In the application of decimal points he was very strict, saying that industry can better tolerate a slight numerical error than a decimal point error or an “order of magnitude error”, which of course applies in real life.

The Use of Library course that he included in our curriculum proved very useful in our industry experiences, although much of this has now been replaced with the use of search engines that are freely available or by subscription.

He also taught us to appreciate the value of intellectual property (IP) and how to create such values from our experiences by including courses on applying for patents and trade names or trade marks. Today, the value of intellectual property is well recognized throughout the world, and has been responsible for the creation of a significant amount of wealth for those who have learned to manage IP’s well.

Perhaps since Dusty was thought to be hard on his students, it was because he also had a very personal interest in each of his “survivors”. I found out when I returned to Manila and saw a letter from Dusty to my dad, commenting on the progress that I had made in school, and expressing great confidence that I would make it. Dad was so happy with the news that he had it framed and that is how I saw it.

There were other courses that were little appreciated at that time but which proved to be very useful in my experience. Among these was the microscopy course taught by Dr. Clyde Mason, which taught us how to look for the details in analyzing a problem. Today nano-technology has become a critical discipline for the microelectronics and microbiology industries.

On the other hand, there were the interesting industry practices that Dr. Herbert Wiegandt would talk about in his lessons on the process industries. Much of these were gathered during his summers spent with industry. These helped to provide us a good feel of industry practices.
During the summer after the fourth year of studies, I got a summer job at Procter & Gamble in Cincinnati, Ohio and worked on “PURICO” which was a shortening produced then by P&G in the Philippines. I managed to produce some useful information during that brief stint in their technical service laboratory.

This experience was reinforced during our fifth year when we were actually provided our own office and laboratory to undertake specific research. I recall that my project partner, Ken Powers, and I elected to study the thermal conductivity and heat transfer ability of methyl methacrylate as it polymerizes. This was related to the problem of eliminating bubble formation during the casting of acrylic sheets. We had the measuring device machined in the Olin Hall shop and believed we had a practical and novel approach to the problem, although the results obtained were not conclusive if my memory serves me well.

Dusty felt strongly for his five-year curriculum and for those who made the grade that they deserved to be recognized for completing it through a certificate of attainment equivalent to a Master’s degree. We knew he would fight for it as much as we felt we deserved that recognition. That recognition came finally in July of 1988, awarding each of us the “Certificate of Advanced Engineering Study for having completed a five-year course of study in 1953 that under present registration would lead to the degree of Master of Engineering”. This certificate was signed by William B. Streett, Dean of the College of Engineering.

**Beyond**

My first job was in P&G Philippines, also in the technical service laboratory. However, this job only lasted four months when I accepted an offer from Hacienda Santa Teresa, Venezuela as Assistant Superintendent of a sugar mill. Knowing how to speak Spanish but without any experience in sugar, I accepted the challenge because the job offer came from the owner who himself was a Cornellian. I learned much, not only how to produce and refine sugar from sugarcane, but also how to build a much larger sugar mill. After eighteen months, however, I resigned as the Plant Superintendent to return and participate in the industrial development of the Philippines.

I helped to organize Resins Incorporated in December, 1955, and I have stayed with the company since. Our resin technology was initially licensed from Reichold Chemicals Incorporated of White Plains, New York. We now operate through several subsidiaries and affiliates:

- RI Chemical Corporation which produces resins and allied chemicals for paint resins, wood adhesives, polyester composites, leather finishes, and coconut methyl esters for biofuels, Philippine Iron Construction and Marine Works which operates a small shipyard construction outfit, and provides manpower services overseas.

- AVC Chemical Corporation, a joint venture with Ishihara Sangyo Kaisha for the distribution of herbicides and pesticides which they manufacture in Japan.

- Pacific Resins, Inc., which produces surface coating resins for the paint and ink industries.

- Pigmentex, Inc., which produces surface coating resins and pigment extenders.

- Integrated Microelectronics, Inc., a joint venture with Ayala Corporation producing and exporting micro electronic components from the Philippines, China, USA, and Singapore.
In 1956 I married Philomena “Mining” Reyes, M.S. Mathematics at Cornell ‘53. Together we have five daughters:

Maria Lourdes Fernando, M.S. Hotel Administration at Cornell ‘80, Mayor of Marikina City in Metro Manila

Carolina Carlos, MBA at MIT Sloan School, General Manager of Resins Incorporated

Rosario Carlos, M.S. Computer Science at Carnegie Mellon, Vice President of Riverbanks Development Corporation

Elizabeth Clavecillas, B.S. Hotel Administration at University of the Philippines, VP RI Chemical Corporation

Adelaida Carlos, B.S. Mathematics at University of the Philippines, GM, Riverbanks Development Corporation Department Store

Mining and I attended our 50th and 55th reunions, and we will continue this as long as our legs will carry us.
Any adventure should start at the beginning. No word had come from Cornell concerning my application and it was too late to enter the 1948 spring semester at Columbia University as the US Army still had to get me back to the States. On a trip to Toronto, Canada that spring, I took a detour to Ithaca and met with Dusty Rhodes. Things began cordially. I explained I already had a year of college before army service, and I thought another five years was a little excessive just to get a BChE. Besides, I could enter Columbia and be out in three years. Dusty looked at me and asked, “You want a good education, don’t you?” The only sensible reply was “yes.” With that Dusty looked at me a little less doubtful. “You’re accepted; be here in September” and that ended the interview.

Registration came and I found Dusty had decided my course work - even choosing the “electives” that replaced English, ROTC, and other required subjects taken elsewhere. Already, I was learning what a “good education” meant to him.

Looking backwards, I know I survived – perhaps precariously. Academics and a social life were a tough mix. Often the latter took precedence making the going rough at times. Is it possible to rationalize and say we were being true to Dusty’s wishes? “You guys are taking life too seriously; you need to have fun.” Did that mean all-nighters writing unit operations reports and then rewriting them when the grade for technical aspects multiplied by the grade for style came to 54? I still hear the birds chirping at dawn to remind myself as well as my fourth-year roommates, Jack Gallen and Tom Gilbert, that the fateful hour was near.

Life was a little more relaxed the fifth year. At least that is the thinking shared with roommates, Walt Cox and Jim Dillenbeck. Rumor had it that a drum of 200-proof ethanol resided in the basement of Olin and that it blended well with various fruit juices. Maybe it was denatured, but the juice masked that problem and made senior research less onerous.

Sooner or possibly later, the day of reckoning arrives. The research project and plant design reports come due and finals week arrives with barely a word written. Life turns upside down with no time to prepare for graduation. Design partners, Tom Weber and Walt Cox, calculate, recalculate, write, rewrite and draw flow sheets for the construction of an ethylene oxide plant. Work on the catalyst plant fell to me. Several years later when Dusty Rhodes was asked what he thought of our work, he kindly said “fine.”

Beyond

Now you may ask “Did you really get a good education?” There is no doubt that it was good just as Dusty promised. Now you ask the next question “What have you done with this good education?” That is another story giving evidence to Dusty’s notion that a Cornell BChE prepared an individual for a variety of undertakings.

First came five years’ work as a Process Engineer with DuPont in their Orlon acrylic fiber plant at Camden, South Carolina. Next came five years as a Research Engineer developing processes for the production of organic chemicals for the pharmaceutical industry. Then came a major career change and
a PhD in Chemical Engineering with heavy emphasis on organic synthesis. Finally, I was free to start my own business making steroids and other intermediates for university, pharmaceutical and medical research. As a career finale, my wife and I own and operate a pine plantation which allows us a more leisurely existence.

What follows is not necessarily Cornell related. My son, David, received his PhD from the University of Tennessee where he is associate director of their Transportation Research Center. His sister, Cathy, a Georgia Tech Chem E works as a project engineer for PCS Nitrogen, a Canadian firm. Our second daughter, Leslie, majored in Industrial Management at Clemson University and works in Greenville, South Carolina for a German Company. She had the pleasure of attending our 55th Cornell reunion recently.
Beyond

Here are some of the highlights of my career since leaving Cornell:

From Ithaca, I drove with a school friend from Laconia, NH to Long Beach, CA, reporting for a three-year Navy tour of duty on the USS Shelton – mostly in the Western Pacific. I almost saw an H-bomb test near Bikini before flying to San Francisco to be discharged. Several years later, I did some Naval Reserve training in Delaware – just missed being drafted into the Cuban Missile crisis!

I then joined Dow Corning, doing pilot-plant work on silicones, and then via a Marketing course in night-school, soon moved to Ann Arbor, MI where I got a degree from the Business School at University of Michigan. While there, I joined a couple of Whiz-kids from Ford in a small venture called Corporate Research, Inc., but after the lights and phones went out and they declared bankruptcy, I started looking for a new job. Strangely enough, I never got so many offers in my life; apparently big businesses look for people who take chances! Nevertheless, I didn’t follow this course, but rather joined the very solid, conservative company, Hercules Powder, in Wilmington, DE in Corporate Research – and eventually the same function in a new Fibers Department. That was all in the first twelve years after graduation.

In 1968, after marrying my wife from Germany and getting a leave of absence from Hercules (really a fine firm), I moved to Germany and then found a job in the Corporate Market Research Department of Hoechst in Frankfurt – also again specializing in fibers (polyester instead of polypropylene). This, in turn, took us around Europe and the Americas, then to NY, first with a joint venture between Hoechst and Hercules in fibers, and later established a Corporate Research function at American Hoechst in Somerville, NJ – and we lived in Princeton.

In 1979, unexpectedly, I received an offer from SRI International in Menlo Park, CA to work for them in Zürich, especially for the World Petrochemicals and Chemical Economics Handbook programs in Europe. Since then, we have been mostly here but, since partially retiring in 1995 and then doing some consulting through 2000 and a couple reports in 2004, we are now commuting regularly to Berlin, where we may find a permanent apartment soon…?
Lloyd Forstall

Memories

Why Cornell? – I had applied to a half-a-dozen colleges offering the Naval Reserve Program but later found out that I couldn’t pass the physical. However, I was accepted by two of these universities. Princeton offered a scholarship plus a job for meals. Cornell offered a full-tuition McMullen Scholarship. I picked Cornell because (1) the scholarship was better, (2) the engineering course was five years, not four, and (3) Cornell was several hours from home, Princeton was less than one – too close. I have never regretted this decision.

Why Chem E? – While still in high school, Cornell wanted to know which area of engineering I wanted. I didn’t want Civil, Mechanical, or Electrical, and I had no idea what Engineering Physics was, so I picked what was left – Chemical.

Summer Job — The summer before (and the next three summers after) I entered Cornell, I worked as a “Candy Butcher” with the Ringling Bros. Barnum & Bailey Circus – the “Greatest Show on Earth.” I traveled all across the United States and parts of Southern Canada selling peanuts, cracker jacks, and ice cream two shows a day, seven days a week. Pay was strictly commission – 17 ½% of what you sold.

Cornell Jobs – My first term at Cornell I wanted to see just what college was all about so I didn’t work. By spring term I worked for meals at the Kappa Alpha Theta (KAT) sorority house. The food was good and the table conversations during sorority rushing were quite interesting. Next fall the waiters were gone in favor of some of the sisters that needed the jobs. I worked my last four years in the kitchen at Theta Xi – my fraternity.

Chem E – By Spring term, freshman year, I’d had enough of Chemistry and thought I should be an Architect. I took some aptitude tests and they indicated that I could continue in Chem E and probably graduate but I would not make a career of it. I was more suited for teaching math or becoming a CPA. Also, if I transferred out of Engineering, I would lose my McMullen Scholarship. So I stuck with Chem E and did graduate.

Beyond


September 1953 – June 1955: U.S. Army Chemical Corps, Chemical & Radiological Lab, Army Chemical Center, Edgewood Maryland. Worked in a pilot plant (MD) and full scale plant (Alabama) for the production of nerve gas.
July 1955 – October 1956: Standard Oil (Ind.) Research Department – back to the Process Economics Group for more cost analysis work on process design projects and several special studies on proposed refinery expansion etc.

November 1956 – October 1959: Standard Oil (Ind.) Coordination & Supply Planning Department, Economic Analysis Group in Chicago, General Office. Worked on setting transfer prices (Manufacturing to Marketing Departments) on products and economics of marginal large bulk sales of petroleum products.

November 1959 – September 1962: American Oil Co., Comptroller’s Department, Budgets & Control Reports Section, Assistant Supervisor. Worked on monthly Control Reports (written and oral) for top management plus several special studies.

October 1962 – January 1992: Worked as a Planning Coordinator on several Ten-Year Plans consolidating and evaluating the plans of subsidiaries and producing a Plan for the Consolidated Company for top management. One thing we knew for sure about the finished product – the projections would not be accurate! It was the process that was important – forcing people in the subsidiaries to think about the future and plan ahead. Between annual Ten-Year Plans I worked on several studies covering all aspects of the company’s worldwide operations. During my stay in the P&E Department, the corporation changed the name to Amoco Corporation, and AFTER I retired Amoco was acquired by British Petroleum.

February 1, 1992: RETIRED – while I enjoyed my 38+ years working for Amoco, I’m enjoying retirement even more.

Since retiring 15 years ago, Jean and I have traveled some (we like cruises). Every year in February, when it’s cold and snowy in Chicago, we head for Palm Desert, California and spend three weeks with our daughter (Laura) and her husband (Scott) and kids (Andrew and Jamie Lynn). We are very active in our church. In 1998 I became the church Treasurer. I’m also Treasurer of the church’s Endowment Fund. My son, Rob, and his wife, Joanne, established a Foundation (BridgeMar Research Foundation) soon after the deaths of their two infant daughters (Bridget and Maranda) from an undiagnosed illness. I’m also Treasurer of this Foundation. It must be in my genes because my father and grandfather were both church treasurers and two uncles were also treasurers (Ringling Bros. Circus and Anheuser-Busch plus the St. Louis Cardinals.)

For fun, I took up golf soon after retirement and play Monday mornings in a league (Geritol Gents). I also play Saturday mornings with my son, Dave, and may get a third round in Thursday or Friday. My league handicap is 12 (nine holes) and playing often doesn’t seem to improve my game.

I had a heart bypass in September, 2003, and have been going to cardiac rehab twice a week. I also walk our two dogs (Nicki —Siberian Husky and Rusty – Golden Retriever) two to three miles everyday. As a result I’m probably in better shape now than I was before my surgery.

Hope this gives you an idea of my life since retirement 15 years ago.
The lectures I enjoyed most were those of Professor Guerlac’s in his course on the History of Science in Western Civilization. This has been a lifetime interest for me, how things got to be the way they are in spite of constant interference by the politicians.

The course I hated most was Accounting. I think it was in the ME Department and everyone was required to take it. I couldn’t understand the bureaucratic reason for requiring it.

Guess what I was doing in a large part of time during 1974 to 1994 – project and program accounting.

**Beyond**

In 1958, Tom Gilbert and I were at Charlie Geyh’s burial in the Fantine Kill Cemetery on the eastern edge of Ellenville, NY on Route 209. I was working in New Jersey at the time and Tom was working in the city for Chemical Construction. It was a very sad day for everyone; I remember vividly the shocked look on the faces of his parents and his lovely young wife.

Charlie and I were both draft dodgers in 1950; he chose the Army and me, the Air Force. Charlie was in contact with hazardous microwaves at Fort Devens.

It’s a small world. Jim Ling and I were coworkers at MITRE Corporation during the period 1974-77. This was after Jim had finished his 20 years with the Air Force. In 1977, Mitre was having severe management problems which precluded my staying with the company any longer.

One of Tom Weber’s students, Mike Nelson, and I were coworkers at Versar during 1989-90. The last time I talked to him, Mike was doing hazardous waste cleanup requiring a rubber suit and self-contained breathing equipment, not the kind of work I would want to do. I left Versar to take a position in West Virginia with EG&G, Inc.
As for recollections, humorous things I recall seem all to reflect the disrespect of youthful engineer hopefuls toward our elders, the professors. Maybe not best for publication.

Counting the “aaah” pauses in Prof Laubengayer’s lectures.

Prof Johnson writing organic reactions on the board, “This reaction then is essentially… (long pause for his habitual throat clearing and a student stage whisper heard for at least ten rows—“straightforward, Goddam it”.

Prof Wiegandt proposing no final exam in Thermo “if you make the rest of the recitations and stay awake.” (Thermo held on Thursday morning after the all-night Unit Ops marathons). Continuing, “Huntress, last week you asked a question and before I was through answering it, you were back asleep again.” Then the voice behind me, no doubt mindful of his windy lecture style – “That’s possible.”

Dusty, demonstrating mixing to – “fully baffled Chem Eng’g students”

I don’t know if I was the only one to go from Dean’s List one term to Probation the next. Dusty quizzed me in detail about my daily life – classes, activities, eating, sleeping – and then filled out a daily schedule intended to correct the problem. I guess it worked.

Seems the rest has faded into a blur. But I enjoyed the experience and it served me well. I rapidly became one of the old people bemoaning how little real engineering know-how the kids get in school these days.
Olin Hall was a place where a lot of smart people studied and worked under a rather draconian academic regime. We found humor when and where we could, and were challenged by an equally smart and dedicated group of faculty members led by the legendary “Dusty” Rhodes. To the best of my knowledge, I was one of the few second generation students to study under Dusty. My father, T.G. Ling, did his doctoral work in industrial chemistry (which is what they called chemical engineering in those days) under Dusty in the early 1920s. When I applied to Cornell for entrance into Chem E, my father, unknown to me, wrote a letter to Dusty saying that I had done so. In mid-January 1948, when I was at Blair Academy in New Jersey, I received a personal letter from Dusty welcoming me into the program. I showed the letter to the Dean of Students at Blair, who was also our college entrance counselor. He was amazed and said, “You got a personal letter of acceptance from Dusty Rhodes?” I realized at that moment that it was something out of the ordinary. What follows are some of my recollections of the five years I spent in Chem E at Olin Hall.

In Class

Sleeping through lectures – Our classmate Lloyd Forstall was notorious for sleeping in class. One day when he fell asleep, the person sitting next to him slipped his notebook from under his arm and wrote “Lloyd fell asleep at this point” and passed it around the room. We all signed our names underneath, and I think even the professor did. We then slipped the notebook back onto Lloyd’s desk without waking him up. Everyone had a good laugh when he woke up and realized what had happened. Our classmate, Tom Weber, recalls that once a dog followed Lloyd from the fraternity house to the classroom, and both of them fell asleep! (The dog was a beagle named “Ginger Peachie”. She belonged to Bob Critchfield’s landlord, but she spent most of her time at the Theta Xi House. – Tom Weber)

Dusty’s lectures – Sometimes Dusty would get stuck writing some long thermodynamics derivation on the blackboard. At those times, he would stand at the side of the lecture room, stare at the board, and absent-mindedly twirl the pull cord that was hanging down from the screen on the side wall. If he was really stuck he would start whistling tunelessly. I think we were all slightly amused since we usually had no idea where he was going with the derivation.

Dusty’s neckties – Dusty always looked like the typical seedy college professor in a rumpled tweed jacket and dull non-descript tie. Some of his ties even had soup stains that almost blended in with the dull browns. After we got our junior blazers, we would wear them on the same day of the week with red and white Cornell ties along with khaki pants and dirty white bucks. One day someone in the class, it might have been the late Jim Villwock, came up with the idea that we should do something to improve Dusty’s wardrobe. We all chipped in and bought him a Cornell tie like ours. At the next lecture, we presented it to him. We weren’t sure what his reaction would be, but he smiled, took off the tie he’d been wearing and put on the one we gave him, accompanied by the cheers of the class.

Jonesy the custodian – In contrast to Dusty, Jonesy the head custodian was always neatly turned out. He wore a tie at work and looked very distinguished in his un-rumpled tweed jacket. One evening, Irwin Margiloff and I were attending one of the university-wide endowed lectures that were often held in Olin
Hall. While we were waiting for the speaker to show up, Jonesy came in, stood behind the lab counter and put a glass and pitcher of water on top. The audience, mistaking him for the guest lecturer, gave him a round of applause. Jonesy looked up briefly, gave them a nod, and walked out in his usual dignified manner. Most of us remember him for wiping down the blackboards after each lecture.

The final exam incident – This story was passed on to me, and I’ve never found anyone who was there when it happened. Perhaps someone can verify it, or it may be apocryphal. As the story goes, everyone in this course that Dusty taught was under the impression that there would be no final. So at the end of the semester they all went home. Shortly thereafter each received a card in the mail saying that if they didn’t come back to take the final they would fail the course. They all went back, and the exam was the toughest thing they had ever seen. After sweating over it for two hours each one was convinced that he had failed the course. Dusty collected the blue books and in front of the whole class proceeded to tear them up and throw them in the trash. As they were contemplating this scene, the classroom door was flung open, and in came Jonesy rolling a keg of beer! I don’t know what the aftermath of this episode was or which class it happened to. Can anyone shed some light on it?

Clyde Mason’s lectures – His lectures in materials were always interesting but most of us remember his comment about unexplained phenomena: “We don’t know. We just don’t know.” His crystallography sessions in the back room off the microscopy lab were often daunting. Once, when a group of us were sitting in there surrounded by boxes of assorted rocks, he picked up an amorphous-looking rock, tossed it to me and said: “Ling, how many axes of symmetry does that have?” I figured that the answer had to be some multiple of four even though I couldn’t see any at all. “Sixteen?” I said. “Nonsense,” was his answer, “there are 64!”

An unusual physics lecture – This incident didn’t happen in Olin Hall, but it was part of our total experience as Chem E’s. We all looked forward to Prof. Grantham’s physics lectures featuring live demonstrations of physics principles. These included his climbing up a ladder that had wheels on the bottom until the force vector away from the wall overcame the downward vector, making the ladder slide out with him on it. We all watched, fascinated, as he climbed step by step, pausing at each rung to show us the calculations for the vectors. Just before reaching the last rung he calculated that one more step would make the ladder slide out from under him. We all gasped when he took that step and he started going down with the ladder. But the ladder only slid out a foot or so before it hit a previously placed stop in the floor to keep it from going all the way down. He also illustrated F = ma by firing a bullet from a .22 rifle into a block of wood suspended from a stand. One day a bull mastiff showed up in the main lecture room in Rockefeller Hall. Since dogs were all over the campus and couldn’t be thrown out of classes unless they were creating a disturbance, this one sat near the back seats at the top of the room. About half way through the lecture, the dog sauntered down to the front of the room and started sniffing the floor and turning around in circles. We all looked on in suspense with one question in mind: “Is he really going to do what we think he will?” Sure enough, the dog dumped a pile right there on the floor in front of the professor and nearly 100 students. The dog was immediately shown the door and Prof. Grantham’s lecture room assistant, a distinguished looking middle-aged man who always wore a lab coat, walked into the adjacent equipment room, came out with a cardboard carton, and calmly covered up the offending pile of dog droppings. The students cheered and the lecture continued.

Ceiling reactions in organic Chem. Lab – Occasionally an experiment in organic lab would go out of control, sending whatever had been worked on at the lab bench onto the ceiling. These were known as ceiling reactions. The most spectacular one I saw happened when one of the Chem majors was rinsing out a flask that he had been using to make absolute alcohol. There was a little bit of metallic sodium left in the bottom of the flask, and when he ran water from the tap into it there was a loud boom. We turned around from our experiments to see him standing over the sink with a stunned look on his face, holding the neck of the flask. Fortunately for him the blast went vertically, so the bottom of the flask went into
the sink, and the contents ended up on the ceiling. He wasn’t hurt.

The ether incident – In one of our organic lab sessions someone at the end of one of the lab benches had been using ethyl ether in an experiment. Unknown to him the ether vaporized in the flask and flowed along the top of the bench to the other end where another of our classmates was using a Bunsen burner. There was a whoosh when the ether ignited. There were no serious injuries but I think one of our classmates got his eyebrows singed.

The ethanol ration – At the beginning of each semester in organic lab we were issued a 500 ml bottle of 95% ethanol for various experiments. Most of the time we used only part of it, but we found that the rest could be sold to fraternities for parties. A popular practice was to inject it with a syringe into oranges that could be taken to football games and sucked on as refreshment. Alternatively, it could be used to spike the punch.

The hydrogen sulfide room in Qual Lab – There was a little room outside the main qualitative analysis lab where we used to go bubble hydrogen sulfide through our test samples to precipitate metallic sulfides. There was a hood in the room, but it wasn’t enough to eliminate the characteristic smell of rotten eggs. I always wondered why I had headaches after being in there, and it wasn’t until I graduated and went to work at DuPont’s Chambers Works that I found out how toxic hydrogen sulfide is.

Special Methods Quant – I think ours was one of the last classes to endure Special Methods Quantitative Analysis. This course was primarily focused on coal chemistry and involved lots of bomb calorimetry and analysis of coal gas samples. It was taught by Prof. Nichols who, I understood, was a buddy of Dusty’s. I believe the course was retired after he retired. We all thought it was a waste of time. Ironically, when the oil crisis hit in the 1970s and people started looking to coal again as a source of energy, I found that coal chemistry had almost become a lost art. My colleagues at the Department of Energy were surprised that I had been exposed to it as an undergraduate.

Cooperative data recording – One of the courses we had to take was Materials Testing given by the CE department. We weren’t terribly enthusiastic about that course either, and I can recall some of our classmates loudly munching on potato chips during lectures. Once we had to do an experiment involving tension on a test sample. We would apply a load to the sample and measure the elongation with each increase in load. By this time in our Cornell careers we were tired of taking data and plotting graphs. Someone on our team realized that the whole process could be simplified by plotting the graphs en masse so that by the end of the lab session we would each have a completed graph (before the days of copying machines.) So we dispatched someone to the Co-Op to buy enough graph paper for the team, found a wooden board, hammer, and nail in the CE lab, and proceeded to punch holes in the stack of graph paper as each measurement was read out. When we were done, each one walked away with a graph that only needed to have the holes circled and the axes labeled. I don’t think we could have gotten away with it in UO lab.

EE lab – If Materials Testing wasn’t high on our list of popular courses, Electrical Engineering was even less so. We were nearing the end of a long five years, and our tolerance for non-Chem E courses was wearing thin. Once a week we had to go to EE lab which was held in an old building on the edge of Cascadilla Gorge where the engineering quad now sits. The lab experiments involved hooking up wires in various circuits to illustrate some EE principle. We operated in small teams and did our best to follow the circuit diagrams in the lab manual. When we finished hooking things up, it usually looked like a plate of spaghetti, much to the dismay of the graduate EE lab instructors who wanted all the wiring to be neat and easily traced. The moment of truth arrived when the switch was thrown and power was applied to the circuit. Occasionally there would be a “poof” followed by a small cloud of purple smoke.
One of the EE graduate students would rush over to see what had caused the short. I’m sure this was all serious stuff to them, but we thought it was rather humorous.

**UO Lab**

Blown mercury manometers – Blowing out a mercury manometer was a fairly common event. When that happened, we would amuse ourselves by batting the little balls of mercury around the lab floor, or using it to make amalgams with coins. Would OSHA approve of it today?

The runaway evaporation experiment – One afternoon we were doing an experiment with the evaporator when the temperature and pressure in the vessel started to rise suddenly. When we saw the manometer blow out and the temperature gauge start to climb toward its maximum, our whole team made a dash for the spiral metal stairs. I had the misfortune of being the team foreman that day, and I figured it was up to me to do something before the whole lab blew up. Gritting my teeth, I ran back and shut off the steam valve, not knowing if the whole evaporator was going to blow up in my face. Fortunately it didn’t, and I think the problem was traced to a plugged line, but it was really scary for a few minutes.

The dreaded UO reports – Our individual lab reports were due on Thursday of the week following the experiment. There was so much data to analyze and so much to include in the standardized format that an all-nighter was almost guaranteed on Wednesdays. The cutoff time was noon on Thursday, and the reports had to be in a box in Julian Smith’s office before he went to lunch and locked the door. Late reports got a grade of zero. It was common for us to meet other classmates either rushing to or coming from his office in the 15 minutes before noon. We were all shocked to get back our first reports with red ink all over, diagonal lines drawn across pages that needed revision and the letters “R & R” for revise and return written on the front. The most shocking, of course, was the grade made up of the product of one grade for content and one for format, divided by 100. Thus, an 80 for content and 80 for format resulted in a final grade of 64 on a scale of 100. Since 70 was passing, we recognized that the two components of our reports would have to be graded at least 80 and 90 to make the mark. After the first report came back with “R&R”, it had to be revised and turned in with the next one. So from then on until the end of the semester we each had to turn in two reports on Thursdays! One day I happened to look into the supply cabinet outside Dusty’s office. In it were quart bottles of red ink ready to be used in grading the next UO reports. I think there were two results from this experience, aside from the many hours of lost sleep. One was that we learned to write under pressure of time. Another was that after the first few reports we all started to write like Dusty. Years later, while in the Air Force, I read a paper that seemed very familiar in style. When I tracked down the author, a fellow Air Force officer, it turned out that he too had taken UO lab under Dusty.

UO report English (or English a la Rhodes) – Dusty was always a stickler for correct English. The first thing we learned was not to use the word “approximately”. My first UO report had “approximately” scratched out with the note: “Use ‘about’. Means the same thing.” Another pet peeve of Dusty’s was the use of “are the following”. Wherever this appeared, “the following” was scratched out. Graphs in UO reports always had to be readable without turning the report sideways, and labels also had to be straight up, not sideways on the vertical axis. We learned the hard way to conform to these rules or risk having more red ink on our reports.
Fifth-year Laboratories

Hiding food – Irwin Margiloff and I shared a lab on the 3rd floor in our fifth year. Irwin liked to drink tea, and it was convenient enough to heat a beaker of water on a Bunsen burner and put a tea bag in it. However, there were rules against keeping food in the labs, and Dusty would go around periodically to check up on us. We all had the large CEC catalogs on our bookshelves in the labs, so Irwin hollowed out the middle of his and kept his tea bags in it. His sugar was kept on the lab bench in a beaker labeled “NaCl”.

Staying warm in winter – The University’s steam heat was turned off at 10:30 p.m., which resulted in our lab gradually cooling down to refrigerator temperature after about an hour. Since we were usually still working, Irwin solved the problem by lighting all the Bunsen burners as well as the gas jets along the walls above the lab benches. Classmates coming into our lab late at night would be startled by the flames shooting out toward the middle of the room. Fortunately the fire marshal never caught us at it, but we did manage to stay warm.

Distilling palm oil – Irwin Margiloff and I did a fifth-year research project involving fractionation of palm oil to look for useful by-products. I think the project was suggested by my father who sent us a supply of palm oil. One process we tried was distillation. After setting up a tall column in the lab we heated the palm oil at the bottom, but nothing seemed to be happening. Irwin got up on a stool to see what was going on at the top of the column. We didn’t realize that the palm oil had decomposed into acrolein, and the acrid acrolein vapor was in a layer at the top of the lab. As soon as Irwin stuck his head into it he started choking and nearly fell off the stool. That was enough to bring the acrolein down into the lab, and we both made a dash for the door after opening the windows and turning on the hood. I don’t think we tried that experiment again.

Experimenting with a bagpipe – In our fifth year I decided to learn to play the bagpipe. The first step is to buy a practice chanter that has all the finger holes of a regular bagpipe chanter but is smaller and played somewhat like a flute. It takes quite a bit of air pressure nonetheless, and I tried to make things easier on myself by hooking it up to the reverse end of the vacuum pump that we had in the lab. Sad to say, either the pump didn’t put out enough pressure or I didn’t have the hoses clamped on tightly, but they kept blowing off and I finally gave up. To show that this concept is alive and well, students at Carnegie Mellon’s Robotics Institute developed a robotic piper named McBlare in 2004 using a custom-built air compressor as well as other special components. I, however, have to content myself with playing my bagpipe the old fashioned way – with my lungs.

Beyond

The Cornell approach vs. MIT – The Cornell approach to Chem E always emphasized the practical. After graduation and while waiting to go on active duty in the Air Force, I was at DuPont’s Chambers Works at Deepwater, NJ, across the Delaware River from Wilmington. I had been assigned to assist in the startup of a new Freon-114 plant. One of the first things I was asked to do was check the work of an MIT graduate student who had spent the entire summer (three months) calculating the amount of lagging required for a heated pipe carrying perchlorethylene from a storage tank into the plant. Before looking at the MIT calculations, I used the rule of thumb that we had been taught in one of Julian Smith’s classes and came up with the answer of 4 inches in 15 minutes on one sheet of paper. Then I looked at the other calculation which was in a binder one-inch thick. After going through all the differential equations and derivations for heat transfer processes, the MIT student concluded at the end of the summer that the thickness was 3.95 inches! If I had reason to appreciate my Cornell education, that was the moment.
Also at DuPont I had been assigned to a task force to figure out why the lines in a methionine plant kept plugging up, resulting in frequent shutdown of the plant. After looking over the plant design I noticed that the evaporator had been placed at the highest point in the building. I recalled that in one of Dusty’s or Julian Smith’s classes that the evaporator should always be placed where there was the largest static head in the system to prevent flashing in the tubes. Voila! That was the problem with the methionine plant. The process stream was flashing in the evaporator, leaving a residue that was plugging the lines. Unfortunately no one believed me at the time. I had the satisfaction six months later, as I left for the Air Force, to have my boss on the task force say, “Jim, you were right.”

The Air Force and beyond – I spent 21 years in the Air Force retiring as a Colonel. My assignments included duty as a transport navigator, project engineer on a mobile nuclear power plant, systems analyst on the Joint Staff and in Vietnam, nuclear weapons research staff officer, and finally Assistant Director for Plans and Programs in the Defense Energy Office. The Air Force also gave me four years of graduate school resulting in an M.S. in nuclear engineering from Iowa State, and an M.S. in industrial engineering and PhD in nuclear resource management from Stanford. After retiring from the Air Force I spent some time with the MITRE Corporation before joining the Department of Energy in the Senior Executive Service. From there I was detailed to the White House as an Assistant Director in the Office of Science and Technology Policy where I served during the Reagan and Bush I administrations. I then spent some time at MIT as a research group leader in the Lean Aerospace Initiative before retiring again. I now use my Chem E expertise as a member of the Board of Directors of the South Fort Collins (Colorado) Sanitation District.
I still think of those days at Cornell.

The quality of education led. Quirks of some of our professors led that.

Remember in Grantham’s classes? I took one exam and picked up a shortcut we’d been taught in Chem E. I used that. My answer failed. I was told I should have developed the entire algorithm to prove I knew how. OK. I did that from then on. I got a similar one in one of Dusty’s classes. I wrote out the whole proof. I was chastised for doing that when I should have known the shortcut. From then on, I did a proof followed by a note that the following shortcut could also be used.

I remember that most of us took an extra course in phase rule that Professor Briggs gave. It turned out to be his last. We took the final exam with an assistant because Briggs had just gone into the hospital. We got our exams back after he died from cancer. I looked at my exam - he had missed one of my answers (five questions). My grade wasn’t so hot but my gratitude for what Professor Briggs taught me continues. I still have Findlay’s Phase Rule behind my desk.

Dusty probably taught me more about writing than Chemical Engineering, and he certainly taught that. His rules in technical report writing are burned into my brain. I remember one I failed came back with one comment. I’d described a curve as coming “quite” close to the asymptote. Per his book and his comments, “don’t say ‘quite’. ‘Quite’ means completely, exactly, entirely. If you mean ‘quite,’ say ‘very.’”

Some 55 years later this may be the first time since then that I have placed “quite” into print. I loaned my first copy of his book to an associate with orders to read and follow. His writing improved but I never got my book back. I bought another copy. Same thing. I have my third copy behind my desk.

Do you remember Clyde Walter with his “we don’t know - we just don’t know?” I had received one of the early monstrous 50-pound portable tape recorders. We taped all of our professors on the sly in our last year. But for whatever reason, Clyde never uttered his statement of fact when we were taping. I went back to him later with his tape. He’d never heard his voice on tape before and was entranced. I asked him to say the words. He blushed and said, “I couldn’t do that.” I saw him later in transit from P&G, Aberdeen, to Fort Wayne, and Detroit. I told him of my use of chemical microscopy in finding out why Spry went soupy. That time he blushed again and said he couldn’t listen because it could possibly reveal business secrets.

Jim and I did our research project on orifice meters and shock waves because Dusty had stated there would be none. Our preliminary research told us that there were, but regardless, we proceeded, built a Scherein system, and photographed the shock waves along with producing an algorithm to determine the speed and flow of the gas.

The two of us went upstairs to Dr. Rhodes’ office, grabbed him, and brought him down. He looked, got a big grin on his face, and said “it can’t be.” With that he marched back upstairs again. Regardless, Professor Smith changed the entry in his text.
The only other memory I can think of at the moment is getting ready to march in the processional line at commencement. You (meaning Tom Weber) had not finished your portion of your term paper. We were all standing outside your room yelling for you to finish and get in line. I had wanted to forego the pleasure of marching and sitting in a stifling miasma of sweaty people, but my father had gently said that he had paid his due to get me to this point and he was going to see me march. We were ready to pick you up in your chair, put your typewriter on your lap, and march you to the quadrangle. But - you finished.

Enough for now. I have to leave, go to my step-daughter’s house and change the stem in one of her outside valves. That’s what the training is all about.

_Beyond_

Here’s a quick summary:

I thought I’d retired a couple of times but I’m still doing things. My brother and partner died in ‘95, which kept me going. I merged our business in ‘03 but retained my public entity and financial institution risk management consulting clients while still acting as of counsel in the insurance business. My step-son, Philip, manages that. I had become a director of a small savings and loan in 1961. I became chairman in 2004 of what is now a savings bank. I opened our first branch in 113 years. I re-married in 1980. I built a house in Martha’s Vineyard where I thought I’d be full-time by now, instead of less-time.
An institution is more than bricks and mortar. It is the accumulation of memories, experiences, personalities and traditions. Thus an institution may be “founded” at some particular time though its well-known edifice may be built somewhat later. In the case of Cornell’s School of Chemical Engineering, the founding was the response to the work of Fred Hoffman Rhodes, a professor of Industrial Chemistry, who finally made Cornell’s Chemical Engineering curriculum a reality in the 1930s.

The present chemical engineering building, Olin Hall, was created as the first of a series of engineering buildings on that part of the Cornell campus. It was, and still is, a somewhat utilitarian building with a handsome, though not distinguished brick exterior with some decorative stonework and some friezes. It has special provision for laboratories suitable for chemical engineering instruction and research, the nature of which, having changed over the years, has led to modifications in the laboratories.

But if anyone thinks that it is Olin Hall as a structure or building that inspires memories and prompts contributions, that is certainly incorrect. Much more important are the memories of those of us like myself, who knew “Dusty” Rhodes, his early staff, and the way chemical engineering was presented in the 1940s and early 1950s, and who then went on to practice the chemical engineering that the staff taught.

In his courses, “Dusty” mentioned a couple of times his experiences during World War I, his work in dyestuffs, alizarin in particular, the supply of which had been cut off from Germany. Chemical Engineering had been taught at MIT for several decades, and I suppose that Rhodes was working to have Cornell join a small group of institutions that presented degree programs in chemical engineering.

As a high school student I had had what Oliver Sacks has called “a chemical boyhood”, which consisted of absorbing a great many of the facts about inorganic chemistry. My father (for reasons I can’t recall he ever stated) had a great variety of small vials of chemicals in the basement of our house in Laurelton, the kind of little vials that customarily were supplied in “chemistry sets.” I duly experimented with many of them, not really knowing what to expect in many cases. While in high school, to supplement the small samples of chemicals I had at home, I made many trips to the sales room of Eimer & Amend at the intersection of Greenwich and Morton streets in Manhattan and bought both chemicals and laboratory apparatus. Somehow I survived all the mixing, heating, combustions and precipitations that I cooked up. As my father was an engineer — self-taught but nonetheless very effective in his field of mechanical engineering — I was similarly inclined, though with a chemical flavor.

So when it came to applying to colleges as I was finishing up at Brooklyn Tech I naturally combined engineering with chemistry and applied for admission to the chemical engineering curricula. Other people had different reasons for pursuing chemical engineering, of course.

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1 This is the subtitle of his charming book “Uncle Tungsten; Memories of a Chemical Boyhood”.

2 One of them was John W. Colton, who hired me to join Scientific Design in 1959. We were returning from his evening speaking engagement on the south shore of Long Island during our desalination days, and I asked John why he had chosen chemical engineering. He answered “Because I heard that it was the hardest course at MIT.” I have no doubt that he was being truthful. John was very bright.
In due course, I received a letter from Dr. Fred H. Rhodes, Director of the School of Chemical and Metallurgical Engineering, accepting me at Cornell.

My parents drove me up to Ithaca on fall day through Owego, and I saw the campus for the first time — a leafy green quadrangle, Goldwin-Smith Hall on one side, mature trees here and there, and a quiet, late summer atmosphere.

But then I began meeting people, and a co-ed from Arts and Sciences, who had no reason to be interested in such details, began telling me about Dusty Rhodes, the ogre who lived in Olin Hall, who threw people out of Cornell very freely and sometimes very unreasonably. I was certainly concerned, as this was a type of character I hadn’t known before.

We spent our first year taking basic requirements, mostly in the College of Arts and Sciences, and getting to know each other. One day while waiting for a chemistry lab classroom section to begin I met Jim Villwock. Jim fascinated me with his detailed knowledge of Egyptology, his professed reading knowledge of hieroglyphics, and especially his (with high school colleagues) mumification of a cat that they called “The Princess.” This was pretty startling stuff. Later on, Jim’s wife Jackie would grumble very strongly about having the Princess stored in her fine casket under a bed in the Villwocks’ residence.

Encouraged by the faculty to do so, I temporarily transferred into metallurgical engineering, which was in the same school and building, in order to take the introductory course, with the intention to switch back to chemical engineering when I completed it. This I did, but I can’t remember what, if anything, I learned in that course.

To a certain extent Jim Ling, Lem Wingard, Tom Weber and I, as alumni, formed a sort of subgroup of Cornell Chem E’s. Most of us appeared in some sort of supporting role at each other’s weddings back in the 1960s. All of the others got their PhD and went on to profit from having that advanced degree. I was short-sighted and never wished strongly enough to engage in years of research to earn a PhD, even though it was clear that even in industrial employment, the doctorate was a strong contributor to job security and mobility.

Lem Wingard was a short, quiet fellow who was well built for his extra-curricular activity as the coxswain of Cornell’s crew. Lem as an academic became active in pharmacokinetics. This he did by applying to pharmaceutical action what chemical engineers already knew about kinetics. He was a significant contributor to that field and became a professor in the University of Pittsburgh medical school. I made sure, by being his sponsor, that he was elected a Fellow of AIChE for his contributions.

Jim Ling, having grown up in China, Villwock, having his interest in Egypt (for what reason I never knew), and I, with my interest in Greece, decided we’d like to take a course in archaeology. At the time, Dr. Frederick O. Waage was professor of the history of art and of archaeology. The others asked me to approach Prof. Waage with a request that he offer us a course. I did so, but he declined, citing the pressure of his existing work in the area of art. So we never got our course. I did audit one or two of his courses in the history of art.

Dusty wanted his concept of chemical engineering to be fully ingrained in his students, so he assigned himself the duty to teach the introductory second-year chemical engineering course, stoichiometry. There is hardly a technique more powerful, that leads to greater efficiency in problem-solving, than stoichiometry, the application of heat and material balances to problems. But in addition, we were treated to discussions of oleum and other forms of sulfuric acid, and of other heavy industrial chemicals, and we relied on information from the hallowed publication, the *Oil, Paint & Drug Reporter*. 
All of this made us feel like members of some sort of club. I’m sure that this was one of the intended effects.

But there was a sense of background menace that, whether at times stronger or weaker, persisted throughout my five years at Cornell. It was always present, though by my fourth year it wasn’t something I felt to be immediately threatening.

By my third year I had begun to grow somewhat restless with the continuous diet of heavily technical courses, and I began auditing and registering for courses in the College of Arts and Sciences. It was of course easier to audit than to register. But having read Thucydides during the summer before my third year, I felt a strong need to study Greek so that I could read some Greek literature in the original. I submitted a petition to my advisor to get permission to add three semester hours to an already crowded schedule. Normally, chemical engineers were required to average about 19 semester hours, fewer during the earlier years and more during the later.

My advisor was Dusty Rhodes. In fact, he had appointed himself advisor to everyone, to keep tight control over the activities of all of his students. Dusty was widely known to be opposed to frivolous courses, and music appreciation was known to be his least favorite. With some anxiety I marched into Dusty’s office to discuss my petition with him, and he took the Philistine position: Don’t you think that the required course in patent law would be better use of your time? I said no, I think I’m taking enough fully technical courses. What he didn’t mention (and of course we both knew) was that he taught the course in patent law. But he approved my petition, and in fact I never took that course in patent law though I earned quite a few patents.

Another pair of courses that I registered for was a year-long survey of the history of philosophy.

In addition to teaching stoichiometry, Dusty taught the unit operations course. This represented the core practice of chemical engineers, at least in those days and for some decades that followed. Our laboratory work supported the lectures, and I often recall the drying of that often-wetted, as-often dried Homosote board, the distillation column whose height determined the height of the high-bay wing of Olin Hall, the constant-head tank, and many other devices about which we wrote, and rewrote, earnest reports that were subjected to Dusty’s inimitable grading method.

Here I should recall that Dusty wrote a book entitled Technical Report Writing, another in the McGraw-Hill chemical engineering series. I remember that I read and re-read one page with great frustration, not understanding the logic of the discussion, until I realized that Dusty had changed topics in the middle of the page, and had not provided the slightest trace of a transition from the old to the new topic! This abhorrence of wording that would enable the reader to get through a text smoothly was carried into his (and J. C. Smith’s) critique of student reports. No phrase like “on the other hand” or “now, passing to topic B...” was allowed. I learned and applied this point of view in my unit operations reports, but I made a mental note never to do the same in anything I wrote for myself or others.

In addition, and more suitably, Dusty and Prof. Smith made it very clear that there was to be a certain formality and balance in language, and a careful maintenance of agreement in number (for instance), so that our final versions of reports read (except for lack of transitions) very smoothly; they were almost courtly in their effect. I admit that I still pretty much follow this style. I am careful, when editing, to make sure that pronouns, verbs, etc., are well balanced, and ellipses rare.

To the atmosphere of general menace was added the overt process of harassment. The most famous grading system in the University was probably Dusty’s method of grading the weekly reports we wrote
in the Unit Operations course. Each report received two grades, one for content and one for form. The grades were multiplied together, so that a 70 in each resulted in a failing 49, with an obligation to rewrite and rewrite the report until it was fully passable. I mocked this process in an article I wrote pseudonymously (though I doubt that the writer was a mystery to anyone who cared) in the May 1952 issue of the Cornell Engineer, of which I was Managing Editor at the time.

In addition to my intense interest in music, my other interests widened, and I wanted to register for courses in addition to those required for chemical engineers. So I petitioned to take 24 semester hours one semester, and Dusty grudgingly agreed. What I didn’t tell him was that I intended to audit two more courses that same semester, one in chemical physics with Peter Debye (a continuation of Debye’s quantum mechanics course that I had already audited) and another in the history of art. So I was committing myself at least to attend 30 semester hours worth of courses, and to register for 24 of them.

By the time we graduated I had over 210 credit hours, possibly a record for an undergraduate, though Cornell’s registrar’s office told me once that they don’t keep records of this sort of thing.

In fact, my average grade in the courses I took in Arts and Sciences was better than my average grade in engineering courses. These Arts courses brought my overall average up, counterbalancing my dreadful performance in Electrical Engineering for Non-Electrical Engineers, which I found impenetrable. I actually failed one of the semesters of EE for non-EE’s, though I never held that against Simpson (Sam) Linke, the professor in that course, who has remained a friend for decades. I have occasionally called Sam after some spectacular debacle in a power system, such as a failure of an entire grid, to see what he thought of it, or to ask a question about some electrical problem that I had. Sam was a specialist, rare for electrical engineers, in electrical power systems.

We started with 108 freshmen in chemical engineering, and by the time we graduated five years later there were 27, just one out of four of the entering class. The story that many people were thrown out was certainly true, though it was probably not true that it was unreasonable. I’m sure that those who were thrown out, in addition to many who decided that it didn’t suit their interests, deserved a firm push.

But tyrant though he was, Dusty seemed on the surface to be a very pleasant man with a diffident manner, and his Hoosier accent emphasized his seeming inoffensiveness. He was very casual about his lectures and didn’t prepare for them, just picking up the lecture notes that were in binders on his office shelves and marching into the lecture room. Without preparation he would get stuck in the same place each year and whistle softly as he tried to wriggle out of his difficulty.

We fifth-year students were given keys to the building and had labs in which we did our senior research projects. Jim Ling and I shared a lab. As everyone would expect, we added a few home-like touches to the Spartan environment of the lab, including provision for my making tea.

Our research project was to see if we could produce an edible cooking oil starting with palm oil. Jim’s father, a PhD chemist, was an expert on foods, having become interested in animal feeds during his residence in Singapore, and had suggested our research. We obtained a couple of gallons of palm oil from the United Africa Company of Guttenberg, New Jersey, and were totally unsuccessful in crystallizing, distilling or otherwise treating it. At one point we had a minor fire in a distillation column’s wrappings, and on another occasion, fortunately when the building was essentially unoccupied except for Jim and me, we managed to produce a cloud of acrolein that briefly stank up the halls. The lack of success in this research taught humility, if nothing else, and I suppose it was distantly related to my aversion to the idea of conducting research as a graduate student in the course of obtaining a graduate degree.
This privilege of having a place to work and study was exceptional, and we appreciated it. But even though endless study of chemical engineering probably could have been justified, Jim and I agreed that we would forego further chemical engineering effort after midnight. It was then that Jim practiced on his bagpipe chanter and I studied my Greek.

In addition to the fifth-year research project there was a plant design project that was intended to tie together professionally and technically all that we had learned about chemical engineering. My project, together with two other students, was to design a chlorobenzene plant starting with benzene and chlorine. We selected a paper by MacMullin as the basis and designed the whole plant. Or rather, I did most of the design since this was very specifically what I wanted as a chemical engineer to do, and my two student colleagues kindly permitted me to do most of the work. I recall that our chlorinators for the chlorination was a falling-film heat exchanger which I thought was a very responsive way to controlling the heat effects of the chlorination. In any case, Chuck Winding, our advisor, liked the design and kept copies of our drawings mounted on the walls of his office for some years. This I thought was a nice compliment.

Dusty liked to play pool in the Straight, and some students who played with him probably did not know his reputation as an ogre and tyrant. In the student lounge in Olin Hall the daughter of a Cornell professor painted a mural depicting the activities of chemical engineers, and showed Dusty good-naturedly getting blood out of students by squeezing them in a filter press. In fact, the last time I saw Dusty we were both in the Olin Hall lounge (I was there as an alumnus on some occasion) when someone took our picture. The picture was later published in a brief history of the school. One wouldn’t guess that Dusty and I hadn’t seen eye to eye on much when I’d been an undergraduate.

Whether Dusty’s philosophy and methods were fully agreeable to the other members of the faculty was never very clear to me. We students did not get signals that there was resistance. In the Unit Operations course, Julian “Ted” Smith, who assisted Dusty, could hardly, being the junior, have adopted a different grading method.

I attended Dusty’s retirement dinner in 1956 at the Plaza Hotel in New York. I was working for Solvay Process Division of Allied Chemical in Syracuse then, and thought that this was too important an occasion to miss. At the time, I believe that most of the graduates of the School, all the way back to its origin, attended that dinner.³ This was an indication that there was an extremely strong sense of school

³ I have a nice panoramic photo of the dinner and all of its attendees.
spirit, and even a fondness for Dusty despite his autocratic ways. Of course, those who’d been thrown out or who’d left voluntarily weren’t there. But some really big shots attended. Sidney D. Kirkpatrick, the editor of the chemical engineering series of textbooks at McGraw-Hill, was at the head table.

Charles C. (Chuck) Winding was second in command of the school while I attended, and was a faithful supporter as far as I know. Chuck succeeded Dusty as Director of the school. Chuck seemed to me to be perfectly reasonable, and he and I got along well. His avocation was sailing, and he was well known as a member of the Cornell Corinthian Yacht Club.

Herb Wiegandt was a very youthful-looking professor with some industrial experience. My impression is that he had been in the refining industry. He taught some practical courses like the survey of industrial technology. When I became active in desalination several years after graduation, I found that Wiegandt was also interested in this field, in the same specialty of “freezing” (actually crystallization), and so we occasionally had something to discuss professionally. I was astonished, years after graduation, when I visited Wiegandt in his office and he mentioned that he had a set of lantern slides on brewing that I’d prepared as part of a public speaking competition. (The origin was an article I wrote for the *Cornell Engineer* after visiting a brewery in Brooklyn.) I hadn’t remembered this at all, but there in all their inaccuracy were the slides, and I think I still have them.

Bob Von Berg’s thermodynamics course must have appealed to me more than I realized, for I was astounded, when he mentioned this to me decades after my graduation, that I’d been a very good student in that course.

The main course that Clyde Walter Mason taught was a third year course in materials. It was chock full of technical information. Complemented by Wiegandt’s survey of industrial technology, it exceeded the scope of my Industrial Processes freshman course at Brooklyn Tech. Mason enjoyed lecturing at full speed and he gushed information. Sometimes he would sense our struggle to keep up with him and say “Don’t take this down.” But that only encouraged some of us to do so. At this distance in time, I think that some of that information is still useful.

We all took Mason’s specialty course, chemical microscopy. It was an invaluable asset to know that one can use a relatively simple optical microscope and identify materials, study properties, and distinguish one material from another. Chemical microscopy taught me some things about the nature of many materials that I still remember and sometimes apply to this day. Mason was an early practitioner in that field, which was started by Emile Chamot, under whom Mason studied.

Henry Guerlac taught a year-long sequence on the history of science. This course fulfilled some of the concept of Dean Hollister’s five-year design for the engineer’s basic education. Guerlac was a spectacularly well-informed speaker, a walking encyclopedia, and delivered his information at a very rapid pace. It was a pleasure for me, with my interest in history, if not for everyone, to take that course. Guerlac delighted in being French and took obvious pleasure in pronouncing *Ampère* as a French word, something we thought was pretty amusing because none of us, at the time, knew any French.

The Faculty Committee on Music was a small group of professors dedicated to bringing in distinguished concert artists. It happened that I knew all its three members. Two were Clyde Mason and Henry Guerlac, and the third was Walter French, a professor of English who specialized in Beowulf, and who offered a course in the history of the English language that I took for fun. Professor French was a big, hearty Midwesterner, and he spoke the standard version of English we associate with “typical” American speech.⁴
Jay Hedrick joined the faculty about 1950. He was a very pleasant man, and he did not let his PhD get in the way of old-fashioned plain thinking. In one course he was discussing pumps, and, referring to mechanical engineers, he said simply that “it’s a good thing there are people interested in that sort of thing.”

After graduation I met him a couple of times off-campus by pure accident, such as the time I found him in the lobby of Carnegie Hall when I was living in mid-town Manhattan and he happened to be in New York on some personal business. One of Jay’s strong interests was in examining University finances, something not his specialty, of course. He took pleasure in disaggregating University financial statistics and showing that the more research was supported by the Federal government, the more the deficit, because the government didn’t pay the University all of the associated overheads. The consequence was that the students, among others, bore the burden of increased research. Whether Jay did this as a matter of mischief I doubt. I think he sincerely felt that research ought to pay its own way, and that the students paid for enough and shouldn’t have to bear some of the University’s administrative burdens imposed by the Federal government.

Chemical Engineering at Cornell was based on a philosophy that differed greatly from other institutions, and increasingly it was deemed by the Dean of Engineering, and probably the rest of the College, to be out of the mainstream. Dusty’s philosophy was distinctively creative, descriptive and broad in viewpoint, but not primarily mathematical or scientific. Ultimately I think that this outlook produced a sense of camaraderie and esprit de corps (excuse the French for both phrases). I have a feeling that the overall distribution of careers among Cornell chemical engineers was much more industrial, much more tended to leadership and technical (in the sense of design and construction) than that of many other leading colleges of engineering. I felt that very keenly myself.

At MIT for instance, the philosophy was very much analytical, mathematical and scientific. You certainly got that impression from the textbooks that came out of MIT. I suppose, broadly speaking, that you could say that the Cornell philosophy was that chemical engineering was an art supported by science, while at MIT and elsewhere, chemical engineering was a science supported by art. Gradually the persistence of a philosophy so much at variance with the mainstream of engineering education, both at Cornell and elsewhere, began to raise questions about who should run the school after Dusty retired.

School spirit was fostered by the appearance of Olin News, later called Olin Hall News. Some news was included, and a detailed list of graduates and their activities made it clear that the school was interested in them.

The constant sense of menace and vulnerability built a group cohesiveness that would hardly have existed based on the widely disparate origins of the class. This, combined with intensive training in certain aspects of chemical engineering—particularly report-writing, the fifth year project and research courses, and the methodology of problem-solving, reinforced by the Olin News and the availability of members of the faculty to help in employment—built a very strong group identity among both undergraduates and graduates.

\[4\] While attending a wedding in Clemson, South Carolina, someone mentioned to me, learning that I was a Cornellian, that a Cornell professor had retired there. It was none other than Walter French. I phoned him and said “Professor French, some years ago you told us that despite many centuries of physical separation by the North Sea, the speakers of English and of Friesian could understand each other. And last year I went there to see if that was true.” French hesitated and then asked “Was it?” When I said yes, he invited me to his house in Pickens.
Beyond

I never expected that my career would be quite so varied. But in a sense, I was prepared for a variety of times, both good and bad, by the essentially unforgiving process by which those few of us who survived the undergraduate experience were transformed into resourceful and adaptable creatures.

My first job, for six months, was as a plant engineer at Joliet Arsenal, southwest of Chicago. This plant produced acids, salts and explosives. This was invaluable, practical, no-nonsense engineering, but I could also apply some ingenuity to problem-solving, and came up with good new solutions to problems that others never suspected.

In the two years I was in the Army, serving out my duty as a commissioned officer from ROTC at Cornell, there was no technical aspect to my job that could have been directly related to chemical engineering training.

When I was discharged from the Army, not wanting to return to Joliet Arsenal, I went to Ithaca to see Chuck Winding. Chuck was very approachable compared to Dusty. He suggested that I see if there was a job available at Solvay in Syracuse, as my classmate Ed Callahan was working there for Ray Baxter, an earlier Cornell Chemical Engineering graduate. It was a good suggestion. Ray offered me a job and I worked there for almost four years. I worked on salts, chlorine/caustic, utilities and many other varied and challenging problems. Solvay was quite willing to make a young engineer a project leader, and shortly after joining I managed a project to make anhydrous caustic soda. It used Buflovač’s new high-temperature process that was a great advance over Solvay’s caustic pots.

I left Solvay in Syracuse, after four years, to join Scientific Design Company in New York. This firm was noted for its chemical process design skills and its innovation. Its technical areas were in oxygenated and chlorinated organics, some monomers and some polymers. I began in process development and evaluation and then migrated through process design to project management. I authored several patents relating to processes and equipment, including desalination. My projects included perchloroethylene (several plants throughout the world), maleic anhydride (several plants, with emphasis on the high-temperature heat transfer in the oxidation reactors), ethylene and ethylene glycol, and others, mainly petrochemicals. After a few years I went into sales, having spent much of my time supporting the sales staff. I became the most effective salesman in terms of engineering man-hours sold—our commodity—and also brought in ample royalty income from licensing proprietary technology. One new area I found was Portland cement technology. Though I traveled extensively on several continents with my plant model and literature, it was a great disappointment that the cement industry never embraced this technology. When I saw that advancement was unlikely, I negotiated a job with my client, Publicker. I had designed a synthetic alcohol plant for them years before. This was based on technology that I had traveled to Germany to obtain, converting my findings to a practical design that started up successfully in sixteen months. It was the first licensed technology of its kind. Altogether I’d spent nineteen years at Scientific Design.

At Publicker I was a vice president with an assignment to identify new businesses. The Cuban revolution had cut off its molasses supply, and its synthetic alcohol plant didn’t earn enough to support the firm. With a lifelong interest in energy topics, and with calls to many including Cornellians Mike Sfat and Lem Wingard, I quickly identified alcohol as a motor fuel as a promising field, one that had essentially no upper limit. This plunged me into the politics and controversy over fermentation-derived motor fuels. This argument has been going on since the late 19th century, with pretty much the same misrepresentations and—may I say it?—irrelevancies and distortions ever since. In FDR’s early days as president it revived, and then again in the late 1970s when I encountered it. It still festers. I spoke here
and there, was interviewed on radio and television, and enjoyed promoting what I still believe to be an excellent component of our motor fuel stream. I found distributors, researched sources of supply, worked on reviving our production facilities, and applied a great deal of accumulated chemical engineering horse-sense to my job. As vice president for research and development, my staff developed a new catalyst that improved the supply of a precursor of MTBE (but this product was labeled an environmental anathema and has disappeared), a new yeast for fermentation and baking, and other technology. Though the fuel alcohol business boomed, inept management created a corporate shell without any production or technical activities. Fortunately I had negotiated an employment contract with a very good separation arrangement.

Unfortunately this took place during the early 1980s, when the chemical industry was severely hampered by a highly valued dollar, which limited exports, and led to high raw material prices. I found no opportunities to serve another firm in any position, with age discrimination one factor, and the “we don’t hire people at less than their previous salary” another, related factor. So without planning, I became a consultant. But also, droves of other chemical engineers were early-retired and stopped on their way home to pick up cards identifying them as consultants.

By energetic bush-beating, including direct mail I acquired about sixty clients, some large but most small, that provided consulting income for nearly 25 years. Based on my extensive process engineering background I easily became a consultant in energy, and later on in water conservation, performing hundreds of on-site audits. Some clients needed technical or economic consulting, others management advice. I also worked for about three years for Brown & Root Braun in Alhambra, California, mostly in refinery-related designs and studies. Several law firms required technical support for litigation. Now, in 2007, my current assignment is in support of a law firm in litigation that, like a previous case, requires a strong background in process engineering and development, management, and licensing experience.

Through the years I have been much involved with civic work, AIChE, local history and other extra-curricular activities.

Each industry has required learning a new vocabulary, technical terms and practices. And things recur. After 45 years my flake caustic experience was directly applicable to one client’s interest in handling molten caustic soda. So everything in my background is usable in some form. At no time since graduation have I ever had the sense that I was not practicing chemical engineering in the broadest sense that Dusty and his crew would have approved.
Bob Messner

Memories

By the time we graduated, I was a bit worn out with engineering. I think it was a wonderful education and discipline, which helped me enormously in my work and other activities, but I really never practiced engineering as such after graduation. And Unit Ops! The writing skills Dusty taught us were invaluable. In that regard, it was the best course of the whole curriculum. All my electives I took outside the College of Engineering, something I never regretted.

One graphic (but maybe not really all that accurate now) memory from “Quant” Chem Lab: The drawer I kept my preparations in, from one lab period to the next lab, stuck and on shoving it in, the contents of two of the three sample dishes spilled a little. I think we were analyzing cement or some other sexy compound. Anyway, not wanting to go back to ground zero, I duplicated the spill puddle sizes with a burette to measure their sizes, and then applied appropriate corrections to the final results of the three samples. The adjusted results were quite close, and I got a reasonable mark on it. Again, I wouldn’t swear to the accuracy of this story at this point, but it’s a good story — not one that some of the professors might have wanted to hear. But then, maybe we all, including the pros, have similar stories in our histories.

Beyond

It all seems so long ago – it was a long time ago. Three days after graduation, I went to Cincinnati to start a career with P & G, as so many of the Cornell Chem E’s have done. After a big five or so days with Procter, I took military leave and reported to my (I was NROTC) ship, a destroyer escort out of Newport, RI, as Engineer Officer. My last year, Bob Morrow, a couple of years behind us at Cornell, reported aboard the same ship and took over from me. I am proud to say not a single North Korean submarine got into Newport harbor while we were guarding it. I even got to practice my organic chemistry once, when in the mid Atlantic, the ship ran out of soap. I had the cooks save the kitchen fat, and I made some fine soap using some caustic cleaner we had in the engineering storeroom on board. I was impatient to “get on with my life” during that time, but I soon realized afterwards the Navy had been a great experience for me.

Back to P & G after my shipboard stint. I stayed with Procter for 21 years, most of the time in their international operation, and all in production management. I know Dusty was horrified that I signed up for production, rather than engineering or development or research, and then overseas to boot! My wife and I raised three kids while living three years in Venezuela and another three in Germany, the rest in several locations in the U.S.

I then followed some other P & G folk to Frito Lay, again for production management work, and again with most of my years in their international division. Three years one more time living in Venezuela as head of manufacturing for a small Frito subsidiary there making pastas, canned pasta sauce, marmalades, and a line of dairy products – not normal Frito Lay fare. Good to see several old friends there again.

I took early retirement from Frito in 1987, so we could move to Vermont – to fly and to ski.
Did I mention that I learned to fly gliders (real ones, not models) while we lived in Germany? Son Bill, an architect, designed our house in Vermont. We live next door to a small country airport, and I remain an active instructor of gliding as well as flying my own glider (competitively, up to a few years ago) and flying the towplanes used to launch the gliders (not both at the same time).

Winters, the airport becomes a cross-country ski operation. Our first ten years in Vermont, I “consulted” for Frito, basically doing pretty much what I had been doing as a full-timer in their international operations. That got me to a long list of countries on all continents, and opportunities while there to fly gliders in several countries in Africa, the Middle East (Israel), Australia, South America, and Europe.

Three kids, five grandkids (one of whom just got married), all gainfully employed. Life is maybe beginning to slow down a little now, but we did just come back from a week of skiing in Alta, Utah and are off next week on a bare-boat charter (42-foot sloop) in the British Virgin Islands. As I am sure with many or most of you, we have recently had many interesting trips including crossing the Atlantic on a 360-foot square rigger that Margorie Merriweather Post, the cereal heiress, had built for herself in 1931. Two years ago, we had a delightful lunch with Martin and Gloria Simon in Los Angeles, but otherwise, we have lost contact with the other Olin Hall classmates.
Since graduation, I have seen very few of our classmates. Jim Ackerman was an usher at my wedding in 1956. I saw Andy Mellen once or twice long ago and his son and mine were classmates at Harvard Business School. Irwin Margiloff did a few small consulting assignments for me 10-15 years ago and Bob Messner stopped by with his wife for an enjoyable visit last year. I visited Cornell last year for the first time since graduation with my brother Les (Class of ’53).

After graduation, I traveled west and worked in the refining side of the Oil Industry for 33 years with three companies. The last of them was here in Long Beach, CA where I was the V. P. of Refining and Marketing. The company was taken over by a known crook, so I decided it was wise to leave before I too became a crook or a dope. By this time, my wife and I had some savings and a bright and energetic son. We decided to buy our own business.

For the last 22 years we have owned Trimco, a modest business of some 150 motivated and largely enjoyable fellow employees. We manufacture institutional door hardware for schools, hotels, museums, public buildings, and in the last two years, high-end residential. All of our products are made at two small plants in the U. S. and a foundry in Tijuana, Mexico. At the moment, we are growing faster than I can find the money to keep up. I expect to work another few years only.
Memories

I was on a collision course to Cornell.

Among my mementos is a book of photo-gravures of Cornell scenes purchased by my parents on their honeymoon in August, 1927. My father, a 1918 graduate of the University of Iowa in Electrical Engineering, had a keen interest in college football. For a time, he was employed in Philadelphia and probably became acquainted with Cornell through the Cornell-Penn games. My parents were married in Iowa and on their way East passed through Ithaca. I am rather certain that that visit to Ithaca on August 27th ultimately led to my going to Cornell some 21 years later.

At the end of my freshman year in high school, my father wrote to Cornell regarding entrance requirements. Nowadays, it is customary for high school students to apply to several schools and oftentimes visit them; not so in my case. My father took care of most of the paperwork for my application. He told me that University of Iowa would be my “backup school.” But to the best of my knowledge, that application was never filed.

On March 11, 1948, Dusty wrote to me:

Your application for admission to the School of Chemical Engineering at Cornell University has been provisionally approved by the school. This provisional approval is not final and official until confirmed by the Office of Admissions, but I think I can assure you that our recommendation in this matter will be followed and that official approval will be forthcoming when all of the formal requirements of your application have been completed...

I would greatly appreciate it if you would fill out and return the accompanying form. The information given on this is necessary for us in our planning of the term to come. I realize that you are probably fed up with filling out forms, but this one isn’t very bad and we really do want the information on it.

When you get to Ithaca, I hope you will make it a point to come in and get acquainted with me and with the other members of the staff.

While recently reading Julian Smith’s History of the First Fifty Years of the School, I was struck by something on Page six, namely, “The sole member of the admission committee was Director Rhodes, who typically would read some two hundred applications, admit perhaps one hundred students, and expect one-third of them to complete the course.”

On the very next day, March 12th, a letter was sent to me by Herbert H. Williams, Director of Admissions of Cornell saying:

I am happy to inform you that your application for admission in September 1948 to the College of Engineering (Chemical) at Cornell University has been approved. You will be admitted at the time providing that you complete any work now in progress at a satisfactory level.
Needless to say, my response was immediate. Today’s admissions procedures are very different!

**Costs at Cornell in 1948 were a bargain.**

When I began in 1948, tuition was $600.00 per year; a year or two later it was raised to $700.00 where it remained until I graduated in 1953. My freshman year, I had a single room in Baker Dorms for $273.00 for the entire year, payable in four equal installments. However, a couple of months into the first semester, there was a budget shortfall and I was assessed an additional $12.50. Fees were $15 for health and infirmary, $5 for Willard Straight Hall, $5 for Physical Recreation, $20 for Laboratories and Library, and $1 for Student Activities.

I attended the 1948 Freshman Camp for Men held at Lake Arrowhead, Little Meadows, Pennsylvania from September 13 – 16. This camp was 48 miles south of Ithaca. Our counselors were student leaders and athletes. A number of Cornell administrators were present at various times. We were welcomed on the first day by President Edmund Ezra Day. We received a thorough indoctrination in Cornell songs, led by Dave Dingle, Class of ’50. It’s difficult to believe, but the total cost of the camp was only $13.50.

Textbooks usually cost between $2 and $4, but our book for Calculus was $4.75. A log-log K&E slide rule was about $14. A one-year subscription to the “Cornell Daily Sun” was $6.

Contrast these costs with today’s. In 2006, tuition, fees and board and room at Cornell cost $43,707, and I just read recently that for 2007, that figure will rise to $45,971. Granted, the dollars of 1948 were very big dollars compared to present-day ones, but were they that big?

I know this is incredible, but when I first began at Cornell, some people actually mailed their dirty laundry home in a laundry case – for my laundry, a trip all the way to a Hinsdale, Illinois (a suburb of Chicago) and back. After a few trips those laundry cases (mine was aluminum) began to look pretty “well traveled!”

**Chemical Engineering Had a Reputation**

I came to Cornell and to Chemical Engineering with no preconceptions regarding the challenges they would pose. I had recently turned 18; it was pretty evident that I was at the low end of the totem pole age wise. There were large numbers of World War II Veterans who took their education very seriously. During fraternity rushing, I was often asked what school I was in. When I said Chemical Engineering, the response was always something about how demanding that was, and everyone seemed to have heard of Dusty.

After a year or so, I noticed that the numbers of students in some of my classes were dropping. We started out with 106 in Chem E, and after two years, I think we were close to 25, the number in my graduating class.

Shirts, ties, and jackets were the usual dress. We dressed for dinner every night in my fraternity. Students today would most certainly wonder why all of the formality.

I don’t believe I realized it at the time, but Olin Hall was just a little over five years old when I came to Cornell. Dusty treated it like a new car, and expected everyone to do the same. Smoking in the building was not allowed. I recall more than once seeing him approach a student who was smoking in the halls and telling him or her to go outside the building.
At the end of the lectures in Olin, “Jonesy,” dressed in a coat and tie, came in with pail of water and a sponge and cleaned the blackboards. It was a different era.

**Some Memories of the Courses**

Faculty members during the period between 1948 and 1953 were Professors Rhodes, Winding, Mason, Smith, Von Berg, Wiegandt, Hedrick, and Thorpe. Each was probably teaching three to four courses a year. The only course we had in Olin in the first year was Drawing and Descriptive Geometry. Finally, in the fourth semester, we had Dusty for Stoichiometry. The Differential Equations course was held in Olin on Saturday mornings.

Generally, it was not permissible to cut classes. In a September 1951 issue of the “Olin News,” Dusty went into some detail about absences:

*Any student who, for a valid reason, is absent from any class may and should obtain from the office of the School, an official excuse for such absence. The excuse should be obtained immediately after the absence and should be shown to the instructor in charge of each lecture, laboratory section, recitation section, or other class meeting that was missed, so that the absence will not be charged against the record of the student.*

This kind of rigidity would be a “tough sell” in this day and age.

Saturday classes were common. The first semester there was a Saturday drawing lab from 8:00 – 10:30 followed by Physical Training at 11:00; second semester, a qualitative analysis lecture at 8:00 followed by English at 9:00. In the third semester, we had a quantitative analysis lab on Saturdays from 8:00 to noon; and in the fourth semester, the differential equations lecture at 10:00 – often referred to as “The Hour of Mystery.”

There was a sigh of relief when that semester ended as our Saturday classes were over.

I had taken a drafting course in high school, but that didn’t prepare me for the course we had in Descriptive Geometry! The text was a one-inch thick stack of mimeographed notes by Townshend and Cleary. From my perspective, they would best be described as unfathomable. However, help was at hand in the form of Bruce Davis who was our drawing instructor.

Professor Grantham’s physics lectures were memorable, and many will recall a few notable ones – the effect of helium on the pitch of the voice, and the suitcase with the built-in rotating wheel.

In the “Quant” lab, we were given three samples of an unknown for analysis. The results had to agree within a certain range in the fourth significant figure. The computations required the use of logarithms for multiplication and division. I recall one particular unknown where I got the right precision, but the wrong result, a lesson in the distinction between precision and accuracy. (I repeated the entire analysis without success.)
A couple of times, Dusty discussed sonic flow of gases. I always found his explanation amusing – he’d say that the situation was like a bunch of fat people trying to get through a revolving door.

All men were required to take two years of ROTC. Many of my classmates went on for Advanced ROTC which led to a commission at the end of four years. I didn’t.

In the Second Year, we had our first elective, a choice between psychology and public speaking. In retrospect, I should have taken public speaking, but I took psychology. The course was given in Goldwin Smith between 11:00 and 11:50 by Professor Lidell, an animal behaviorist. (His assistant was Wilson Greatbatch who went on to Buffalo where he invented the Pacemaker.) I remember virtually nothing about the course material, but I do clearly remember three things about the course. The first was a lecture at which Professor Lidell hypnotized a sheep. The second was an embarrassment for me. One time, we had a guest lecturer. I was a little short on sleep because of some report I had been working on the night before. Figuring that we would not be tested on the material, I took a little catnap, probably slinking down behind the person in front of me. At 1:00 p.m. I woke up in an empty lecture room; about 200 people had filed out of there and left me alone! One of my fraternity brothers had placed a sign on my desk saying “Please Do Not Disturb!” The third thing I recall was the final examination. The questions were multiple-choice. It was evident that there was a lot of “collaboration.” Finally, one of the Teaching Assistants got up and said, “We don’t mind you looking at each other’s papers, but please don’t discuss the questions.”

Chemical Engineering 5353 – The Infamous UO Lab Course

We had heard rumors about this course from the day we entered Olin Hall. It became a reality for us in September of 1951 when the ten “General Instructions” for the reports were handed out. These covered a little more than two pages. Briefly, these instructions were (Direct quotations are in italics.):

1. The reports must be typed and submitted in a manila folder or an Accopress binder. Page numbers should be in pencil.

2. Reports must be submitted by a certain time on the due date. 

3. Reports accepted on first submission are “double-checked” and graded, and the grade is recorded. (Needless to say, that was a rarity.) It went on to describe the grading scheme for reports that had to be “revised and returned.” The point that made the course so famous campus-wide was: Each report is graded on the basis of completeness and correctness of subject matter and also on the basis of correctness and effectiveness of presentation. The final report mark is the product of these two grades.


5. Left-hand margins must be at least 1½ inches. Graphs must be mounted to read from the bottom of the report, without turning the report on its side. Graphs must not be on the same page with the discussion.

6. Calculations should be in the Appendix and follow the style of “Technical Report Writing.”
7. The reports must contain a title page, abstract, apparatus description, procedure description, data, discussion, and appendix. The discussion is divided into sections.

8. Instructions for the drawing of the apparatus.

9. *The report shall be written as if it were to be read by a chemical engineer familiar with the elementary and fundamental principles involved, but unacquainted with the specific experiment – and with the results obtained.* The report should not have long passages, copied from textbooks.

10. Each report must be the result of individual effort. *Two or more students may work together in the calculation of the data, provided that each contributes his proper share and is fully familiar with the methods and principles involved, but the writing of the report shall be done by each man* (how times have changed!) *individually, without reference to any similar report or criticism sheet of this or any former term.* Failure to observe this requirement may result in the student being dropped from the course or from the University.

Dusty and Julian Smith left nothing to chance. Realizing that spelling was not a strong point of many engineers, they gave us a spelling test of 35 words. As shown in Illustration 1, I missed five words and got an 85.

So we handed in our first report on the “Calibration of Orifice Meters with Water.” Illustrations 2 through 5 indicate the general nature of what we got back. In Illustration 2, I managed a pair of 80s for Material and Form, giving me a 64. The report required two revisions.
ABSTRACT

A central circular thin-plate orifice meter is calibrated with water at 25°C as the measured fluid. Two orifice plates are used; one carries an orifice 0.3125 inch in diameter, while the other carries an orifice 0.7503 inch in diameter. The empirical calibration equations are:

\[
\begin{align*}
W &= 1.5 H_{\text{CCl}_4}^{0.49} \\
W &= 6.5 H_{\text{Hg}}^{0.49} \\
W &= 10 H_{\text{H}_2\text{O}}^{0.49} \\
W &= 7.9 H_{\text{CCl}_4}^{0.50} \\
W &= 37 H_{\text{Hg}}^{0.50} \\
W &= 57 H_{\text{H}_2\text{O}}^{0.50}
\end{align*}
\]

where \( W \) = weight rate of flow, lb/min

\( H_{\text{CCl}_4} \) = manometer reading, cm of \text{CCl}_4 under water

\( H_{\text{Hg}} \) = " " " cm of Hg under water

\( H_{\text{H}_2\text{O}} \) = pressure difference, feet of water

The discharge coefficients of the 0.3125-inch orifice increase slightly with decreasing Reynolds numbers; for Reynolds numbers between 6,000 and 43,000, the discharge coefficient is 0.626 \pm 0.005.

The discharge coefficient of the 0.7503-inch orifice

Illustration 3: Hard to Believe!

I’ve labeled Illustration 3 “Hard to Believe” because the whole page had to be retyped on account of the omission of the units of the diameter dimension. In Illustration 4, there’s a pretty blunt explanation by Dusty as to why he put a red line through the page – namely that I couldn’t copy correctly. I suppose Dusty was right, but did it really justify re-typing the page (which probably required half an hour)? Finally, Illustration 5 shows Page 1 of five similarly detailed pages of corrections. OK, maybe he had the patience
to write this page once for me, but could he have had the patience to write this page 13 times, once for each member of the class that he graded?! (This assumes Julian did the remaining 12 members.) And remember, in this case, this was one page of five pages.
Sometimes these corrections were written on the backsides of discarded paper – Dusty must have been worried about the budget for supplies. I marveled that he and Julian had the time and patience to go through our reports so meticulously. (Quite a few years later, I was in a similar position grading unit operations reports; that’s when I truly appreciated their efforts.)

Along with the return of the first report came two mimeographed pages critiquing the general nature of the corrections in the first report. These instructions went on to say that in the future, the corrections would be less detailed (I suppose so that Dusty and Julian could get more sleep at night.) and abbreviations would be used for some: For example, “Vb” meant “too many words” and “Sc (on a graph sheet)” meant “scales poorly chosen.”

Each report usually involved preparing a half-dozen or so graphs using India ink, sometimes in several colors. We all got pretty adept at using ink pens and French curves. Some people worked in groups, producing multiple copies of a graph by using a hat pin to punch data point holes through several graph sheets at one time.

For the UO Lab, the 25 students in our class were broken up into groups of five, one group for each day of the week. The data for all groups were (Note that “data” takes the plural verb form!) combined and given to us for analysis. The calculations were all done by an assistant, but one run was left blank and that was the run that we used for the sample calculations portion of our report. Sometimes we were required to do some least-squares calculations. Someone had discovered a room full of calculating machines up on the Ag campus, so we’d trudge up there. But through the five years, 99+% of our calculations were done with slide rules. Years later, I told my students that if we’d had the computational power that they have today, we could have gotten through the five-year program in two!

(I still have my slide rules – I had both a 10-inch and a 20-inch. Sometimes I look at them to remind me of the “good old days.” The 10-inch has a small blemish. During my undergraduate years, I was a fairly heavy smoker and I had a cigarette going most of the time when I was doing calculations. Once, I noticed a puff of smoke emanating from the lower edge of the rule. A lighted cigarette had touched it! The slight damage interfered with the movement of the spring on the indicator slide. Fortunately, I was able to repair it with a little Duco Household Cement.)

During the spring break of the fourth year, we went to the Philadelphia area for our Plant Inspection tour. An upfront payment of $35.00 was required to cover transportation and five nights at the Penn-Sheraton hotel. Dusty wanted to make

![Plant Inspection Trip, Laboratory of Hercules Powder Company, Wilmington, Delaware, March 25, 1952](image)

**Front row, left to right:** Jack Gordon, Earle Ginter, Jim Villwock, Tom Gilbert, Tom Weber, Jim Ling, Cliff Dunn, Irwin Margiloff, Ken Powers, Ito Carlos

**Second row, left to right:** Walt Cox, Ed Callahan, Marty Simon, Jim Ackerman, Bob Messner

**Back Row:** Professor Von Berg, Jim Dillenbeck, Bob Baker, Jim Clarke, Jack Gallen

**Missing:** Lloyd Forstall, Charles Geyh, Arnie Huntress, Dick Lofberg, Andy Mellen, Lem Wingard
sure we behaved ourselves so he provided us with a full page of instructions. Concerned that we might revert back to our childhood ways, he wrote, “There will be absolutely no horseplay or running at any time. Be careful.” We left on a bus on a Sunday morning in March at 8:00 am from Ithaca. Through the week, the company providing the morning tour would host us for lunch. (I don’t recall what the setup was for dinners.) We visited a large variety of plants: Socony-Vacuum Laboratories, Campbell Soup, Hercules Experimental Station, Atlas Powder, Frankford Plant of Barrett Division of Allied Chemical & Dye, F. J. Stokes Machine Company, Sun Oil’s Marcus Hook Refinery, Brown Instruments Division of Minneapolis Honeywell, and the Eastern Regional Research Laboratory of the U. S. Department of Agriculture. On the Thursday night, we had a Cornell Party at the hotel. Dusty was there – he must have flown down just for that. We’d had a pretty full week by the time we arrived back in Ithaca on Friday night. Seeing so many plants in such a short time made the whole thing somewhat of a blur. But it wasn’t over – we had to write a report on one of the plants that we had visited, and of course we didn’t know which one in advance.

In the spring of 1952, Dusty actually wrote a “To Whom It May Concern” letter authorizing me to use the Olin reading room when the building was officially closed. He could have easily delegated that task to someone else, but he didn’t.

For some, the “thorn” of the program in the fourth and fifth years was EE for Non-EE’s. That’s when many found that they had made the right choice in going into Chemical Engineering rather than Electrical. My father was an electrical engineer, but his interest in that area hadn’t rubbed off on me when I was in high school; I had been attracted to chemistry in my early teens. However, electricity must have been a latent interest for me as I liked the EE course a great deal and found it to be very useful in both my professional career (process control) and in my outside interests (hi-fi and electronics).

In the fifth year, we were assigned labs for our Senior Research Projects. Early on, we were told not to bring food in the labs. (I think some people finally found a good use for those six-inch thick Chemical Engineering Catalogs – a few were hollowed out for storage of such things as tea bags!)

We began to think about interviewing for jobs. Dusty issued five pages of instructions on “Applying for a Job.” They were very detailed. As always, he wanted us to make a good impression:

*Come to the interview dressed as you should be for any important business conference. The informality of attire that is prevalent in the classroom or the laboratory is out of place here. Wear a coat and a necktie; have your hair combed and your shoes shined. Remember that the interviewer has only a little time in which to form an opinion of you, and that his opinion is going to be strongly colored by his first impression.*

Several pages later, he went on to say, “A letter of application might read as follows:” What followed was a complete one-page letter with a number of blanks to be filled in. I suspect that a number of letters went out, closely following that guideline! He followed that letter with strongly worded instructions regarding our responses to letters from companies. For some types of letters, we were to respond immediately.

To the best of my knowledge, Dusty’s help paid off. I would guess that most of the class went off on a half-dozen or more interview trips and wound up with a job paying something on the order of $400 a month. In some cases, there would be a military interruption, especially for those who had taken advanced Army or Navy ROTC, but at least they had a job to return to upon completion of that commitment. I had elected not to continue with ROTC and thought that I might not be drafted. I accepted
a position at Esso Research and Engineering Company in New Jersey and was to report for work the first of July.

We graduated on Monday, June 15, 1953. The next day, my parents and I headed back to Hinsdale — a monotonous, roughly 700-mile drive in those days. Our mail had collected on the floor below the mail slot beside the front door. There was an official-looking envelope from the Government. The document inside, dated June 16, 1953, was an “Order to Report for Induction” on July 1st. In retrospect, it shouldn’t have been a total shock as I had had military deferments for four years and was reclassified 1A on June 2nd. My draft board was saying, “Enough is enough.”

Almost as soon as I was inducted, someone told me that if I ever had a chance to take a typing test, I should. The Korean Conflict was winding down at that time, so from July 1st through the holiday, I still only had my civilian clothes. On or about July 5th, during a “formation,” there was a call for people to take the typing test. Although I hadn’t taken one in years and was a bit nervous, I passed. That test was to set the general tone of my two years in the Army.

After six months of infantry and artillery basic training in Arkansas, I wound up in Public Information School at Ft. Slocum, NY, a small island in Long Island Sound, just off the coast of New Rochelle. Following my “graduation” from that School, the Army decided that my typing talents, gained through all of those Unit Ops Reports, could best be utilized for Government purposes at Slocum as a Company Clerk starting at $78 a month. While there for about a year and a half, I took a half-dozen correspondence courses in electronics, radio, and television through the USAFI (United State Armed Forces Institute) program – EE for Non EE’s had provided me with a good grounding in the fundamentals.

At that point, I thought my days in Olin Hall would be limited to Reunions and Homecomings. While working at Esso I began taking graduate courses in Chemical Engineering in the evening program at Newark College of Engineering (now called New Jersey Institute of Technology). As I neared the end of my Masters program, I contacted Chuck Winding, now the Director of the School, about returning to Cornell for the PhD program. He offered me an Assistantship in the Unit Ops Lab, probably thinking I hadn’t learned the subject well enough the first time. So I returned for what was to be another 4 ½ years in Olin.

**Graduate School – Seeing Olin through a Fresh Pair of Eyes**

During the five years that I had been away, the School added Professors Harriott, Finn, York, and Rodriguez who was just finishing up his PhD there when I arrived in the fall of 1958. Pete Harriott was in the BChE class of 1949, so he was actually in Olin Hall during our Freshman year, but I don’t recall ever seeing him. He then went on to MIT where he received his PhD in Chemical Engineering in 1953.

Pete was working in a relatively new area for Chemical Engineers, namely Process Control. I really had no background in it, but thought that it would be interesting. So I chose to go into that field. That fit in well with my minor in mathematics, and led me to some courses in servomechanisms in the EE School. Much of the theory dovetailed into the course we had taken in EE for Non-EE’s, and with my interests in hi-fi and electronics.

About four or five months before returning to Cornell, I had received notice from the Graduate School
that I would have to pass two reading courses from among German, French, and Russian. My only language background was two years of Latin in High School. In the intervening months, I learned enough German in a correspondence course through the University of Chicago to pass the German exam. A short French course for graduate students during my first semester back sufficed for the French exam. These foreign language reading requirements were a real “thorn” for many and I considered it a miracle that I got through them the first time.

It’s a small world. I was surprised to find Deran (“De”) Hanesian (who had graduated a year ahead of us) back for a PhD as well. Craig Christensen, a childhood friend of mine from Hinsdale, was a year or two ahead of me in the program. I had worked two summers for his father in a pilot plant of Armour & Co. in the Chicago Stock Yards. Bill Baasel, a Chem E from Northwestern was also there. Bill and I had worked on different shifts at that pilot plant. During my second year back, a fellow named Charles Krutchken began the PhD program. I recall that Charlie had worked for Hercules where he met Mary Metaxas, one of the students in the Chem-major program with us. They were later married.

About a year or so after I started, Ray Thorpe gave several of us the opportunity to teach a few sessions of the Introduction to Chemical Engineering. He sat in the back of the room and critiqued us. It wasn’t surprising that a number of us wound up at universities – Bill Baasel, De Hanesian, Bill Mathewson, Bob Coughlin, Lem Wingard, Steve Rosen, and I. During 1961-62 I was an Instructor, teaching, among other things, the Computations course. It was an outstanding class and no doubt contributed to my interest in teaching.

In 1961, George Scheele joined the faculty. He and I shared an enormous office at the northwest corner of the first floor. It was the largest office I ever had; for the rest of my professional career, it was all downhill! I set up my first stereo system in that room and I heard my first stereo simulcast of the Philadelphia Orchestra from Bailey Hall; I think WHCU transmitted the “AM” signal and WVBR the “FM” signal.

I began these memories by relating how I had been on a “collision course” from the time I was born to the day I entered Olin Hall in 1948. My father was to “blame” (or take the credit) for this. In 1985, my daughter, Anne, began four years at Cornell in Baker Hall where she took a degree in Chemistry. Along the way, she took a couple of engineering courses; one was the introductory course in Chemical Engineering under “Rod” Rodriguez. Two years later,
she got a Masters in Chemical Engineering at the University of Illinois. In 1989, my son, Bill, began four years in Olin Hall. Thus, Anne and Bill were on the same collision course I had been on. It was fitting and Bill’s good fortune that his advisor would be my good friend, George Scheele.

Although Anne didn’t receive her undergraduate degree in Chemical Engineering, she is quick to point out that she has been more of a Chemical Engineer than I ever was because she wore a hard hat and I never did! She has spent her entire professional career in the food industry. She was with General Mills for fifteen years, and has recently taken a position with Sara Lee; her husband is a Mechanical Engineer (U of MN). They have three children. Bill went directly to the University of CA at Davis where he received his PhD in Chemical Engineering. After a few years with Mobil (now Exxon-Mobil), he left for Columbia University where he received his MBA. He’s now with Integra Life Sciences in Princeton, NJ. His wife, Wendi, received her PhD in Chemical Engineering from the University of Virginia and she has an MBA as well from the University of MI. She worked for Engelhard, which was recently acquired by BASF. Now the disclaimer: While it might be argued that I “engineered” this whole scenario, I plead innocence! Just ask them.

About ten years ago, my wife, Marianne, and I were touring California and stayed overnight in Carmel. We were up early and strolled through the town before the stores opened. One display window caught our attention – it had a bunch of small souvenir pillows embroidered with various sayings, most of them pretty clever. There was one red and white pillow that we particularly liked. Unfortunately, the stores were closed, but it was close to ten when they would open. We decided to hang around. My wife knew that pillow was the perfect Father’s Day gift. The inscription read,

It’s Hard to Be Humble
When You’re From Cornell

Beyond

I mentioned above that my first two years following graduation had absolutely nothing to do with Chemical Engineering, but there were some positive spin-offs. Pounding away on a manual typewriter for a year and a half as a Company Clerk in the Army improved my typing a lot, especially with respect to the number keys. So when computers came along, I was a pretty proficient “keyboarder.” Moreover, my two years in Service provided me with 36 months of GI Bill, and that supported me pretty well through my Masters and PhD degrees. And most importantly, I met my future wife on a blind date a month or so before I was discharged from the Army.

While at Cornell in Graduate School, one of my roommates in 1959-1960 was Peter Paullin who was doing his Masters research under Chuck Winding. Peter told us about the beginnings of a new Department of Chemical Engineering at the University of Buffalo (UB). Bill Mathewson joined that Department in 1962 and I followed him there the next year, bringing our full-time faculty up to four. In 1963, UB became a part of the State University of NY.

With my background in process control, I handled that area in the Department and wrote an undergraduate textbook on that subject in 1974. When Bill Mathewson left in 1964, I took over the advisement of one of his graduate students who was working on adsorption in packed beds. I continued to work in that area for a number of years.
Unlike most engineering students that I have known, I had always been attracted to thermo. Early on in my career, I volunteered to teach an introductory course taken by engineering sophomores. From then on, I taught a variety of thermo courses throughout the rest of my career.

I was heavily involved in the undergraduate program. About 1980 I became the Associate Chair, and in 1982, Chair. In 1989, I returned to full-time teaching and research. As the saying goes, any resemblance between the way I handled the Chairmanship and the way Dusty handled the Directorship was purely coincidental! I’m pretty sure I didn’t achieve his “reputation.” I retired seven years ago with close to 38 years of service.

I saw many changes in the Chemical Engineering program over that period, and of course the evolution of computers has had much to do with it. Yet, I feel there are two “constants” that will continue into the next 55 years of engineering: The first is the value of hands-on laboratories. Although there is much to be said for simulations, students remember experiments that either didn’t work or didn’t quite fit the theory. (Sorry, I simply couldn’t find a better word to express it than “quite.”) Experiments really stimulate one’s thinking, or at least we educators hope so!

The second “constant” is the memory of thermodynamics that nearly all engineers carry away with them. A few really like thermo and may go on to study it further, but most come away saying they could understand enthalpy but they never quite (again, please excuse the “quite”) grasped the property and concepts of entropy. Many new textbooks and multi-media methods will continue to be developed to make the subject more palatable, but I doubt that students’ impressions of the subject will be much different than they have been during the past 55 years! When we were in school, we studied the many “faces” of thermo in a number of courses – a so-called classical treatment was followed by Chemical Engineering Thermodynamics, and of course it turned up in stoichiometry, physical chemistry, and heat power. And in graduate school, some of us encountered the statistical approach. The tendency now is require less of it – I’m confident that that will help to eliminate the bad taste in students’ mouths! With energy a particularly “hot topic” in the world, wouldn’t you think there would be more emphasis on classical thermodynamics rather than less?

In 1979, I learned to swim when my son, Bill, was in age-group swimming. (I had passed the swimming test required of all Freshmen at Cornell – that only proved that I could dog-paddle across the pool, but I really didn’t know how to swim then.) This has led me into an area that I never would have dreamed possible 55 years ago – namely, US Masters Swimming. The University pool is just a mile and a half from my home, and I have continued my swimming activity into retirement. I compete in “age-group” swimming in the 75-79 group in two events; one is a 3,000-yard swim and the other, a one-hour swim. My wife and I travel some, and visit our children in Minneapolis and Burlington, NJ.

Finally, I had to laugh as I read what Dick Lofberg had to say about me on graduation day. Something to the effect that I was still working on some report, and he and others were becoming impatient with me, threatening to carry me to the procession line in my chair. I must confess that I don’t recall the incident, but I have no problem believing it was true. I still haven’t found the time to “smell the daisies” but I continue to enjoy life nonetheless.
Reunions

I have been back for most, if not all the five-year reunions, but the number of returning alumni has fallen off for various reasons. I do have a few pictures from our 50th and 55th reunions that are shown here.

Lloyd Forstall and Arnie Huntress at the 50th

50th Reunion Returnees from left to right: Jim Ling, Jim Clarke, Lloyd Forstall, Tom Weber, Bob Baker, Arnie Huntress, and Ito Carlos
50th Reunion Returnees: Jim Clarke, Tom Weber, and Ito Carlos

Ito, Tom, and Gene Wilkerson at the 55th. Gene, who began with us in 1948 and was a Chem major, taught high school chemistry in California.
The main entrance to Olin Hall beckons our return, if not in person, then in spirit through our memories.