



Ken Hedberg Oral History Interviews, September 9, 2011

Title

“An Oregon Childhood During Hard Times”

Date

September 9, 2011

Location

Valley Library, Oregon State University.

Summary

In interview 1, Hedberg discusses his birth in Portland, his upbringing in Washington and southern Oregon, and his memories of tough times during the Great Depression. He also reflects on his high school years and his early interest in science, and his beginning college years at Southern Oregon Normal School.

The interview then shifts to Hedberg's undergraduate experience at Oregon State College, with particular focus paid to campus social life in the late 1930s and early 1940s, his academic progression, important mentors, and the research that he conducted while an undergrad.

The session concludes with Hedberg's reflections on his draft deferment, the work that he conducted for Shell Development Company during World War II, and his arrival for graduate studies at the California Institute of Technology.

Interviewee

Ken Hedberg

Interviewer

Chris Petersen

Website

<http://scarc.library.oregonstate.edu/oh150/hedberg/>

Transcript

***Note: Interview recorded to audio only.**

Chris Petersen: Please state your name and today's date and our location

Ken Hedberg: My name is Kenneth Hedberg; the date is September 9th, 2011.

CP: Where were you born and where did you grow up?

KH: I was born in Portland, Oregon on February 2nd, 1920.

CP: Did you grow up in Portland?

KH: Well, no I spent my first six years of life there and my father had a job that took him to southern Oregon, the Coos Bay region which at that time was called Marshfield. And after that we moved to Hoquiam, Washington where I spent my years from age about 12 to 16. Whereupon I moved to Medford where I went to school and graduated from school in Medford.

CP: What were your parents' occupations?

KH: My mom was a housewife, during the war she worked at the naval station in Astoria. My father was called a wholesale grocery salesman. In those days, groceries were delivered by truck from a large warehouse to the retailers and my father traveled to these small retail stores, some of them in outlying rural areas, and would take their orders for groceries which he would then write up on a form in the late evening, early in the morning he'd take it to the warehouse and the orders would be filled and the trucks would then take these groceries out to the various stores that had ordered them. That, of course, passed pretty quickly in a time of better communications, so that business is faded now. Disappeared actually.

CP: That was a job that would require some moving around apparently?

KH: Yeah, my father worked for a company called Mason-Ehrman which is now out of business, and they had several stores and warehouses in southern Oregon, in Medford and Coos Bay, and in Astoria. And he worked in all of these places for that company as they moved things around. These rural stores were, of course, separated by wide intervals and they were grouped together in what my father called a route. Now any given day of the week he would go on a certain route. It would take him all day long and on the next day he would go on a different one, and the third day and so on for five to six days a week. It was a lot of driving, some of it over quite significant distances. I accompanied him on a few of these drives just to keep him company; he seemed to like that, but it was, from my point of view, pretty boring. I would sit in the car or go into the store while he took orders and of course he'd have to stand around when the proprietor was waiting on customers because the customers were served first. So there was a lot of waiting and watching. I'm glad I wasn't in that business.

CP: Did you have any siblings?

KH: Yeah I had a sister; she died about three or four years ago. Of course we moved as a family. She moved in a different group than I did; she was two and a half years younger. Her high school group of friends were well behind mine. So we didn't have much of a social interaction as kids. We just had different groups we were with all the time. She went to Oregon State for a couple of years and the war came along and she was a very good secretary. So she dropped out of school and served as a secretary to a naval officer at the naval air station in Astoria during the war, and afterward he set up a real estate business and she went to California and served as an office manager for him and she married a young man from the area. So she lived most of her life in the San Francisco area. Actually she retired across the tunnel from the Bay Area into the valley, Pleasanton. [6:11]

CP: What were your hobbies as a boy?

KH: In those days, we didn't have anything of the sort of thing they have now. We had quite a lot of family interactions in the evening, I remember, when my father was home early enough and on weekends we played family cards like rummy and pinocle and things like that. The only source of entertainment apart from the movies was the radio and I can still remember my father and mother eagerly listening to certain programs on the radio, among which were Amos 'n' Andy and a few of the other things. As for activities, I took up tennis when I was in Hoquiam and I played tennis all my life, including the Medford High School team and the OSU team when I came here later. So that was a hobby and the other one was, we had a group of pretty closely knit kids in the neighborhood and we played a lot of touch football in the streets. I collected stamps but everyone collected stamps in those days. I guess that kind of summarizes what it was; no cell phones, nothing, no TV, nothing like that.

CP: Do you recall being interested in science as a boy?

KH: I was always good in school although I never really realized it. I skipped a couple of grades. My real interest in science developed, well I was always interested in it, but it wasn't clear to me that I was going to be a scientist as a professional. And through high school and so on, science was easy for me, both physics and chemistry. When I lived in Hoquiam, there were a number of people who always came to me with questions about science. We didn't have homework in the same way then but it seemed to come so easily to me that I didn't have much trouble answering the questions.

And then when I graduated from school in Medford, it was in the height of the Depression and my father had just lost his job. I graduated in 1937 from Medford High School and there was no employment at all for young people. There was summer employment, which I availed myself of for several years; I worked in the orchard picking pears. You did all this by hand and that's about the only income that I had. There was nothing that a young high school guy with no specific skills could earn money at. I mowed a lawn here and there for 25 or 50 cents, that's about the going rate then. But I made good money in the orchards when I worked there; it was very hard, back-breaking, hot, dusty work but when you're young that doesn't matter very much.

So back to your question, after I graduated I began to wonder what I was going to do and I knew I wanted to go to college and my parents, neither of whom had gone to college, in fact my father finished the eighth grade and my mother graduated from high school. That was the limit of their education. They always told me that they wanted me to go to college and that they would match every dollar that I could earn. Well they pretty soon put an end to that of course. So one day I went to the Medford Public Library, I can still remember, and I walked in and I checked out a book in elementary physics and another one in chemistry and I took them home to read them. And the physics that was exposed in the textbooks of the day was pretty elementary stuff; mechanics, levers, and that sort of thing. And then had a project of radioactivity. And that sort of thing was something that didn't penetrate to the high school level or in the textbooks of the time. So I finally decided that I liked chemistry better and that started me on my career. [11:38]

In the winter of 1939, my father had lost his job. We had almost nothing in Medford; my mother, my sister, and I. And I was able occasionally to provide a little bit of money for groceries. My father tried to send money but at one point we were enough destitute that the power company turned off all the electricity so that we cooked with a stove with some wood and we had a camping lantern that we used in the evening. We managed to avoid getting thrown out of the house, which was a rental in Medford, but just barely.

For some reason, I'm not able to remember how or why, enough money was gotten together to allow me to register at Southern Oregon Normal School - now it's Southern Oregon State University. For ten cents a day, I had a friend with a car, I could pay him and I rode back and forth with him. I stayed at home and I registered for chemistry and a few other things and I took a number of courses in music. And that continued and I got all A's the first term. My father told me that somebody in Portland had said 'you know there was a guy, Kenneth Hedberg, I noticed he got all A's at Southern Oregon Normal, is that your son?' My father knew nothing about this and I guess my mom didn't want to tell him that we had found money to send me to college but the tuition was a bagatelle, it was something like twenty or twenty five dollars a term. So he said 'no that can't be my son' and when it turned out that it was he was not angry, he was delighted actually. So I stayed the second term and I got all A's except for one which was a B in piano. I had taken a number of courses in music and harmony and composition and things which interested me.

At the end of that time, in the spring of 1939, my father actually got a job in Astoria and he and my mother decided that rather than she go to Astoria to join him, she would move to Corvallis and allow my sister and me to matriculate at

Oregon State and she would set up a rooming house there and that rooming house would have three or four people staying with us and she would do the cooking and so on. And the rent and things she collected would enable us to maintain a house so my sister and I could go to school. That was done. At the time I didn't realize what a sacrifice that was but as time has gone on, I can see what a monumental contribution that was because I wouldn't have been able to go to Oregon State at all. That was followed through and I had won a tuition scholarship to OSU so I didn't have any tuition to pay. And then the National Youth Administration was set up by Franklin Roosevelt and this enables students who qualify to earn twenty five cents per hour and I got a job in the chemistry department here at Oregon State handing out supplies to people who were in the laboratories and that continued for 1940. And in 1940 my mother decided that we are now able to do this on our own and so she moved and we closed the house. She moved to Astoria and I had pledged to a fraternity so I had a place to live and my sister moved into a co-op at Oregon State. So I lived in my fraternity house for the rest of my career at OSU. I finished in December of 1942. [17:31]

CP: Which fraternity were you in?

KH: Theta Chi. It's still the same house; in fact fraternity row there has not changed much at all. I guess the houses have been renovated. My social connections with the fraternity are essentially zero. I have a lot of professional connections that I spent my energies with.

CP: What was your social experience like at college at OAC.

KH: The social experience was tremendous. My grandson has just enrolled at - I'll think of it in a minute - but at any rate, he wrote back and he is a very studious guy and a superb pianist, he wrote back to my daughter that it was funny because she was concerned that he wasn't studying and that he just landed on campus. Well I told her that was my experience at OSU. I don't know how much is known about those days but there was a lot of social life and the community was more strictly defined as 'independents' as they would call them and the Greeks, which included all the fraternities and sororities. There were lots of social functions associated with the university on the students' behalf that I don't see now, but that may be because I am a retired faculty member.

But every Friday they had on the campus when I was a student something called the 'nickel hops.' And this meant that all the sororities in particular, I'm not sure about the independents, but all the sororities would clear away the stuff in the living room and they had music they'd play and men would move from one house to another. And you paid a nickel to enter and dance with the girls that were there. So you would go from one place to another. So that was one easy way of getting acquainted with girls. The other important series of social affairs were a bunch of formal dances. There was something called the sophomore cotillion, the junior prom, the senior ball, and the military ball that was put on by the ROTC group here on the campus. And these were formal dances. The women wore long dresses and the men wore, on some occasions, even tuxedos, but no less than a dark suit at any rate; there were ties everywhere. They were events planned pretty much long in advance so you got yourself what was called a dance card and you would go around to your friends in the fraternities and you would exchange dances. You came with your girlfriend of course, but you exchanged dances, you didn't dance with her the whole evening. So you generally saved the last dance and the first dance for yourself and a couple in between, and then you would be trading off with friends. I don't know what happens these days but I look back at that with a good deal of fondness, it was lots of fun. [21:43]

The campus was highly regulated in the sense that, well to put it into blunt terms, it seems to me that the university regarded itself and looked at as a de facto parent in the absence of a family, you see. So there were real restrictions, particularly on the women. If I remember this correctly, closing hours in all women's groups - there were very few married students, very few on the campus. I only knew one couple in chemistry. So the students generally lived in living groups, a few of them had apartments, but not very many. These living groups, the women's living groups, had strict closing hours. The women had to be in by 9:30 on a school night. That meant that they were going to the library or were out of their living group at 7:00, and of course they could meet boyfriends and so on there, and you could arrange with your girlfriend to meet her at one of the Monroe Street places that served Cokes, and you would have a Coke or something like that. But they had to be in by 9:30, and if they weren't, if they were late, the penalties varied quite a lot but they could be 'campused,' which meant they had to stay in their living groups and they weren't allowed to do certain things that they otherwise would have been allowed to do.

The men had no restrictions on them at all. In my house, there were real strongly enforced study hours from 7:00 to 9:00 and the house was supposed to be very quiet and it was. Academia flourished at those times; I just studied. The other thing I can comment on was that there was no alcohol available anywhere. Not in town. I think there was something like a two mile rule: there would be no retail outlet for alcohol within two miles of the campus. And that prevailed until rather late in the history of the institution. What you see along Monroe Street now is a lot of places where you can get beer and other things, and the students are clearly enjoying their Fridays like today at the Brew Station for example. But in those days, you couldn't get it. In fact, alcohol was slow to come to Oregon in the sense that, first of all you could only buy it in a green front, you couldn't buy it in a restaurant. But you could bring your bottle in a restaurant and they would charge you a corkage fee and serve you. But that took a long time for that to be overturned. [25:40]

There was one incident I can tell you about that I mentioned before but it was really quite remarkable. I think it was in the winter of 1941, I think it was before Pearl Harbor, and we had a tremendous ice storm. I don't know if you heard about this ice storm, but what happened is that we had a freezing rain and this was the night of one of the all school dances, which were held, by the way, in the Memorial Union ballroom. The size of the institution when I was there in the Fall, the maximum size was 4,200 students, so the MU ballroom could generally contain all the people that wanted to go to a formal dance. A lot of people couldn't afford to go so they didn't. Anyway, at the MU at this particular occasion there was an ice storm that began early in the evening and people began to show up. And as the evening drew on, the rain which had continued began to develop into a freezing rain and the tree branches began to be covered with ice. All the power lines were covered with ice. And as the dance went on, all of a sudden at 8:30-9:00, the lights went out. What had happened of course was that the power lines went down because of the weight of the ice and so on.

Well this was an all school dance and it was dark. No lights in the MU ballroom, so somebody scrounged up some candles and put them around the edge for some form of light. But the MU lounge, which was very much the same as it is now, is a place where at these dances, couples would repair to rest a while and sit and smooch with each other. And when the lights went out, you can imagine the glee that that was greeted with. I happened to be up in the lounge at the time with my girlfriend at the time and the lights went out. In due course, there came one of the chaperones, usually the wife of a faculty member. She came in with a large candelabra with lighted candles and she put it on a big table in the middle of the room. And then she turned around and she walked back down the stairway into the ballroom and she got to the head of the stairs and disappeared. One of the students there got up, walked over to the candelabra and blew all the candles out to great cheers. In a few minutes the same woman came back and she lit the candles again and she turned around and walked away but she didn't get to the head of the stairs this time before a student, maybe the same one, blew them out again. Again to great cheers, this time she never returned.

It turned out that the lights were out as a consequence of that storm for the best part of a week and that was devastating. It was extremely hard for my mother because we cooked on an electric stove and we had all these students there; four of them, plus my sister and myself. So she prepared the meals as best she could using pots and pans in the fireplace. We had a fireplace, fortunately. She could build a fire and do that, so essentially we camped for a week. Remarkable experience. As far as the campus was concerned, the consequences of that ice storm were devastating. The campus in front of the MU at the time was covered in large number of beautiful trees, perhaps many of them elm trees. The ice storm actually broke the branches off these trees to the point that it looked like a tornado had hit that section of the campus. You could still see the ice, branches lying everywhere, trees effectively denuded of their branches. That led to the removal of most of the trees in front of the Memorial Union. I supposed it was true of some other places on the campus also but I certainly remember the MU before and after. Remarkable thing. [30:55]

That's more or less the way social life was, well there was football of course. There were a couple of other things. Football was mostly for the students and a lot of them went. But you weren't allowed to come with a girlfriend. The men and women sat apart and if you walked in with the girlfriend there would be raucous cheer from the men's section and they would shout the word 'fusser,' and that term was sort of an epithet. There used to be a directory called the Fusser's Guide here and that was for people to look up the addresses and phone numbers of other students. Some of the townspeople went too, but the stadium would only hold a couple of thousand, maybe three thousand people, and just one grandstand along one side or maybe some end zone bleachers, I don't remember that.

But there were also organized on the campus four times a year, it may have been six but certainly four, what were called lycia, lyceum in the singular. And these were events that were comprised of visiting artists of one kind or another, often

music. I have heard Arthur Rubinstein play the piano here for Oregon State at one of these. I have heard Paul Robeson sing and a number of other people, really famous artists. And that was paid for, I don't know how, but out of university resources because your student card admitted you to these. And they were held in the old men's gymnasium and with a small student body you always had enough space. They were looked forward to by a lot of people and Oregon State students were largely rural students, Agriculture was the biggest college on the campus, or school as it was called. I guess this was regarded as an opportunity to expose them at least to a kind of cultural side of life. But they were quite remarkable events and I was enthralled, there's no history of music in my family, but I thought these were marvelous events. So that was essentially the way the campus was set up. I was going to say that the basketball games were also played in the men's gym. The basketball schedule was different then from what it is now, we had what was called a Northern Division and a Southern Division and the champions of these two would meet for the Coast Championship. That's the athletic side of things here. So what else can I tell you about the times? [35:16]

CP: I am interested also in what your academic experience was when you were an undergraduate.

KH: After Southern Oregon Normal School, it was quite a change. Now the normal schools, of course as you know, were teachers colleges. There was no major in science at all and I just had elementary chemistry taught by a well meaning lady that really didn't know very much. A couple of years later one of my friends told me that his brother was there in the same class. This brother told my friend that I knew more of the chemistry than the teacher did. At any rate that kind of gives you the level of instruction there.

When I came to OSU, that was a different matter entirely and the first thing I took here was a course in analytical chemistry. And I was dismayed at my first grade in an exam in that course because by my Southern Oregon Normal standards, it was a very difficult exam and I didn't do very well, I got a C or something like that, but I wasn't used to that. So I learned what I had to do, to work hard, and I ended with a B in that first term, for which I was very grateful. Generally speaking I did very well here after that initial shock and there was a lot of interaction between faculty and students because the classes were much smaller. It was a good experience and I enjoyed it a lot.

Of course the war broke out and, as I said, I spent a year here. And since I was in science I was deferred until I graduated. And the campus was pervaded by a sense of what was going to be happening to almost everybody, the men on the campus. So a lot of the students chose paths that would take them into the military officer's training, that sort of thing. ROTC was required at that point. That just about finishes my recollection of my undergraduate days here. Well, as I said, I played tennis and we played Oregon, Washington State, Washington, Idaho. To get to these places we traveled by car and usually that was the car of our tennis coach, who was a guy named Bill McCallup who also played football here and was on the faculty as a football coach of some category or another. So to get to Idaho we would drive a car, and of course we would arrange to play Washington State at the same time. So that was a long trip in, by my personal standards, an uncomfortable car. But we were young and it was lots of fun. [39:54]

CP: Were all of your chemistry classes in Gilbert Hall or did you ever have classes in the old 'Chem Shack'?

KH: All the chemistry classes at that time were in Gilbert Hall. There was a building down on Jefferson and what is now 15th street, it used to be called the 'Chem Shack.' Linus Pauling, of course, met his wife in the Chem Shack and I often walked him around the campus, and one time when we were walking down there he wanted a glimpse of the building. And we went up and we went on to the floor and he went into one of the rooms there and, I can't remember whether the configuration was different from what he remembered of course. But he was able, with reasonable certainty, to identify the room in which he was teaching when he met Ava Helen. And he told me a couple of amusing incidents about the Chem Shack in those days.

CP: What did he say about the Chem Shack?

KH: Well there was one famous incident. You see, he didn't have natural gas as we did later on, as when I was there. And so when you had a burner in the laboratory, this was generally burning gas, perhaps acetylene I think it was, in a steel tank, and that was mixed with oxygen in an adjacent tank. And these were admitted into the laboratory by hoses. And there was a guy there, an assistant of some kind, Pauling told me his name but it was a foreign name, an Indian name or something like that, a student who was working there and being paid to do certain things, and he managed to get these lines connected up in the wrong order in such a way that when he turned on the tap, the higher pressure in the oxygen tank

forced its way through the tube into the acetylene tank outside. Well the consequence of this ultimately, for reasons that are unexplained, was an enormous explosion and fire that destroyed the stock room, and much of that section of what was called the Chem Shack. And Pauling said he never knew what happened to this student. He wasn't hurt, nobody was hurt it turns out, but Pauling didn't know if he managed to get his degree or not. That much he was able to tell me about.

CP: The Chem Shack apparently had a reputation for catching on fire.

KH: Did it? I don't know. Well this was certainly one and you can see why, if that was the method of firing up the burners. The chemistry nowadays is done in much smaller batches, usually in the undergraduate lab, than it was then. If you made a preparation then, you made a pound of it. I'm exaggerating, but I mean you had a lot of stuff there. Nowadays it's all green chemistry, very small amounts of things. In the summer time, I worked one summer - I don't remember whether I worked two summers or just one summer and another vacation period - on the campus as a part of the surveying crew. And one of the guys who stayed with us in my mother's operated rooming house was a guy who was a civil engineer and had a standing summer job. And he ran this line of levels and he taught me how to hold the cross thing and so on. He taught me what the signals were and so on. And that was better than working in the hot orchards in southern Oregon, but I didn't earn a lot more money out of it, I can say that. [45:12]

CP: Talk about your stock room job.

KH: Oh the stock room job. You signed up and it was all student operated. There was a head of the stock room, a man named Stony Wells, I remember that still. One of the reasons I remember it is because I mentioned that name to my father and he said 'Stony Wells, I know him.' So I brought him around one time and they shook hands and reminisced for a while. I don't remember what the connection was. But the students were the ones that actually did the leg work, taking in glassware, handing it out. In those days you checked it out; you had a pad and you filled out what it was you wanted and handed that to a guy behind a window just like at a shelf someplace, and he would go get the items and give them to you. And then there was a return sheet and when he returned it, the items had to be cleaned and dry. You put them back, looked at the sheet, made sure everything was there and put them back and then matched it up with the checkout sheet and threw the two away. So things were borrowed and returned from the stock room and we who did this work behind the window were being paid for by NYA, National Youth Administration. The first year I got twenty five cents per hour and the second year I got a raise to thirty cents per hour. But that was big money in those days. You could buy a Coca-Cola for a nickel and you could go to a movies for something like twenty five cents, and a full plate lunch would cost you thirty five or forty cents, something like that.

I remember my childhood in Hoquiam, my mother was away and my father and I went out to a local rooming house, it was called the Finnish Boarding House in Hoquiam, and they would serve meals to people that came in. It was family style, a big long table, a bunch of silent guys sitting there and spooning it in and the cost of that, for the two of us, each of us was something like twenty cents a piece. Just a bagatelle by today's standards. Unbelievable.

CP: Were there any classes or teachers that made a big impact on you as an undergrad?

KH: Oh yes there were. J.P. Mehlig was a very long term faculty member here, he was an analytical chemist, the first man I really met on the faculty because that was the first course I had to enroll in here. He lived to be over 100 years old and he was a man of incredible precision in everything he did. 'Analytical chemist' seems to fit his personality because he did everything by the clock and by rules. People used to say, J.P. Mehlig always walked to work and he lived down on 8th street or something like that and he would walk up Jefferson to the Chem Shack and I was told, I don't think the story is apocryphal, but people used to stand and wait for Mehlig to walk the gates and they said you could almost literally set your watch by his coming in. He got his degree at Purdue and he never ceased to be very interested in what Purdue was doing. He subscribed, all his life, to the student daily newspaper at Purdue. He used to go back there for the summers to do research and he drove his car and every year he bought two new tires, either for the front or for the back in alternate years. In those days tires didn't last nearly as long. And then the war came along and he couldn't get tires and he was terribly upset that it turned his life around in an uncomfortable way because he was so used to buying these tires. [50:13]

There was another man later who made a great impression on me, a man named James W. Ferguson. And he was an organic chemist, and as the war broke out, of course, he left and he went back to the Midwest and worked for Eli Lilly company. But anyway, I learned an enormous amount of organic chemistry from him. He didn't do a lot of research

but he was certainly a superb teacher from my point of view. Another person, of course, was Bert Christensen who became department chairman after I returned to the faculty. He was remarkable in a way as a faculty member because it was very hard to do research here at the time. Federal grants didn't exist then. The structure that we have now, like the National Science Foundation, didn't exist so you had to do more or less everything on your own and you got very little contribution, if any, from the state. But he managed to involve himself in research both with graduate students and undergraduates and I worked for him for a year or so with a very interesting project that we finally published. And that was my first publication, with Bert Christensen. There was another guy named Bill Caldwell who I never had as a teacher but he was a very popular instructor of freshman chemistry. He had very fancy demonstrations that the kids liked a lot. And then, of course, there was E. C. Gilbert who was a physical chemist, but I grew to know all of these people as a student. But of course when I came back in the faculty, all of the ones I mentioned except Ferguson were still here. Ferguson, after he went back to Eli Lilly, he returned to Oregon and he went to Portland State where he finished his career there. And after I came back on the faculty here, I saw him a few times in Portland, he looked just the same. Of course I knew other faculty members too but I didn't have them in any of the coursework that I took.

CP: So this project that you did with Bert Christensen, that was your first experience in scientific research?

KH: Well it was called 'a microdetermination of hydroxyl group' and it was an analytical technique where we worked with a very small amount of sample using microbalances, sealed them up and then the reaction took place and then we could analyze the mixture and we could determine one aspect of the composition of a molecule. Later on when I worked at Shell Development Company, I learned that our analytical method was being used in that commercial analytical lab. So that was really pleasing to me, they were big time down there.

CP: So by the time that you were done at OSU had you decided that you wanted to be an academic?

KH: No, the war was on then and I was faced with a decision about what I was going to do and I had two opportunities. War work was going on in the chemical industry and in particular there were people from Shell Development Company who came around and they were looking for people recommended by the faculty to do war work on some of their projects. The other opportunity - and I was interviewed by them [Shell] and offered a job - the other opportunity was to go into the Air Force in a program that would have been, for me, in meteorology or armaments, not in flying because at the time my visual acuity wasn't very good. So I had been registered with the draft board and I went to see Gilbert and Gilbert, he was a nice guy, I liked him a lot but he kind of grumbled, you know he would talk in a low voice and he said 'I think it's ridiculous for you to go into the Air Force and not use your chemical training when you could do that in war work where they need skilled people.' [56:05]

And then I went down to my draft board and I talked to the chairman of the draft board and I think his name was Sandy McGallagher or something like that. At any rate, he was clearly a Scot and he ran a gas station downtown. And I explained this situation to him and he said 'young man, you better go in the Air Force or we're going to draft you.' Well, this caused me to think a little bit about this and at that point I knew I wanted to go graduate school, you see.

To make a long story short, I finally decided that I would take the job at Shell Development Company which was a professionally, extraordinarily valuable experience but in terms of emotional contentment, it certainly wasn't very relaxing. First of all I spent most of the war on 1-A which is the draft status that is eligible for the draft. And you never know whether you are going to be drafted and, well, I guess I shouldn't have said it that way. When you are in 1-A you are eligible to be drafted and will be drafted. I was always classified 1-A by the draft board. The company appealed to the appeal board in Oregon on grounds that I was doing war work and supplied the paper verification of this. And because of the secretive and important nature of this war work I was always reclassified in deferred status of 2-B.

Now this deferred status lasted for only six months dated from the time that you were first classified 1-A. Well it took about three months for this process to go on and for you to be reclassified 2-B, but by that time you only had three months left. So I spent, literally, half of the entire war years in 1-A while the process of keeping me deferred to do this war work went on. And it's more than just paperwork because before you're classified 1-A you get a notice from the draft board that says 'Greetings,' and then you have to appear for a physical. First of all I had to appear at 5th and Monroe for a physical and I said 'I can't do that, I'm engaged in war work down here.' 'We'll transfer your physical down there.' All this took time you see. So then I would take the physical, I would go down, I would be transported to San Francisco out to the Presidio and there a whole bunch of potential draftees were lined up and we went through a physical that took at least, well it took

all morning and most of the afternoon. At which time, you were either classified as physically capable or classified 4-F, which means incapable of military service. So at the end of this I was classified 1-A, my draft board was notified and they told me I was 1-A. Then the company would get the papers and they would appeal this and we would go through the whole thing again.

I did that about five times during the war and on one occasion just before the war was ending, both in the Pacific theater and European theater, it was in 1945, and I had an emergency appendectomy. And in those days an emergency appendectomy was a big deal. I was in the hospital in Oakland for over a week, bed ridden, they didn't allow you to get up or anything. I had a huge scar like this long. So anyway, in the middle of all this my notice to appear for a physical came but I knew that if you had a recent serious operation, and that was serious in those days, you were automatically deferred for six months. So I tried to tell them that I had a recent appendectomy and they said 'take your physical.' So I lined up and went down in Oakland and we in due course were transported across the bay with a hundred other guys, you see, and told to strip there and I said to the corpsman, the first corpsman I saw, 'I had a recent appendectomy.' And I said 'I'm supposed to be deferred for six...' and he says 'get in line.' So I got in line. I came to the next corpsman and I said the same thing and he said 'get in line.' I went through all the tests and so on and passed them all and came to the last guy who was an officer there, and there was a guy who was supposed to test whether you're mentally fit, he's a psychologist, and he looked me up and down and he said 'you had a recent appendectomy.' And I said 'yes, I've been trying to tell them that all day long.' He grabs my papers and he writes 'Deferred.' [1:01:59]

Lastly, the war ended, there were still going to be occupation forces - and the war ended of course in the Pacific in August of 1945, and a lot of the military were being decommissioned and being sent home and so on. And then the year rolled around and the question was, who were they going to have in the occupation forces? At this point, of course, there was no further need of my services in this war work and so I was eligible for this, but on the second of February in 1946 I turned twenty-six and they didn't take anybody over twenty-five. So then I was automatically out of the occupation draft group and then I entered Caltech in the spring of that year and left Shell Development Company.

CP: What was the work that you did at Shell?

KH: Oh well, there were several things. The Japanese of course had succeeded in overrunning all of the plantations that provided latex for natural rubber which, of course, was really needed during the war. And so synthetic rubber had been discovered and there were all sorts of ways of making synthetic rubber. So I worked a lot on the problem of synthetic rubber.

Another thing that developed about this time during the war was the discovery of the efficacy of penicillin, which was being produced in a traditional way, in our area, by Cutter Laboratories, that existed either in Emeryville or in Berkeley or Oakland, right down there close to the bay. They had huge vats and they cultivated this and separated the penicillin, which was distributed to the Armed Forces and was not available to civilians at all at this time. And I worked on the methods for extracting penicillin from this.

And the third thing that I did during that was probably the most interesting in many ways; it was an aviation gasoline inhibitor. Aviation gasoline at that time was hundred octane fuel because all the aircraft were propeller driven and it was high performance engines that required that level of antiknock quality. This was particularly during the North African campaign and these tanks of hundred octane fuel were shipped across and then they had stand in the desert. Now one thing that happens to gasoline is that over time they tend to form some gum which settles out to the bottom. Now that gum, if it gets into the engines, of course, can be a very serious matter. So they apply what is called inhibitors to delay, greatly slow down, the formation of this gum and the stockpiles of fuel there in North Africa had in them a red dye. It turned out that when the gum was formed this red dye would be occluded and the fuel would change color so that the sergeants running the dump would realize what was going on and they would then use this deteriorated fuel in jeeps and in motor vehicles of various kinds. [1:06:22]

Well of course, it's obvious that what you want to do is to prevent this from happening as long as possible because that's expensive fuel to be using in jeeps, and it turns out that a lot of the time that the dye was disappearing but the fuel was still good. Well we had a special inhibitor that was better than anything in use; that we were developing and testing in the desert with a drum that we had mounted in the Mojave desert at an Army base with a bunch of thermocouples all through it, because we needed to figure out how quickly the gum formed in accordance with weather conditions. I mean if you

store these drums I mentioned in North Africa in the winter then there's no problem, it's cold, but in the summer it goes to pot very quickly. Well how do you know that? Because you don't know what the temperature inside the fuel is? Because in the summer a barrel at the bottom might be relatively cool and the one at the top might be totally gum. Well we had a way, we put these thermocouples all through this test drum and then we could measure the rate of the formulation of gum as a function of - well we took these temperature data from the thermocouples all through the drum and worked that up into something that we could call an effective temperature for the whole drum. And we can predict from a thermocouple in any place what the effective temperature was in the whole drum. And that would tell us how long that fuel can be expected to last. And so we did that in addition to developing and testing our inhibitor, which turned out to be very good. Well the war ended before the inhibitor could actually be used. And then, of course, the fuel now is not a hundred octane anymore, so that never got into production, but if the war had gone on much longer it would have been. So that's the kind of thing that I did. And all of this laboratory work was of tremendous aid to me when I entered graduate school because I knew how to use my hands, I'd been doing it for three years in the laboratory.

CP: And this job was in southern California?

KH: Yeah, Caltech.

CP: Oh was that Caltech?

KH: I went to Caltech.

CP: But the Shell job?

KH: Oh, the Shell job was in Emeryville. It was called Shell Development and Emeryville is a small enclave in between Berkeley and Oakland on the bay.

CP: We're at about an hour and ten minutes, do you want to keep going?

KH: I can go longer, I probably should leave here about a quarter to twelve, if you want. [1:09:33]

CP: So you finished up at Shell and then you ended up at Caltech, what was the process by which that happened? How did you wind up at Caltech?

KH: Well the laboratory that I worked in at Shell, I should say just a little bit more about that, was a small laboratory. At Shell Development there were all sorts of projects distributed all over. There was a motor lab out in back in which gasolines were tested. I was in the research end and there were the head of my small laboratory and another guy who had been working there for a long time and I was brought in as a third guy to help these people. We became, all three of us, very close friends in a social as well as professional sense. The man who headed it was named Daniel B. Luten, Jr. and he was a remarkable person. He was a very good scientist and at the same time, when the war was over - during the war he got very interested, partly because of this North African stuff, in climate, and thereby associated himself with geography. So he knew a great deal about geography all over the world and especially about climate changes and temperature and so on. And he used to amuse us by coming up with some facts that you didn't know. He'd said 'where do you think the rainiest July in the world is? Where is the place where the rainiest July takes place?' Well right away you think monsoon or something. It turns out that there is some village called Cherrapunji in India and he said that in the monsoon season, he announced to us that it had something like 240 inches of rain in the month of July. These are the kinds of facts that he would come up with.

Well the reason I mention all this is that after the war was over he retired from Shell as a chemist but became so knowledgeable in this other area that he was appointed as an adjunct professor of geography at Cal, and as time went on he built quite a reputation in that field. He came to Oregon State, gave lectures here, was invited up by the geography department. He was a very, very interesting guy.

The other fellow who is just as interesting, his name was Aldo DeBenedictus and he was Italian obviously. He came from an Italian family; they had a business in making pasta and one time he told me 'don't let them kid you, the dough is all the same. It's just the die that makes the difference between pasta.' So the texture is different depending on the die but not the dough. Well Benny graduated from Cal and he was an excellent student but he had a family of several children and

he had to go to work. Not having a doctorates degree, he was not running the lab, you see, but Dan Luten treated him in every way as an equal. He had his own projects and everything. Well, he spoke Italian fluently and Shell had occasion to want somebody who knew Italian very well to serve as a translator and so on. And after the war, he moved out of chemistry into marketing for Shell where his language skills could be useful and he moved to New York. Well he did very well in the company, he moved up the ranks. Finally, when he retired officially from that aspect of Shell, he moved back to Berkeley, he and his wife and family - I guess his kids were grown but they lived there at the time. And then he told me that he became very wealthy after he retired and he told me how this happened. There is a company known as - I'm thinking Advanced Micro Devices, if not that one its another one that makes chips, the biggest chip maker in the world now, chips for computers and so on. [1:14:57]

CP: Is it Intel?

KH: No, no. They make - I'm sorry, I misspoke, I think they make the devices for making chips. But Benny told me, we called him Benny, that he was approached by some people about this project and he said about five or six of them sat down around the kitchen table in his house in Berkeley and he decided, they all put up ten thousand dollars. And that company just grew like wildfire and he ended up a multi-millionaire just by investing that money. And so he endowed a chair at Berkeley in chemistry called the Aldo DeBenedictus Chair of Chemistry. His wife went to UCLA and was a nutritionist and he set up a similar thing in her name at UCLA with another million dollars or so. This was done years ago, it must be worth a lot more than that now. So I thought that was quite a remarkable story for a guy who spent his youth making pasta and working in a chemistry laboratory to end up like that.

Okay, so Caltech, what decided me to go there? Well I was thinking about going there and I wrote to E. C. Gilbert and he said 'you know, there is a very good university right there where you working, that's the University of California.' For some reason, I wasn't interested in going to Cal, I don't know why, but it's a tremendous institution of course and great people there, but maybe I had enough of that area for a while and so I applied to Harvard and to Caltech. In due course I was admitted to both of these as a student and then I had to make a decision. And so I talked to Dan Luten about all of this and I said 'Caltech has got Linus Pauling, who else do they have on the staff?' And I knew a lot of people at Harvard, you know very famous people, but the only one I knew at Caltech was Linus Pauling. And Luten, with his customary brusque sense of humor manner said 'look, with Linus Pauling they don't need anybody else.' That was his famous line to me and I've never forgotten it.

Well that wasn't enough to decide, but what did decide me was that it was only a short distance away, it was on the west coast in a place where, at that time, was reputed to be beautiful. And indeed it was. And I had a small beat-up car that I knew wouldn't make it across the United States. And so I packed this thing up with my duds, my wife, and myself and we started out for Caltech. On route to Caltech, I'll tell you this too, this is more a personal history than it is a professional history if that's alright? [1:18:39]

CP: Absolutely.

KH: Well this was a 1933 Chevrolet Coupe and it had been repaired once and we had it loaded, my wife and myself, and we started up a steep hill out in the valley just before you get into southern California. And the car began to falter and it went [car noises] and then it wouldn't go anymore. But then if I stopped it and fired up the engine it would catch and I could go a short distance. Then it would go [car noises] and it would stop. Just as if it were tired, you see. So then I turned the thing around and managed to get over into the other lane, it wasn't a freeway in those days. And I went down to the bottom of the hill. The car ran just fine, pulled it up into the gas station which was closed for the evening and it had a mechanic associated with it.

And so I pulled into this gas station and there was a light on in the house in back and I asked about the mechanic. I came to the door and he said 'well, I'm a mechanic.' And I said, 'well, I hate to bother you, I guess you're closed.' He says yeah and he said 'what's your problem' and I explain this to him. And he put down his knife and fork, he was literally having dinner, and he went out and he listened to this and looked and he said 'you need a new fuel pump.' And he says, 'I don't have one here but I think I know where I can get one.' And I say 'gee, that's very kind of you' and he said 'no, no that's okay.'

And he gets in his car and he goes away and in ten or fifteen minutes later he appears and he's got the fuel pump. And he gets to work on my car and he puts the new fuel pump in, in those days it was a fairly simple job. He puts the new fuel pump in and we fired it up and he said 'there, that ought to do it.' And I said 'how much do I owe you?' He said 'well, you pay me for the fuel pump.' And I said 'I've got to give you more than that.' And he says 'nah, nah, sometimes you just have to help a guy out.' That is a lesson. You know that happened when I was twenty-six years old and I have never forgotten that. And to my lasting regret, I never learned the guy's name or the location of this. But I have never forgotten that. Absolutely remarkable, you know. He spent a lot of time and he wanted nothing for his time.

CP: So I didn't know that you were married at this point.

KH: Yeah but that was my first wife; we divorced some years later. And my second wife, I met in Norway and we have been married for 55-56 years or something. Anyway, to get back to Caltech. So I went over the hill, got down, found a place...my then-wife had a relative there who offered to put us up for the night. Turns out her husband was a postman in Pasadena and he, on his rounds, happened to know quite a bit about vacancies and so on, which were very, very few. And in that time, in that era, there were a lot of houses that had garden cottages in the back of them, and he knew about one of these and I went up to, my wife and I, interviewed these people. They were old people, eighty years old or so, and nobody was in the house and they had fixed it all up. They were very particular about their tenants and after, I guess, we turned on the charm they agreed finally to rent it to us. And we were then able to wheel up our few belongings and put them in the house which was furnished. And we lived there for quite a long time.

When I went to Caltech, I presented myself at the main office and said 'I'm on an appointment' to Mrs. Beatrice Wulf, and she said 'well, Dr. Pauling likes to talk to all the new graduate students, I'll set up an appointment for you' and she did. And I can't remember whether I got an office right away or not but at any rate I do remember the interview with Pauling. He knew that I was from Oregon and from Oregon State, and of course there was a kind of a bond there because he had gone too - I mean, not a bond but at least it was something we had in common. And so he asked me what I was interested in and I told him I was interested in chemical kinetics and mechanisms and so on. And he said 'well, it's too bad because the right person for you to work with would have been Roscoe Dickenson, but he died last year of cancer and we haven't anyone to take his place yet.' But he said 'we do have a young post-doctoral fellow here from back east and he's interested in this kind of work and doing a project and that it would be fine for you to work with him if you would like to and if he would like to have you.' And to this day my mind has boggled at that, because you can't imagine our department chairman here suggesting that any of the incoming graduate students work with a post-doc and not with a faculty member, whose hands are very hard to come by in a research program. [1:25:00]

So I went see this man whose name was C. Gardner Swain, who later went on to a distinguished career at MIT as an organic chemist, and I worked a full year for him until his period was over and we did a project of his that turned out just fine and we published a paper on it together.

CP: What was the project?

KH: It was the oxidation of leuco malachite green to malachite green carbanoyl, which was an organic compound which then decomposed to form a dye called malachite green. And we could study the reaction by watching the color formation of this stuff. So it was a fine project and it was good for Gardner because I had all this laboratory experience during the war - I probably had more than he had at that time in actual laboratory work.

But he was a very clever guy. If we wanted to do a reaction at Shell Development Company, we had all the equipment on the shelf there. I could bring down what was called a thermostat constant temperature bath, I could put up the control mechanism and put in the controlling thermometer and the heaters and so on. I would have it all set up in fifteen or twenty minutes. At Caltech, they didn't have any such thing. So Gardner sat down, he was good at electronics, and he drew out some components that he would need and I went to the avenue to the electronics store and bought these things. I came back and spent, I don't know how long, a couple of weeks or three or maybe even more than that because I was taking courses, building this relay that would work. Building it, putting it together, soldering wires, and so on. And then I spent another week locating and getting transported a big tank that I could fill with water that would hold our samples. I set up the heater and put everything in it and got it going. It got me the best part of six months versus that twenty minutes I mentioned to you.

Once it was set up, the reactions, the experiments, went on rather nicely and conveniently fast. So that got done in Gardner's year there. So at the end of that time, I had to decide, I was looking ahead for what else I was going to do. And there was a young guy there, he was only about six years older than I was, that was a very, very good scientist. He had done his work with Pauling and had been added to the faculty. And he had a group of young people that were kind of eager, and I went to talk to him. The upshot of that conversation was that I decided to work with him and we had a project that we settled on right there. When Gardner left, I began to work with this man, Verner Schomaker. So maybe we should talk about some of this at a later time?

CP: Yeah, we can start off with Schomaker next time. [1:28:27]