Reminiscences of Three Years (1944-1947) Spent in Urbana/ Champaign at the University of Illinois Chemistry Department

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I was born in 1923 in Lincoln, Nebraska. My parents were Guy and Grace Chambers and I had one younger sister. I grew up in Lincoln and graduated from the University of Nebraska. My father was a prominent and respected lawyer in the town. My mother had been a librarian and piano teacher, before they married but as I knew her was a housewife in a good part of town who had a live-in maid to do all the cleaning and cooking. In my view the middle class wives of my parent's generation had a soft life compared to the generations before and after. My grandmother bore and raised 10 children and made ends meet financially in a frontier town - a tough life with lots of hard physical labor. My (second) wife had a full time professional job, senior vice president of Hill and Knowlton, one of the largest PR companies, and also did the cooking and laundry and raising of six kids. By comparison, the generation in between, that is, my mother and her friends, had relatively little useful to do or perhaps I should say the culture neither encouraged nor permitted them to do very much. My childhood was spent fighting with my mother who seemed determined to run my life. I successfully thwarted this ambition, and the techniques of resistance to being bossed I developed have lasted me the rest of my life, for better or worse.

At Nebraska, the Chemistry Department chairman was Cliff Hamilton, a real gentleman and good chemist. The program was set up so that a chemistry major was supposed to take a master's degree before moving on. Cliff offered me, in my senior year, the best scholarship he had to stay on the extra year, but I turned it down. Frustrated in romance, among other things I could not wait to get out of the town I grew up in.

I had a bad case of asthma as a child. I missed one third of my days in grade school, was never considered robust enough to take a course in gym in any school and flunked the advanced ROTC physical because I was 6' 3" but only weighed 117 pounds. So in 1944, graduating just before I turned 21, 1 was declared a 4F and Cliff got me into Illinois for graduate work.

Looking at the train schedules, the station master in Lincoln scheduled me to take the shortest route from Lincoln to Urbana going through Peoria. Getting to Peoria was simple, but then I had to wait a while at the station to take the next leg of the trip. I walked up the street to stretch my legs and fell in behind two fellows walking ahead of me who, I could hear, were discussing at length, the fine points of the law as applied to stabbing someone to death without being charged for murder. After a couple of blocks I quit following and beat it back to the station where I felt safer in the presence of other people.

The next leg was a small electrified railroad, really not much more than a trolley car, that ran east across Illinois. It did eventually get me to Urbana. But I never ran into anyone else who even knew that railroad existed, and I certainly never rode it again, given the good service from the Illinois Central.

I walked into the chemistry department, up to the counter. Mrs. Evans, the department secretary, came forth to meet me. I identified myself. She made it plain that she was not favorably impressed. She said she had felt sure I would be drafted and be unable to show up, but since I was here, she would put up with me. Clearly I got off on the wrong foot with Mrs. Evans, but I guess most other people in the department felt the same way about her.

At any rate, she gave me a suggestion for a rooming house, one right across the street, which was handy. There were five students on the second floor, and one vacancy when I arrived. The lady of the house, leading me up to see the room, turned, halfway up the stairs, and asked me if I was a Jew. I was baffled but said no, and asked why. She said she was very opposed to Jews and had always been proud of her ability to detect them. But the previous year she had rented one of the rooms to a redheaded boy and became very fond of him. Then several months later it turned out he was a Jew. It was too late for her to dislike him, and she resolved never to be put in that position again.

I had a roommate, Paul V. Smith (who later worked at Exxon). Paul, an affable chap, was a graduate student, who worked on Marvel's rubber research program. I learned that the graduate students who worked on that program either did monomer synthesis or polymerizations, one or the other. Paul was super efficient and carried out a full load of work of both kinds, doing about twice as much as anyone else. Then when he got back to the room at 4:30 pm he would sit right down and read the JACS. Personally, at that point in the day I was half dead and unable to read anything until I'd had dinner. After dinner I would study, but Paul had, on top of the work and journal reading, a full social calendar and would be out on a date nearly every night.

During that summer I joined Alpha Chi Sigma and when fall began went to live in the AXE house. This was wartime, and the department only had a few entering graduate students. At any rate the AXE house had plenty of space and I lived there the rest of my time at Urbana. The AXE house was just down the street from the residence of the Dean of Women. That meant the AXE house was located in a sorority district. I gather the house had been bought from a defunct sorority. The dean of women (we heard from girls who swore it was true) had instituted all sorts of remarkable rules. For example, coeds were forbidden to wear red on dates, too stimulating, or patent leather shoes, a boy might see a reflection up their skirts, or sit in a boy's lap unless there was a phone book between them. Sometime during the war it was decided by the dean that the usual dance hours would be reduced from requiring the dance to end by midnight, and all the girls to be back in the dorms and in their rooms at 1 a.m., to requiring that the dances end by eleven and the girls be in by midnight. There were impassioned protests and the dean finally accepted a compromise. The end of the dance was reduced to eleven, but the all-in-the dorm time was left at 1 pm. The students were gleeful at putting one over on the administration.

Getting back to the Chemistry Department: I have a vague recollection that the first step was to take a placement exam, and the day I walked over to take that exam was D day in Europe. Then later there was registration for summer classes. The registration started at 8 a.m. on Monday. I had always been early for registration at Nebraska, so early that my advisor never had his papers and I had to get them for him, as well as make out the program for myself and do everything except sign it, which he managed without reading any of it.

So I arrived at 7:45a.m. to be first in line at the department office. It was quite a shock to see that about half the chemistry graduate students appeared to be already in line at that hour. There was no reason at all to be early that I could see. There were not going to be any full classes. So I said to hell with it, went up to my job in the bomb room and came back at l:00 p.m. when the line was gone. What I learned from this was that, after being the only early bird in sight at Nebraska, I had come into a place where there were a lot of other people who had the same pushy inclinations vis-a-vis schedules and probably other things as I did.

That reminds me of a related finding. I had been elected to Phi Lambda Upsilon at Nebraska and I knew that the meetings were devoid of substance. So when I saw the notice of a meeting at Urbana, I ignored it. Mistake. After the meeting I was officially informed that I had been elected vice president. Further questioning elicited the fact that the vice president did all the work in the organization, namely going over to the graduate school and looking up the academic record of each eligible student, and calculating his grade point average. I did this chore that year, but I was careful after that to attend all meetings in self-defense. While doing the work, I did notice some things about the records. Every student who went to a big enough school and took a course that should have made him eligible for Phi Beta Kappa was a member. And the all engineers were members of their honor society. I decided membership in the honor society must have been part of the criteria for getting in.

Anyway, I signed up for the appropriate courses at registration, but said that I wanted to take physics as my second minor. It had been my minor at Nebraska, and in fact I probably spent more time there in the physics department (which was small and like a family) than I did in the chemistry department which had a lot more graduate students, and where undergraduates were somewhat insulated from the faculty. The faculty advisor at Urbana did not sign off on the registration, but suggested that maybe I would do well to discuss the idea of a physics minor with some of the other graduate students. I did, and was told that physics was never chosen. According to the story, the physics department had flunked a chemist on the oral defense of his thesis and no chemist wanted to run that risk again. I was told further that the three recommended second minors were math, physiology and ceramics. I went back to registration and took math.

(Just as an aside, I was there the day the fire engines pulled up to the "Chem Annex" building and reeled out the hose ready to fight the fire. There was no fire. It turned out the call had come from "ceramics.")

The courses that summer had about 20 people or so in each of them. The tough one for me was Thermodynamics. First time I had had anything like that and I was not pleased with my performance in it. In fact, I kind of expected a B. The teacher, who may have been Foil Miller, gave me an A which so encouraged me that I resolved to make everything after that an A; and in fact this did work out.

A good part of my time that first summer was spent on my job, which was running the bomb room doing hydrogenations. This facility was right next door to Dr. Snyder's office. He was a somewhat nervous person and obviously was afraid that in any real explosion a heavy steel bomb might go right through the rather thin wall. Every couple of weeks I would find some article or

clipping about something that produced an explosion pasted on my wall so I would know what not to do, courtesy Dr. Snyder. Nevertheless, I was fond of Snyder who also was teaching one of the courses I took. He was the only one of the senior staff I knew at that point and I suppose I would have asked to join his group if Cliff Hamilton had not come through and said that his particular friend was Marvel, and he would consider it a favor if I signed up to work for Marvel, which I did.

One other thing I remember about Snyder was that he walked pretty fast. So did I. One day, he proposed we walk together and see which one of us was going faster. I could think of no particular advantage to doing this. I never went into a contest without doing my best to win it, and given my poor record with bosses, I thought that winning something against a senior staff member might not be very wise. So I turned down the offer. I am sure I was wrong in this, but I was very cautious at that age and I hated losing. Actually, much of the constant running conversation in the laboratory was a form of groping for things that we could disagree on. And there would usually be an attempt to convert that into a bet. Probably a real bet with money put up only developed about once a week. However, I never bet on something unless I was sure I was right. I stayed out of most bets, but did win money on some of them, and I don't believe I ever lost a bet in the three years I was in school there.

I am not a very good mechanic. I call myself a Mexican mechanic, which is not politically correct, I am sure. My instructor in the bomb room was my predecessor, John Stewart, who was a good mechanic. At any rate during usage, mechanical equipment tends to develop various problems. The proper way to respond is to analyze, correct the problem and return the equipment to its original functional status. I was not up to doing this. My solution was to mix and match pieces and procedures until I found combinations that worked. Stewart decided to run a hydrogenation one day a couple of months after I took over and he just moved in during one of my absences and did it himself. The next day, he came in and put on a display of hitting the ceiling because he had ruined his experiment, leaks, etc., and by investigation found that most of the equipment was in deplorable shape. I pointed out that I was getting the work done, but then lapsed into silence and took my bawling out. Unfortunately, this did nothing to educate me in the rather complex field of acting like a good mechanic, and I continued to serve my time in this job using my Mexican mechanic approaches, including hairpins and safety pins if needed or whatever else worked.

In addition to doing hydrogenations for anyone who asked, I was in charge of shipping chemicals from the program that Marvel had had before the war making chemicals in the summer. It seemed as though I was shipping out ninhydrin every day and getting it on my hands where it left black marks. In order to do this shipping, I had to scrounge for boxes and packing materials, a substantial amount of which was excelsior. It turned out that the fire department regarded the person in my job as some kind of subversive and their natural enemy. They would make unannounced sweeps of my cupboards from time to time looking for excelsior. Large bottles of ether or carbon disulfide, which I would consider fire hazards, apparently did not mean anything to them. The one thing they had been trained to eradicate as a fire hazard was excelsior. They knew I had the stuff, and had hidden it from them, so we carried on this game of my hiding and their seeking as long as I was in this activity, which extended well beyond the summer.

Out in the hallway, were some cases full of small bottles of chemicals made in various research projects, and one of my other duties was to keep the records of these materials and access them when needed. Men from pharmaceutical companies would come through with lists of things they wanted and then would want to see what else we had. I remember one guy who announced he was looking for anti-fungal agents. He had a list and I dug out the compounds, finally bringing up one that had mold growing on the cork. I said I assumed he would not want that one. But he took some, telling me that it might be a good growth-promoting agent for fungi used in making antibiotics and such. I was impressed by this thinking.

When I signed up to work for Marvel, I was assigned space in a six-man lab on the second floor next to his office, and on the other side just next to the main chemistry building entrance steps coming in off the quadrangle. The others in the lab were Charlie Overberger who occasionally acted as group leader, Bill Bailey, Ralph Rowland, Fred Woodward and Junior Johnson (who got his PhD at Indiana after the war). Bailey worked directly across from me with Overberger on my left and Woodward on my right. There was some gossip that a predecessor at my desk had worked into the early morning alone, caught fire and died in the corridor outside. My immediate predecessor had left ampules of liquid around in the desk. This was a little nerve wracking because he had been working on compounds that were spontaneously flammable when exposed to air. Despite these grim reminders, I found the location to be one of the best in the building, and thoroughly enjoyed associating with my lab mates.

My first assignment was synthesizing compounds to be tested as tackifiers for synthetic rubber. When rubber is put together in layers, as it is in tires, natural rubber molecules, migrate and effectively weld the layers together. The styrene/ butadiene copolymer used during the war as synthetic rubber for tires does not do this and something had to be added to make the layers stick together. That additive was called a tackifier. I reported to Robert Gander on this work, although he pretty much left me to do what I wanted on the assignment. I made a series of resins from para tertiarybutylphenol plus various aldehydes. This approach was based on information from the capture of a German synthetic rubber sample which had a material that seemed to be something like this. (It turned out the Germans were using acetylene instead of acetaldehyde but we were not aware of their extensive work on acetylene at that point, and did not guess the structure from our primitive interpretations of ultraviolet and infra red spectra). At any rate in due time a report was issued on this work, which included maybe a couple of dozen things I had thought up and contributed. Gander's and Marvel's names were on it, but mine was not. My feelings were a bit hurt, and only later did I understand that the report was part of the government rubber project, and I was not officially on the project and possibly should not have known what was going on. At that point I was on an industrial fellowship (Allied Chemical).

I doubt if Marvel concerned himself with legalistic details of that sort when there was work to be done. I was impressed when I walked past his office and often saw somebody sitting in a chair talking to him, while a secretary stood responding to something, and Marvel had the phone to his ear carrying on another conversation. I remember hearing him on the phone being asked who he was and giving his title as mister, saying "this is Mr. Marvel." I figured that was a high class way to carry a big weight of prestige, and have followed that practice myself, without the prestige of course.

Moving into the six man laboratory was quite a pleasant improvement over the bomb room where I was by myself. However, I began to find out that the equipment I had access to at Nebraska was more primitive than what I could get at Illinois. Specifically, I had never had access to vacuum before. So in a few days I had an explosion evacuating a four-liter Erlenmeyer flask and splattered dirty chemicals on the ceiling. The other five men in the laboratory rather apologetically huddled together and then announced to me that the ceiling had been freshly painted not long before, and that they had all agreed that whoever spoiled the new paint had to buy a round of drinks (beer) at Greasy Nick's (Farwells) across the street. So I accompanied them and picked up the bill.

But then over the next few weeks, I managed more explosions and hit the ceiling three more times. I saw them huddle again at the other end of the lab, and then they approached and said they had had a meeting, and a vote, but I was entitled to vote also. The proposal was that every time somebody hit the ceiling he had to stand a round of drinks. I guess they figured they had a good thing going and might as well take advantage of it. It was 5 to 0 before my vote, so I agreed. In the three years following I did not hit the ceiling again. This was only partly due to my being stingy. I was actually learning things too.

Woodward had a box of solvents in half gallon bottles, nine of them, right between us. But they were slightly on his side and belonged to him, not personally of course, but organizationally. Junior one morning was mad as a wet hen. He had been working very late the night before and had run out of ether, and had used some from Fred's bottle labeled "ether." When he did this, his whole product became miscible. He could make no separation and threw it away. He was trying to figure out what had gone wrong when Fred admitted that none of the labels on his bottles was correct. This was his form of security against poachers because he knew that the alcohol bottle had acetone in it, etc., etc. Sometime later, being my usual objectionable self, I began to use his solvents right in front of him, so he learned that I had figured out the code, not really much of a feat. Poor Fred was visibly in a quandary. To get me off his back, he would have to change the code. He decided he was just not up to learning a new code only to have me figure it out again and be back in the same position. From there on out we both used his collection of solvents, and I did my share of refillings.

Ralph Rowland was characterized as being a poor housekeeper. I noted when I was first there that he never seemed to wash any dishes. He would just pile them up on his desk. When the desk was completely piled three levels high he would take action and they would all disappear. It turned out he had stashed them under his bench in the cupboards. But eventually the cupboards got full too. At that point a nice young girl showed up to wash all his dishes for him. Turned out she was his younger sister who was being sent to a girls college in Minnesota. He would invite her down for a visit and get her blind dates for the evenings and in return she would wash all his dishes.

Bailey was a professed communist whereas I am a libertarian (although I did not know the word at that point) so our days were spent arguing theoretical politics. Once a month or so, Charlie would come back from Speed Marvel's office next door and say Speed had asked if Bill and I could turn down the volume. We tried. Communism during the war years did not have the universal bad name it got later, and Bill's form of communism always turned out to be some

form of Christianity when he was pushed. Charlie, who had to listen to our arguments, said that he noticed that when Bill was in retreat, he made liberal use of red herrings. Charlie said my technique was different. When I was finally cornered on something, it would turn out that I based my position on some sort of fact that was totally unprovable either way, but where I based my argument on one view and everyone else believed the opposite. I took that as an endorsement, since I always figured I was right regardless of how many people thought the opposite, but I suspect Charlie didn't mean it that way.

Those were interesting days. Charlie was a self-professed ladies man and did more dating than the rest of us. I remember one time he got absentminded and woke up an hour ahead of time to the fact that he had appointments with two young ladies to come by the lab for him to take them out at exactly the same hour of the same day. There was a hurried consultation. Charlie was to hide across the hall, and whichever was the first of the coeds to show up was to be swept off her feet by the rest of us and taken from the scene. Then he would come back to the lab and take out the second coed as planned. I don't remember how this all worked out, but our laboratory was certainly a close-knit community. We were all stuck there during the war, and the personnel did not change for two of my three years.

Bailey was my closest friend. Neither of us was interested in drinking alcoholic liquors, and on this basis we did double dates together with coeds who were aware that they were not going to be offered drinks. Bailey and I were both basically looking for a wife, but Bailey was much better organized. He had, as I remember, four coeds who were friends, but not candidates, and it was their job to feed him names. When he got a name, he would invest in a Coke date, nothing more expensive to begin with. He would make it known on this date that he wanted eight children, and tell the coed that when his mother made pie, she made two pies for the four members of the family. That is a helping was half a pie. He expected that kind of culinary performance from his future wife. Perhaps needless to say, he did not make much progress toward this objective in graduate school.

Bailey worked for the rubber reserve project and got paid a couple of hundred dollars a month, as I remember, a princely sum for a graduate student. (My fellowships were $75 (Allied) and $100 (Monsanto)/ month respectively). As far as I know he banked his salary. I think I would have known if he had spent it. He also lived in an undergraduate boy's dorm and was the proctor for one floor of the dorm which paid his room and board. That way he provided for his living costs. Then he would run football pools for his innocent charges and walk away with money from their bets. At the lab we felt it was our duty to relieve him of as much of these ill gotten gains as possible through winning bets of course. At any rate, Bailey, the avowed communist, was the only chemistry graduate student I was familiar with who was actually following a capitalist protocol and saving up significant amounts of money while attending school.

The AXE house had parties from time to time, and there was much consumption of beer, no wine or hard liquor, as far as I can remember. The members seemed to be able to get drunk just on beer. I remember a picnic where the fellows had a keg of beer and were playing a game of softball. The game deteriorated to the point where several pitchers and batters were trying to do their thing simultaneously. Nobody had the faintest idea what the score was, but a good rowdy time was had by all.

I had a room on the top floor, and some of these parties went on in the room next to me, during periods when I was trying to sleep. When the party really got going, a trumpet would appear. Nobody, especially with destructive intent, could ever find the damn thing at other times. And the drunks would take turns using it to make noise. It wasn't as bad as it may sound because at that age I could mostly sleep through it. The house parties were also beer busts. However Bailey and I, with a few other teetotalers, kept complaining about having to share the costs of the party, which were largely the beer, when we didn't drink it. So the house instituted a policy of selling beer by the drink at their parties. That fully met our demands. Unfortunately, I noticed that the quality of the parties fell off noticeably, they were no longer as much fun, in the new charge-by-the-drink environment.

The AXE house had a pretty good library and I was intrigued by the story they had about it. A few years before, the house had sent out requests for journals for this library. They got a lot of runs of journals, but most of them were multiple copies of the last half dozen years. At that time they were located in an old house, and all this paper was stored up in the attic. The story was, that a fire started in the basement and rose through the chimney area to wipe out the attic. The library was a total loss. Fortunately, probably with Bailar's advice, they had insured everything and put in for the loss of a large number of annual runs of the various journals. When they were paid, they went out and bought annual runs of these same journals, but of course they bought sequential rather than duplicate runs (the cost was about the same per annual run) and wound up with a nice library - which I don't remember ever seeing anyone use.

What we did use was the pool table. The sorority had a secret room in the basement, for their secret meetings, I guess. We were mostly too busy for meetings and had a pool table in the room. When I needed a break from study, I would go down to the pool room and set up a game of solitaire bottle pool unless there was somebody else there to play a game with. Bottle pool, the way we played it, was a game in which one could as easily get negative points as positive. I was very loath to lose a game, and can remember that a few times I accumulated enough negative points that despite the fact that I wanted to get back to the books, I compulsively continued to play pool for an hour or so more till I got my score back up to the modest positive level that was the objective.

When we weren't arguing in the laboratory, we tended to sing. Fred was from Dartmouth and knew the words to a large number of songs, many of them risque. He seemed to be rather tone deaf, and oblivious to musical sounds. I, on the other hand knew practically no songs, especially the words. So I sang without words and mostly made up the tunes as I went along. The other four got together one day and took a vote in which they expresses a preference for Fred's words rather than my tunes. I have a very thick skin so I went right on singing the way I wanted.

As you can see, I was not exactly striving for popularity. One day at the AXE house at lunch I was served a plate with a large fresh bovine eye staring up at me. After all, this was an agricultural college. I ate around the plate everything but the eye and sent the eye back to the kitchen with a complaint about it being undercooked. After Christmas each year, the AXE house had a Christmas tie party where each person wore the loudest, most objectionable tie he had received as a present. There was a judging and a prize. Everyone also parted his hair in the middle and there was a contest for the most symmetrical hairdo. Tradition was always followed

in this one, and Dr. Bailar, the AXE advisor, who was essentially completely bald was always awarded first prize. One year, I and two of the other brothers were awarded a special certificate for "efforts beyond the call of duty in protecting the brothers from hash." What this referred to is that we often ate stuff from the plates of brothers with more delicate constitutions who left parts of their meal untouched. In those days, I had the ability to eat large amounts of food if it was free.

That reminds me of another experience. I was approached by one of the other guys and asked if I would be willing to serve as his substitute waiter at a Sunday dinner at one of the sororities since he had to go out of town. He said I would enjoy the food and ambience. Actually, the girls did not associate with the four boys who were waiters. However the food was good. The cook had gone home and the four of us had the kitchen to ourselves. The prepared dinner featured a leg of lamb, and there were two of them. The senior waiter carved one of the legs into enough slices for the sorority, and we served them. The four waiters ate the other leg. Unfortunately, the way life works nobody ever offered me another chance at a job like that.

We usually sat around the living room of the AXE house and read newspapers for a few minutes every day before dinner. I had the distinction of people greeting me with, "Hello, Chambers" without even looking up to see who had come in. I gathered this was because I spent most of my days working with mercaptans, which, of course, I could not smell after a day breathing them in the lab.

I skimmed the *Tribune* and the *Sun Times* which were on different sides of the political game. After a while, I found that the way they slanted their reporting was to omit facts that were adverse. I found careful reading of one of the papers enabled me to perceive areas where they avoided mention of a necessary part of the story. I would then check the other paper and find out what it was they were avoiding. This technique has stood me in good stead for the rest of my life, but is of more limited value today because the standards of journalism seem to have fallen, and omissions are probably more often a reflection of deficient reporting and editorial work than bias.

I think it was after the first semester in the lab, and the work on tackifiers, that Marvel called me in and asked me to work toward the objective of making a polymer by reaction of a dimercaptan with a diolefin. He did not mention that he had given out this project before and a master's candidate had fumbled around on it. A chemist at DuPont had an issued patent in which some kind of dark goo was made this way. I read what literature I could easily find and then set out to do the polymerization with hexamethylene dithiol and 1,5 hexadiene. I was suspicious of conjugated diolefins. I made the monomers, but the polymerization did not work immediately, so I went in to see Marvel and laid out five other, somewhat related research projects as alternatives. On one of them I had made a couple of runs, the polymerization of a dimercaptan with an aldehyde, and this was eventually followed up by another student of Marvel's. I would guess that the product was not of much interest. Marvel said two of the projects were under investigation by DuPont so he couldn't touch them. He growled a little about the other two and finally just said, "Why don't you go ahead and do what I told you to."

So I returned to the project, and found that ultraviolet light seemed to do a fine job of catalyzing the polymerization. Thus I made a linear polysulfide from the mercaptan addition to an olefin bond. An interesting combination, a chain reaction polymerization of a different sort that the free radical catalyzed polymerization of vinyl groups. (Marvel would never let me comment on this. Perhaps he thought it was too philosophical, but I regarded it as a testimony to his selection of projects).

At any rate that polymerization seemed to satisfy Marvel's assignment, and I was free to pursue the project in whatever direction I wanted. Mostly this involved running the reaction with different monomers. He did suggest to me a couple of times that it would be nice if I ran some molecular weight determinations. I never did. That was physical chemistry and work in contrast to synthetic organic chemistry which was always a form of play to me. So I continued on making stinky intermediates using thioacetic acid and other such chemicals.

One day I dumped a modest amount of some particularly objectionable sulfur chemicals down the drain and evidently the stuff vaporized and made its way back up the sewer system to the third floor. They had an analytical chemistry class doing laboratory work up there and felt so aggrieved by the odor that the professor dismissed the students from staying any further on that day. I heard by the grapevine that there had been a formal letter of protest filed with Marvel over this by the other professor. I was the only one in the lab working on mercaptans, so I could hardly have escaped identification with the problem. But Marvel never said a word to me about it.

My laboratory was immediately south of the main central stairway, and there were students who came in going to a fairly large lecture room in the corner of the building immediately south of Marvel's office. In due course, I was made aware of the fact that many students coming up the stairs were going all the way around the second floor - I guess the equivalent of about three and a half blocks - in order to get to their lecture room without passing my stinky lab.

The other men in the lab did not particularly complain of my project. Perhaps that was because the mercaptans deadened their noses too, and perhaps partly because they had their own burdens to bear. Bailey was working on sodium catalyzed butadiene polymerization. A short time before I came to the lab, Bailey had dropped a bottle of butadiene. It flashed and evaporated, rising to the top of the air space in the lab. Bailey yelled, and with the door immediately behind him jumped out into the corridor. Everyone else fell flat on the floor according to the story. The butadiene was set off by a Bunsen burner and a flash fire covered the top part of the roo, but no one was injured. Nevertheless, this story bothered me because my position was not near the door. I was on the wrong side of the bench. So when Bailey was handling butadiene, I paid close attention. Bailey noted this and occasionally made little fumbling movements as though he was dropping a bottle just to watch me squirm.

This went on until one day I made some 2-ethylacrolein. Acrolein itself is an impressive molecule, and once I made some in a hood and found that if it is in the air, my lungs would refuse to draw in the air at all. I can hear my thoughts, "Just pull your head back out of the hood, stupid." The 2-ethylacrolein was not that bad. What it did was merely cause the eyes to close. Charlie and others were making styrenes and not infrequently went through benzyl halide

structures which were lachrymatorys. People in the lab were used to having sore eyes. My 2-ethylacrolein was much more civilized. The eyes did not burn, they just would not open. I had a window at my back and when I felt Bailey deserved it, I would spill a few drops of the 2-ethylacrolein on the bench where the breeze (what there was of it) would carry it across to Bailey and his eyes would suddenly close. In subsequent years, I have worked with fruit trees and other plants a bit, and they are characterized as conducting chemical warfare from fixed positions unlike animals that can move around and inflict mechanical damage. I sometimes think that immature chemists in an organic lab are in a position that resembles a plant.

One day I decided that one of the simplest molecules that ought to work in this polymerization was allyl mercaptan. So I made some. Not much - possibly a drop. It turned out I was horribly allergic to this molecule, and even the contact with a little of it in the air caused my fingers to blister up to about twice or three times their normal thickness. So I joined the white glove club. Like others with this problem, I wore white gloves so that when the blisters broke I would not wind up with infections. About every four hours I would get an almost uncontrollable urge to clench my fists thus breaking the blisters. The infirmary had little to say about this, but they did recommend calamine lotion. I tried this and it got worse. Then I found that the particular calamine lotion they gave me had phenol in it. I learned I could get some that did not, and the blisters began to subside. It was more than two weeks before my fingers got back to normal. I remained somewhat allergic to mercaptans in general for about ten years, and after that experience immediately applied calamine lotion to any outbreak.

And of course, allyl sulfur compounds are present in onions and other similar foods. I found that my stomach would strongly reject fresh onions, scallions, shallots and even garlic, although enough cooking made them tolerable. Back when I had asthma as a child, I did not eat eggs, milk or wheat or anything with any of those in it. I was used to such routines, so I avoided eating onions. However, when I married my second wife, Clytia, I got a gourmet Sicilian cook who cannot picture cooking without onions. We don't discuss it, she just puts them in and makes sure they are cooked.

Another program I got involved with was Dr. Rose's project on determining the minimum daily requirement for the amino acids that the human body does not make. Being a guinea pig for this project paid a dollar a day, but even then that did not compensate for the effort. I think the reason I went on the program was that at age 22, I was still testing myself to find out just what I could do. They had had a number of subjects that could not take the protocol and withdrew. Anyway, I went on the diet which was about 5000 calories a day and we were forbidden to do anything but minimum exercise. No ping pong for example. I ate this stuff in a little room on the top floor overlooking the sidewalk. My companion at these meals was another graduate student guinea pig on a related program where they were testing hydrolyzed casein, which to me had a really awful smell. I was on phenylalanine. The diet consisted mainly of a flour and water mix which had been baked in a flat bottom pyrex pan. The bottom of this large cracker was hard as a rock, and on the top it was rubbery. Of course it had no taste. There was lots of chewing and it took about an hour at each meal, three times a day to eat this carbohydrate. Then there were some vitamin pills, an extract of liver pill, some sugar, a tiny pad of centrifuged butter, the amino acids themselves, which with the sugar I dissolved in water in a four-liter Erlenmeyer flask, and finally three drops of cod liver oil. This last was the only thing that had any taste, and I have to admit

that I thought I deserved to take six drops a day and did. I figured that each meal took about an hour and a quarter to eat.

It took a while for the diet to settle in, but then I began to gain about a pound a day. The point of eating all the carbohydrates was to make sure I did not use any of the amino acids for energy. I was on the diet for 40 days in all and I gather they concluded that a typical male graduate student required about a gram of phenylalanine a day. Toward the end of the program they evidently worried about the fact that their phenylalanine was a racemic mixture. My experimenter had planned to make some pure levo by a procedure from the literature, but the procedure had not worked for him. There apparently was a stash of levo around somewhere, but it was committed to a student who was working with rats. So they had a summit conference and Rose decided that I took precedence over the rats and would get the levo amino acid. It was just a few days worth, and I was dubious that they got much out of it. The main effect of the diet on me is that it converted me from a skinny person who could eat as much as he wanted to someone who had to watch his weight for the rest of his life.

The second floor of the chemistry building had two storerooms on it. One carried chemicals, solvents and glassware. The other had electronic stuff. The storeroom keepers (I assume it is an occupational hazard) were quite possessive of their stock. They weren't much impressed by the gaggle of graduate students that came around wanting more than the storeroom keeper thought they needed. The demeanor of the second storeroom keeper was a bit obsequious. I asked for a Veriac one day and he told me that he was out, there were none left. I leaned over the half-door of the stock room and saw one up on a shelf to the right. I pointed it out to him. His reply was that he couldn't give me his last Veriac because then he wouldn't have one if someone needed one. Translated, I took this to mean someone on the senior staff, but he wouldn't say this to me.

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The other storeroom man was very gruff. I would go in and ask for six 100cc Erlenmeyer flasks. He would glare at me for a minute, turn around and put out three. After about a year of this I got a heavy cold for a couple of weeks and my voice dropped about an octave. I noticed that he got very cooperative. I got exactly what I asked for without any of the gruff treatment. I assumed that I had somehow managed to get on his good side. Then I recovered, my voice went back to normal, and lo and behold, he returned to his previous demeanor. Considering this I decided that the way to deal with him was to act gruff myself. So after that I would come in, slap my hand down on the bar and demand something. That seemed to work. In fact the nastier I got, the better service I got. In fact, I began to go out of my way to be unpleasant to this guy. When I went to get a Dewar flask of liquid ammonia, I would come back past his storeroom and deliberately

splash a teaspoon of the stuff into his cubicle with a sneer. He seemed to thrive on this. He perhaps was an odd and twisted personality, but I did respect him as much as I despised the other storeroom man.

My basic schedule was to be in the lab by 8 a.m. and back to the AXE house for the night at 1:00 a.m.. This was 6 days a week. I worked Sunday morning, but took off Sunday afternoon and saw a movie. I did some dating, but was not finding the kind of woman of substance, I was looking for. So, I was open to other forms of recreation. Bob Frank was a friendly member of the senior staff and sort of a side kick of Marvel's. Bob asked me if I would like to go out and walk in the woods in winter. I did not have a car, and was very pleased to get out in the countryside. Bob was looking for shelf fungi. According to him the literature said some of them were very tasty. He wanted to find a way to farm them on tree stumps that he could apply to the logged over forests back in his home in Wisconsin.

So I went out with him a number of times and walked the woods. I don't remember we found anything very useful but I certainly enjoyed the trips. We would stop and see local inhabitants that Bob knew in some of the small towns around Urbana/ Champaign. Many of these people used mushrooms as a seasonal part of their diet. Typically they would know that when the temperature got into a certain range and it rained, there would be mushrooms over behind a tree stump a couple of lots down the street and that sort of thing.

Bob was on my prelim exam committee. After about two years, one took the exam and passing it generally meant that the previous six years or so of work was going to lead to the Ph.D. I took the three hour written exam in organic and physical chemistry. I had originally signed up for the exam prior to the one I took, but Mrs. Evans informed me I did not have enough units of credit for that. Investigation brought out that she had cancelled my credits for a whole semester on the basis that I had not passed the French exam early enough. The rules book clearly said that it had to be passed by the end of a certain semester and I had done that. However, Mrs. Evans pointed out that the French exam had been given twice that semester and that I had chosen to take the second exam. I pointed out that this fit the written requirement. Mrs. Evans said that she made an exception when the exam was given twice in a semester, which evidently did not happen often and required that it be passed the first time it was given in that semester. I complained that there was no announcement of this exception, and in fact even the cancellation of the credits had not been revealed to me at the time. Marvel was in Germany leading a team looking at what progress had been made in chemistry so he was not available to appeal to. Adams was still off on war duty. Fuson and Evans would not even speak to one another even though they lived in the same apartment building. As an aside, one day, from his desk, Fuson hailed me walking down the hall, and handed me a note to deliver to Mrs. Evans and bring back the reply note. That was the way they communicated.

So I went over to the Graduate School Dean's office. The woman that ran that office I found later was a bosom buddy of Mrs. Evans and wouldn't even let me see the dean. So I gave up and since this was going to delay graduation anyway I spent the summer as assistant director of the Denver YMCA boys camp in Colorado, followed by a couple of weeks backpacking in Rocky Mountain Park.

All this leads up to the fact that I took the prelims with Ben Aycock. Ben was the protege of the department. He was often found sitting on the stool in an AXE house bathroom reading Gilman's book. He was never known to go on a date. He was supposed to have a photographic memory, and he was in line to get the most prized academic appointmen, (I think it was Wisconsin), given out during my stay. Actually, one of the war functions involved an auction. A group of grad students and senior faculty put up the money to buy the use of the President's limousine and a date with the campus queen in Ben's name. When this appeared headlined in the paper the next day, Ben is supposed to have said, "I didn't know there was another Ben Aycock on campus." At any rate when the limo pulled up in front of the AXE house at the appointed time with the campus queen in it, Ben hid in a closet. He was found and tossed out the front door. He jumped up and ran around back of the house and away across town through back yards. The result evidently satisfied not only the chemists, but a lot of girls who thought the campus queen was unduly stuck up.

At any rate, taking the prelim exam with Ben was not a desirable situation because we suspected the senior staff might adjust the exam to give him a run for his money. And it appeared that's what they did. The exam usually had three examples where the reactants led to unusual products, and the game was to explain why that happened. In our exam, there were ten examples and only the reactants were given. We had to assume that the results were unusual and we were expected to both identify the unusual products and give an explanation. Ben finished the test in two hours (although I gather he neglected to answer all the questions) and the rest of us were kicked out after three hours. Apparently all of us passed, however, and we then had to face the oral.

Bob Frank led off my oral with a line of questioning that I had heard of from someone who took the oral a couple of days earlier. So I knew the answer. I proceeded to slice the responses very thin, that is, answer nothing more than the question required. By doing this I strung out the line of questioning and it took five or ten minutes to corner me with the key question about commercial reduction of long chain esters being done by elemental sodium at P&G. Apparently that used up Frank's time. Marvel said he had laryngitis and turned me over to the physical chemists.

Now that was what I was afraid of. In studying for the prelims, I had sent away for answers to the problems in a couple of text books and got back the answers for the text authored by the senior physical chemist at Minnesota. Fred Wall, who studied under this guy at Minnesota, evidently was charged with making up our exam, must have been short of time, and copied the exam problems from that book. I had worked every problem in the book and made sure I understood it. As a consequence I am pretty sure I got a hundred percent on that prelim exam. This was based on going back, after the test, and looking up each of the problems and answers.

I figured the physical chemists knew perfectly well that I was not that good in their field and would be planning to disabuse me from any delusions of grandeur I might be under. They did the job. My committee was Wall and Miller, both modern physical chemists I'd had in classes. In my case, they brought in a ringer, Prof Phipps, a man I hardly even knew by sight. Phipps was an old timer and had a reputation for running students through some kind of thermodynamics of a rubber band, and that was all I knew of him. Phipps ran me through a gamut of physical chemistry rules such as Henry's Law that the modern types, Wall and Miller, hardly even

mentioned. I knew the basics, but Phipps had me delving into details and applications that I thought had long since been shifted over to the engineering courses where I would not be responsible for them. I was perspiring vigorously and just doing my best to hang in there and avoid getting out on a limb that could be chopped off. After a very long time Phipps let me go and I was happy to answer a few cream puff questions from the math guy, who may have been sympathetic after seeing what I had been through. The verdict was pass, and I guess all sides went away satisfied.

I don't remember whom I heard this story from, Marvel or Hamilton. Marvel often fished in the polywogs and had a reputation of catching about twice as many fish as others. (Bob Frank told me he thought that Marvel got this result because he cast out about twice as often per hour as anyone else.) At any rate when Hamilton was in town, he and Marvel often fished the polywogs out of the same boat. One day Hamilton fell overboard and Marvel fished him out and hauled him back into the boat. Hamilton thanked him profusely and mentioned how important the help was since he, Hamilton, did not swim. Marvel said, my God, I don't swim either. That was the last time they paired off, each found a swimmer to be in his boat.

Marvel came into our lab every afternoon about 3 p.m. for iced tea which was made in a four-liter beaker. He chatted with us. I don't remember much of what he said. I do remember that during the course of my research project there were three occasions I was stumped on something and asked him for a suggestion. He replied in each case, and in two of the three cases his prescription worked, which I considered a very high batting average.

I was told that Marvel performed this sort of thing at DuPont in a lecture room in which anybody could come and throw questions at him. He responded off the cuff and had a reputation of being right most of the time. I gathered Du Pont compensated him well. He mentioned to me that one of the things he found in Germany was a list of all the academic consultants that served industry there. Speed said he destroyed all copies of that list he could find because the consultant compensation rates were so much lower in Germany than the US.

The general story was that Marvel got the nickname Speed because he could identify so many compounds by their odor. However, I think he may have deserved this for other types of performance too, such as his hourly progress in fishing and bird watching. When he was in school, he got to making large preps of fairly simple chemicals for sale. Later on he used this activity to support graduate students in the summer when there were many fewer lab and quiz assistant jobs needed. He told me that he had demonstrated that he personally could run as many as 26 individual prep reactions at a time.

There was a story around of some guy in his big laboratory who did not get around to doing some experiment that Speed suggested several times over several months. Finally, one day Speed put on an apron, rolled up his sleeves and took over the guy's desk and did the experiment himself. Just the thought of having him do that was enough to motivate generations of students after that.

Marvel had a bad case of sinus and told me once that he never had an hour free of pain. During his consulting work, he encountered sulfa drugs that he thought might help this. He would get a

sample and try it on himself. One day he pulled up his pant leg and showed me a large purple spot maybe four by six inches on his calf. He said this was a side reaction to one of the sulfa drugs he had been trying.

Marvel was substantially overweight and Bob Frank told me he used to worry about this. Then he found out that Marvel's father was built along the same lines and seemed to be doing fine in his nineties.

Marvel's well known hobby was bird watching and he would talk about that anytime. On his trips out of the country he would observe birds that were never seen around Urbana and that increased his annual identification count and gave him an edge over his less traveled bird watcher friends. He seemed to delight in this and underneath his calm demeanor I think he was very competitive. He always wore a navy blue suit and black socks, no exceptions around the lab. He was quite open in his evaluation of other chemists and would comment on his peers freely. The word we heard was that Marvel originally was part of the Vannevar Bush wartime science organization with Roger Adams, who was second in command, but quit over some policy decisions allowing chemists to be drafted. Marvel came back to the department and was there the whole time I was in school. Roger Adams returned, as I remember, about the fall of 1946. One of Adam's students was given Woodward's desk in the lab and Roger came in every day for a month or more and spent about a half hour in a conversation with him. I listened carefully, and finally concluded that this was a tutorial course in how to think like Roger Adams.

A couple of other memories of those days: All of us math minors took the same courses. In the evening we would all be working the same problems. One of the AXE members, John Young, took it upon himself to cycle around the building checking on how each man was doing. If one had trouble with a problem, John would tell him how the other fellows were doing it. I had already had a lot of the stuff at Nebraska and it was a lot stiffer course there. At registration I wanted to branch out and take something new, but was dissuaded by the argument that I should have better things to do than learn math. On the other hand, Ralph Beaman used to argue than everyone who had the guts to sign up for a really advanced math course never had to take a test and got an automatic A. I didn't have the guts in math, so I was working problems the way I had learned at Nebraska, which in many cases was not what the Illinois professor was teaching. This upset John greatly and I gathered he thought I was some kind of antisocial person for not converting over to the methods used by the rest. Actually, he was probably right.

I reflected, when I got to doing recruiting a few years later, that I had learned to some extent all the kinds of work that people were doing in the building at least in the organic area. Even more, I learned the location of all the interesting pieces of equipment that were being used, that I might have reason to want to use some day. I was amazed in talking to potential candidates for employment to find that not everybody did this, and even in much smaller departments there were lots of people who were not cognizant of much of what was going on outside their own labs. That was one of the factors I used in choosing people to hire.

Many of the discussions in our laboratory were headed for disagreements that led to bets, and the attempt to get data that would settle questions. One of the things I thought was really laughable was the frequent attempt by somebody who began to fear that he would lose a bet to side track

this process of gathering data. Finally I got a small toy stand in the form of a tree trunk with branch. I glued a small ceramic chicken to the limb and offered the trophy as a prize for men who did an unusually artistic job of chickening out of some bet they had made. My idea may have been good, but the execution was terrible. I had essentially no political skills and before long it had been named the Chambers Trophy even though I had never even been accused of chickening out of anything. I doubt if the trophy survived very long. But my inability to sell the concept illustrated a barrier I experienced in much of later life.

Our lab was only a short distance from a storeroom belonging to the Agriculture school where they sold, among other things, gallons of cider. I loved the stuff and was constantly over there buying it. One day I found a place to store it and asked if I could get a price break by buying five gallons at a time. They wouldn't sell me five gallons, or it turned out, anything more than a gallon at a time. Someone in authority had concluded that any chemist who bought more than the minimum amount of cider probably intended to use it for nefarious purposes, such as making liquor.

Another observation was the way they had paths across the quadrangle. The grounds department promulgated a "tradition", that a good Illini never walks on the grass. The fact of the matter seemed to be that when enough people walked across the grass in one path, they would put down some cement and make it an official path. The solution at Nebraska was much simpler. They just spread manure all over the areas of grass that they didn't want people to walk on and transgressors ran the risk of being identified by their smell.

Fred Woodward got married in the middle of his career at the lab to a girl whom we understood came from a wealthy family. Charlie and some of the others went down for the wedding in Kentucky and reported great difficulty in finding alcoholic sustenance. They finally had to duck out of the reception and go to saloon of some sort that was around. After some months, I asked Fred one day what it was like to be married to a girl who had a lot of money in the family. He said that she did not spend a lot, not as much as he thought most women would spend. But he did observe that if she wanted something she just bought it. She didn't think about whether it would fit into a budget, or what else she would have to deprive herself of to buy it.

One day I was working in the library on the second floor and after several hours came out into the hall on the way back to my lab. The atmosphere in the hall and my lab was incredible. I couldn't see more than about five feet, the odor was awful and my eyes and nose stung. Now, I was used to reasonable amounts of pollution. Bailey used to have a constant beaker in the steam cone boiling off residual benzene from polymers into the room. (One consequence of not having a hood.) We had the simplistic notion that as long as the benzene was free of thiophene, it was all right to breathe. My threshold resistance wasn't breached until Charlie decided to have four four-liter beakers of glacial acetic acid all boiling constantly on hot plates simultaneously in a recrystallization. I decided that fifteen feet was not far enough to be away from this, and went back to the AXE house to study. (Charlie prided himself on being able to stand right over that kind of thing and his consequent ability to drive his neighbors out of the lab.)

Anyway, the atmosphere in the hall was worse than that. I thought this was ridiculous and took off for the AXE house. Everyone else stayed and worked right through it. I was told later that an

hour earlier Fuson had made a circuit of the labs mentioning that a committee of the legislature was coming through in a couple of hours to see if conditions were bad enough that the department really needed a new building. The grad students got the point and organized immediately to put on a show. They had people parading around with four liter beakers of boiling aqueous ammonia, muriatic acid, pyridine and a few other little things like indole. Then they all settled down to work as though this was the everyday condition. The committee was evidently impressed because just a little later they funded the next building across the street from Chem Annex.

Actually, conditions were, in fact, deplorable in the laboratory. We had a hood space, but there was no fan in it. We kept a Bunsen burner in the chimney to keep the air moving gently upward. We had a gunk bath in it which we kept full of concentrated sulfuric acid at near boiling. When somebody put something in the bath they would add a big slug of concentrated nitric acid which boiled off fairly soon, but also quickly tore up any organic matter in the bath. A paper clip brought into our lab was completely covered with rust by the next day, something that we demonstrated frequently.

Charlie was a major contributor to the lab pollution, but he did observe limits. He had a tetrazotization that emitted boron trifluoride when set off, and he conducted this gas through a glass pipe under the window to the air outside to protect his lab mates. The only problem with this was that his window was almost right above the front steps of the building. The front steps were a popular place for undergraduates to congregate between classes and I used to wonder what they thought of the occasional puffs of white smoke that came out of the pipe over their heads.

We discussed the pollution problem with Marvel, and I can recall his telling about being in a lab before the first world war where one of the chemists made a batch of phosgene every day. The newly mown hay smell spread throughout the lab, but nobody thought anything about it. Only when they heard later that it was a war gas did they become concerned. Marvel said, however, that it was pointed out that one's reaction to phosgene was much less if one was not actively doing something, and some of his lab mates fit the description.

The talk continued, and one day we got orders to go over to the infirmary and get our blood tested. We all did this. Then we waited and waited for the results. After a while we began to ask about the results. Finally it became clear that the authorities were not going to reveal what those tests had shown.

Nebraska had a very streamlined and well-organized class selection and registration system and it was amazing to see the one at Illinois which sputtered and bucked. The last year I was there I wound up standing in lines that extended down the quadrangle for a couple of blocks leading to the Library where the process was being carried on. My impression was that the biggest bottleneck was the bursar, an older lady, who insisted on doing one of the procedural steps herself personally for each and every student. She had been provided with lots of student help, and she spurned this leaving the helpers with little or nothing to do. I remember going through the process and passing from the bursar's station to a room which must have had 25 coeds sitting at typewriters waiting for the registrants to come through one by one. Having my choice of the

25 helpers, I picked out the best looking one and had her do my typing. This girl was so beautiful that I was kicking myself starting a few days later for not getting her name. After some months I saw her picture. Her name was Martha Wayne, and I learned that she was a woman of some substance. I tracked her down, but found she had left for law school at Columbia. I landed in Chicago a year later after graduating and got a room in the Hyde Park area. One day, I saw a girl coming out of a cleaner's shop down the block on 55th street and for some reason she reminded me of Martha. Since this girl was walking with her back to me and the only time I had seen Martha before was sitting, full face front I cannot understand how I could have made the identification, but I did follow up. It was Martha and in less than a year we were married.

Another difference between Nebraska and Illinois was in sports. The Illinois football teams had great talent (they paid enough), but laughable performance compared to what I was used to. In basketball the shoe was clearly on the other foot, Illinois was far superior.

My last year at Illinois started in the fall of 1946. My laboratory changed. The people who had been there for two or more years all left. Charlie went to a post doctorate at MIT, the rubber reserve program wound down and Charlie got some boxes in which to ship stuff back east. At that time, he had an undergraduate named Mary Ellen, if I remember right, working as his assistant. One day when Charlie was out she asked Bailey and me what the boxes were for. We told her to send his equipment. But she asked what the biggest box was for and we told her that it was to ship his assistant in. And that we had been commissioned to pack that box. We moved toward her and she sat down on a straight back chair and gripped it firmly. We were careful not to touch her, but we picked up the chair with her in it and put it in the box. Then one of us took the lid and pushed it down on her head while the other pulled the chair to get it away from her. Just at that moment Marvel walked into the room. Marvel wore soft rubber soled shoes and walked in a pretty noiseless way.

Obviously we froze. We took the lid away and made small talk, and Mary Ellen climbed out of the box. Marvel didn't say a word but edged his way back out of the room and that was the end of that. Mary Ellen was a mediocre chemist, but so good at music that she could proficiency courses (pass a test) for credit in that when she needed extra credits. We never understood why she wanted to work in the laboratory.

One of the new graduate students who moved into the lab had previously been a graduate student at Iowa State, but got drafted. He got into Illinois and had no interest in returning to Ames, Iowa. He said that the grad students at Illinois were lucky because they were treated fairly by all the senior staff. He had worked for Gilman at Iowa State and said that to get a degree, a student had to find something to blackmail Gilman about. Otherwise Gilman would keep him there working on publication after publication. He said Gilman came into his lab every day to check on what progress had been made. The students in the lab hated him and learned to put a large stirred flask of ether right at the door because Gilman would not enter the room if there was ether on his exit route.

In the fall of 1946, the campus was hit by a wave of new undergraduate students who found places to live that nobody dreamed were there. I got a polite post card, as did others, that invited me if I was interested to be a freshman advisor, to go to a meeting to find out how. I considered

the matter for ten seconds, decided that I was not interested and threw it in the wastebasket. Then one morning a few weeks later I was walking to the lab when one of the fellows came running up shouting at me that there was a whole room full of freshmen on the second floor of a building just north of Chemistry waiting for me to show up and advise them. I said the post card asked if I wanted to be an advisor. My friend said that wasn't what it meant. It really meant you are an advisor. Anyway, I hurried over there and sure enough there were all these kids sitting and standing near a locked room. And they had papers with the room number and my name on it. The first fact was the door was locked, so my first job was to find a janitor to open the room. That done, I left them to settle in and made a quick tour around the floor to find another chemist advisor. I asked him what was the very first step. With his help I got the papers, got the kids to filling out all the forms, got them to put down the classes they wanted. Then I went back and asked what the second step was, etc. Advising was not a factor. I knew nothing of the undergraduate system at Illinois, and of course I had not attended the meeting. So I encouraged the kids to fill in the forms with the classes they wished. The control on this I found out a little later by reading the papers was that each room had an assigned time when the freshmen were to be released to go pick up their tickets for each class. My group was to be released in about three days. I could see how that was going to work. They would be streaming back to me with stories that the classes they wanted were all full, and I would be supposed to help them work out alternative schedules with due regard for their objectives, etc. I decided that did not make sense. The first group on the whole campus was released at 8:00 a.m. or something the next day. I released mine fifteen minutes later. None of them came back, which I took it meant they all got their desired classes. Needless to say I was not asked to be a freshman advisor again.

My second year I acted as a laboratory assistant for a semester with one class of ag/home-ecom students and another of liberal arts students. Bob Frank told me the first group were the ladies and gentlemen of the campus. He was so right. They would never deign to ask for help until they had tried something four times the wrong way. So I stood there in the middle of the lab with nothing to do for three hours, but unable to sleep on my feet. The liberal arts students were endless fun. They came in with a game in mind. How much credit could they get for how little performance. After watching the various approaches and pitches they tried for a few days, I decided that I had enough of playing defense. A careful reading of the rules revealed a section that authorized me to give exams when I felt like it. At least that is the way I interpreted it. Thereafter I required that each student pass a one question oral test before being allowed to start a new experiment. I made up the questions as inspiration occurred and the one question often had several parts. The class was up in arms. It was unheard of. No other lab assistant in memory had ever done that. It must be illegal. And so forth. The interesting part was that given this outbreak of emotion they settled down, took their tests and did the lab work they were supposed to do. And I policed the occasional scam with a display of outrage.

After the war, we got several new men in the lab. Ralph Beaman, who had been in the department before being drafted, spent the war learning Mandarin Chinese. He sat at the end of the laboratory reading Chinese newspapers much of the day, but evidently got his work done too. He said he had joined the Chinese students group on campus and went there to practice his language skills. To his disappointment only one of the students would talk to him in Chinese, a girl who had grown up near Beijing. The rest of them would listen to his Chinese but respond in

English. He said their dialects were inferior to Mandarin and they would not lower themselves to speak to him in an inferior dialect.

There was a graduate student from India across the hall who had movie star looks. He entertained us by tricks such as pouring a beaker of water down his throat without swallowing. But he was not much of a chemist and was not respected as such. Then we got another Indian chemist who somewhat resembled Gandhi, a post doctoral student who already had his PhD from India and was a knowledgeable chemist. He was well-respected. But whenever the two came together in a group, the good chemist became obsequious in the presence of the younger one. Apparently the younger one was from a very high caste family who owned a steel mill or two. The good chemist was from some lower caste. This gave us some insight as to the power of the caste distinction.

After getting to Chicago I used to think I would have been better suited to a more contentious place like the University of Chicago. But given the choice again I would for sure pick Illinois.

There is a lot of learning done in a place like Illinois that isn't part of the official curriculum. I remember walking home with Herb Carter one day and hearing him say he was going to spend the evening reading one particularly good JACS article. The idea of devoting one evening to one article gave me a different perspective on the problem of keeping up with the journals which I guess everyone has.

Despite the very high caliber senior faculty, I eventually concluded that the most important factor in graduate school learning was the other graduate students. I don't remember in detail why I concluded this, but I was sure about it at the time.

The three years of graduate school were good ones for me. I worked hard, although there were plenty of times when I felt somewhat drained. During study for the preliminary exam I crammed so much organic chemistry that I began to notice that my brain didn't work as fast as I was accustomed to. I would see or hear a question, and then there would be a blank period when I experienced nothing and then the answer would pop out. I was not comfortable with this and resolved not to do it again. I was somewhat attracted to the idea of teaching as opposed to industry and went in to see Marvel about the choice. He did a masterful job of ducking the question. It was pretty clear that to get into teaching required initiative on my part. For chemists that did not take the initiative to go in an academic direction there were plenty of industrial recruiters hanging around and one would eventually wind up in industry. I interviewed about 40 industrial firms and eventually picked Sinclair Oil, mostly to avoid moving east I think. For half dozen or so years, in the spring of the year, I would get the urge to go into teaching, but there were always things to do that kept me busy till the urge passed.