



Richard E. Marsh, 1979

RICHARD E. MARSH
(1926 – 2017)

INTERVIEWED BY
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Subject area

Chemistry and chemical engineering

Abstract

An interview on November 7, 1997, with crystallographer Richard E. Marsh, senior research associate, emeritus, in the Division of Chemistry and Chemical Engineering. Dr. Marsh received his BS in chemistry from Caltech in 1943 and his PhD from UCLA in 1950. He came to Caltech that year as a research fellow, to work under Linus Pauling. He continued in crystallographic research at Caltech for the remainder of his career.

In this interview he discusses his father's stint as a speechwriter for Franklin D. Roosevelt; the family's move to Redlands, California; his undergraduate years at Caltech; and his subsequent naval service (1943-1946). He recalls his year of postwar graduate work at Tulane, where he studied crystallography with Rose C. L. Mooney, and his transfer to UCLA for his PhD with James McCullough. Recollections of postdoc with Linus Pauling, working with David Shoemaker, Edward W. Hughes, Jerry Donohue, Verner Schomaker, Robert B. Corey.

Pauling and Corey's paper on possible DNA structure; "overblown" competition with James Watson and Francis Crick. His work with Corey on small-molecule biological crystallography. Lavish government funding of sciences after the war. Pauling's profligate hiring. Remarks on his work, which continued in his emeritus status. Remarks on undergraduate life at Caltech in the early forties: Officer "Fig" Newton; intramural tackle football.

Administrative information

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CALIFORNIA INSTITUTE OF TECHNOLOGY ARCHIVES

ORAL HISTORY PROJECT

INTERVIEW WITH RICHARD E. MARSH

BY SHIRLEY K. COHEN

PASADENA, CALIFORNIA

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ORAL HISTORY PROJECT

Interview with Richard E. Marsh
Pasadena, California

by Shirley K. Cohen
November 7, 1997

Begin Tape 1, Side 1

COHEN: Good afternoon, Dr. Marsh. I'm delighted you've agreed to participate. Tell us a little bit about your family and how you grew up. We'll start from there.

MARSH: I was born in Jackson, Michigan, in 1922. My dad was the editor of a small newspaper around there at the time.

COHEN: So he was a newspaperman?

MARSH: He was a newspaperman by training. Later on, he went into writing, mostly short stories. He found out that he could write in Michigan very well in the summertime but not so well in the winter, and that writing in California in the winter was a good thing to do. So my family started alternating residences between Michigan in the summer and California in the winter. That began in about 1926 or 1927.

COHEN: I'm assuming your father was able to make a living with his writing.

MARSH: Yes. *Argosy* magazine was his favorite outlet. It seems to me he would have two or three short stories in *Argosy* most every month: "Wild West" tales and that sort of stuff.

COHEN: What was your father's name?

MARSH: Howard Marsh. Later on he wrote a couple of adventure biographies that did pretty well. Then he got involved in FDR's administration. He was a speechwriter in, I guess, what

would have been the second administration. In the third administration, he was with the Bureau of the Budget. So he was in Washington during that period.

COHEN: It's hard for me to understand how he went from writing short stories to being part of the administration.

MARSH: Well, you don't want to get this detailed. [Laughter]

COHEN: Just a brief explanation would be good.

MARSH: My father's fraternity brother—and, later, my godfather—at the University of Michigan was Edward Kemp. He was the brother of Dorothy Kemp, who married Hall Roosevelt, who was Eleanor Roosevelt's brother. Eleanor Roosevelt was Eleanor Roosevelt Roosevelt.

COHEN: Right. She was a cousin of FDR.

MARSH: Yes, and Hall was her brother. And he was married to Dorothy [Kemp] Roosevelt, who was my father's roommate's sister, I believe; they got divorced later on. And speaking of Roosevelts, in my senior year at Caltech, my instructor in U.S. history was Kermit Roosevelt, Jr. He was working at the Huntington [Library, in San Marino], and was hired to teach a course or two. I guess this was before his CIA days. So anyway, my father got in close with Hall Roosevelt, and the Roosevelts a little bit, and the administration.

COHEN: He must have been a Democrat.

MARSH: Oh yes. I'm sure he was. [Laughter]

COHEN: So he became a speechwriter?

MARSH: He became a speechwriter and then he worked with Harold [D.] Smith when Smith was director of the Bureau of the Budget. That went on into the Truman Administration, but I think my father got a little disenchanted with Truman and then he went back to writing.

COHEN: I see. And did the family live in Washington during those years?

MARSH: They lived in Washington much of that time, yes. I was shipped off to boarding school and got interested in math and science and stuff.

COHEN: I see. Where did you go to boarding school?

MARSH: Well, I went to a couple of places. The last two years were at the Kent School in Connecticut.

COHEN: And then you joined the family in the summers?

MARSH: Oh yes, we all went to Michigan in the summer. We still have a place in Michigan. I go there every summer for two or three months with my family.

COHEN: *On Golden Pond*, eh?

MARSH: Very much. There's a main cabin and two or three cottages and lots of family and friends.

COHEN: And your mother just traveled with your father?

MARSH: Yes, she was nothing other than a housewife.

COHEN: For many houses, though.

MARSH: Well, it was mainly Washington and Michigan and California.

COHEN: And where in California did you live?

MARSH: Redlands. I went through junior high school in Redlands. Then the Washington period began, and I went through high school in boarding schools and then on to Caltech.

COHEN: I see. You were an undergraduate at Caltech?

MARSH: I was an undergraduate beginning in 1939. I graduated in '43.

COHEN: I see. So you were here actually during the war years?

MARSH: Yes. I managed to get deferred until I graduated.

COHEN: So you were interested in science and math, and that was all on your own. You didn't get it from your family.

MARSH: That is correct. There was certainly none of that. They were interested in books and reading and all that sort of stuff, so I did a lot of reading. I guess they saw my interest in science, so they gave me books on science.

COHEN: And your father was connected with the government until Truman's time?

MARSH: Basically, yes.

COHEN: Only with the [Bureau of the] Budget? Did he do any diplomatic kind of work?

MARSH: No. No politics, diplomacy, or that kind of thing.

COHEN: And then he went back to writing and took up permanent residence here in California?

MARSH: Except for the summertime in Michigan.

COHEN: And was your family home in Redlands?

MARSH: It was in Redlands, yes.

COHEN: So you started at Caltech in 1939.

MARSH: Yes. It was a good place. [Laughter]

COHEN: Do you remember who your teachers or professors were at that time?

MARSH: Oh, vaguely. It seems to me James Edgar Bell did the chemistry, if I'm not mistaken. I just drifted through Caltech, having a ball. I don't remember a lot of the details, like classes and instruction. [Laughter]

COHEN: So, even drifting through, you must have certainly been successful, or you would not have stayed.

MARSH: Well, I graduated, but I did a lot of athletics and a lot of horsing around.

COHEN: There was no single professor who made a big impression on you or anything like that?

MARSH: I don't really believe so.

COHEN: Well, you would be able to answer right away if there had been.

MARSH: There was perhaps one who left a negative impression, but I won't dwell on that. [Laughter] They had that wonderful option then of applied chemistry, which meant that you didn't have to take much chemistry—you could take other things. In my senior year, I probably had seventy units of things like alternating currents and geology.

COHEN: So you really liked the rounded curriculum.

MARSH: Yes, if it was fun that was fine. But things like physical chemistry were not fun.

COHEN: How did you get waylaid into chemistry in such a serious way?

MARSH: Well, I came to Caltech as a physicist, certainly, but then it dawned on me that physicists used 110 and sometimes even 220 volts of electricity, and I didn't like 110 or 220 volts. This probably had some origin in my childhood. I remember as a very young child

playing hide-and-seek with a piece of tinfoil, jamming it into an electrical socket, and that may have been what turned me off to physics.

COHEN: The shock remained?

MARSH: The shock remained.

COHEN: But you had to major in something, so it turned out to be chemistry?

MARSH: It turned out to be chemistry. Exactly.

COHEN: Do you remember any of your classmates?

MARSH: I remember some.

COHEN: Of course the V-12 program would have been in effect.

MARSH: I had very little interaction with that. My roommate was a fellow named Harold [K.] Garner, who was also a chemist. He died a number of years ago.

COHEN: So you graduated in '43, enjoying yourself here and not thinking of yourself as a great scientist?

MARSH: Not thinking of myself as a great scientist at all. [Laughter]

COHEN: What did you do next?

MARSH: Then I took a job with the navy.

COHEN: The war would have been on then.

MARSH: The war was on then, yes. I remember standing on the top of Gates [Gates and Crellin Laboratories of Chemistry] for four-hour shifts in the middle of the night with a little bucket of

sand, waiting for the Japanese aircraft to go over, and being all prepared with a little bucket of sand. [Laughter]

COHEN: That was serious then. You didn't laugh about it.

MARSH: No. Before the war, in the fall term of '41, Caltech offered an opportunity to do civilian pilot training. All you had to do was pay for the insurance and you got to learn how to fly and navigate. So I did that. Again, that was a lot of fun. I was scheduled on the Monday after Pearl Harbor to go out and take my cross-country solo flight. So I went to the little Monrovia airport, and of course it was all shut down because of Pearl Harbor. We were given the opportunity to move to Denver and continue flying school and presumably join the army air corps or the navy. I decided that I'd rather stay at Caltech to finish.

COHEN: So you got your bachelor's degree. And then what did you do

MARSH: After working with the navy for about two years, I saw I was about to be drafted, so I enlisted in the navy and spent a year or a year-and-a-half there. The war was winding down. In fact, I might have still been in boot camp when the first atomic bomb was dropped. After that, it took them maybe another nine months to get everybody out of the service.

COHEN: Where were you stationed?

MARSH: I was stationed in boot camp in San Diego and then up in Chicago and then down to Gulfport, Mississippi, and then up to Treasure Island. I think those were the places. I got around a bit. When I worked for the navy, I degaussed ships. The idea was to pass current through various coils of wire which were wrapped around all U.S. ships in order to demagnetize them so they wouldn't be damaged by magnetic mines. I believe that one mine was actually deployed by the Germans in the Thames River at the beginning of the war, but as far as I am aware, no other magnetic mine was ever manufactured.

COHEN: OK. So now the war is over. You're out of the navy. That must have been in '46 already.

MARSH: Yes. That would have been in '46. While I still worked for the navy in '45, or late '44, I was transferred to New Orleans and I met a young lady there. When it came time for me to get discharged from the navy, we had a choice of where we would be discharged, so I chose New Orleans, because that's where she was. By then, we had pretty well decided that we were going to get married. So I was discharged in New Orleans with absolutely no idea what I wanted to do. But I had a GI Bill.

COHEN: That was wonderful.

MARSH: That was a pretty great thing for my generation. So I walked over to Tulane University. This was probably in late August of '46. And I knocked on the door and said, "Here I am, and I have the GI Bill, and I have a BS. Is there any chance I could get into graduate school?"

COHEN: Caltech already, at that time, had a good reputation, I'm sure.

MARSH: Oh, yes.

COHEN: So a Caltech degree was not insignificant.

MARSH: Probably not. And Tulane, being what Tulane was, was willing to accept people that other places wouldn't have. Anyway, they accepted me. I remember at first that I only could get about three classes, because it was so late that most of the classes were filled. I got a class in heterocyclic chemistry, and I had no idea what heterocyclic chemistry was about, but it was about the only thing I could take. I remember the first lecture. It was a night class. The guy was standing up there and talking about benzene, and I had no idea what benzene was. This was after being out of school three years, and organic chemistry wasn't very big at Caltech then anyway. I was completely at sea for quite a while. But another course I had went differently. It was taught over in Sophie Newcomb College, which was a girls' school right across the street from Tulane. The course there was in crystallography, with Rose C. L. Mooney teaching. She later became Rose Slater. She married Professor John Slater at MIT, who was interested in atomic orbitals and was a very well-known theoretical physicist in the forties and fifties. That was my first loving exposure to crystallography.

COHEN: So you knew right away you liked it?

MARSH: Right away. I don't know why.

COHEN: But you hadn't done anything like that at Caltech.

MARSH: Nothing, except for the rather trivial mathematics in it. It was a very exact science. Chemistry is not a particularly exact science, but crystallography is. You have a whole lot of data and numbers.

COHEN: We use the word "empirical" sometimes.

MARSH: Yes, but in crystallography if you collect good data you can get an answer you are absolutely certain of, and that is not true of a whole lot of areas of science.

COHEN: So that really appealed to you?

MARSH: I'm sure that's what the basic appeal was.

COHEN: And she must have been a good teacher.

MARSH: She was a good teacher. Anyway, I liked the field. So, at her advice—I guess everybody realized that Tulane wasn't the place to do a serious four-year graduate program—I applied back to Caltech and to UCLA. Caltech said no, for which I certainly don't blame them. I didn't have the greatest record when I graduated. I probably got D's in P. Chem. [physical chemistry] pretty regularly.

COHEN: Do you remember who taught you P. Chem.?

MARSH: Yes. [Laughter] I said that there was one whom I really didn't care for.

COHEN: So, who was it?

MARSH: Stuart Bates. I shouldn't do this.

COHEN: Why not? Of course you should.

MARSH: As I recall, we had an eight o'clock with him, although it could have been a nine o'clock. We would traipse in there and he would write a formula on the board, and then he would start going through taking partial derivatives toward heat capacities—I don't know what he was doing. Along about 8:15, he'd lose a minus sign on one of those derivatives, and from 8:15 until ten minutes of nine, when the bell rang, he would look for that minus sign. [Laughter] I was just very depressed by it. I just never learned much in the way of physical chemistry.

COHEN: But anyway, you then went to UCLA?

MARSH: So then I went to UCLA and quickly knocked on Jim [James D.] McCullough's door. He was a crystallographer there and a student of Pauling's here.

COHEN: Now, had you had Pauling as a teacher when you were here as an undergraduate?

MARSH: Not that I really remember.

COHEN: He must have been here then.

MARSH: He must have been. He probably gave a lecture or two. I think the year I took freshman chemistry, he was away. That is why the name "Bell" comes to mind.

COHEN: Otherwise you would have had Pauling.

MARSH: Right.

COHEN: OK. So let's get back to UCLA. You moved to California with your wife?

MARSH: We got married just before I came, in August. We took our honeymoon driving out to California. We found a little one-room place in West Los Angeles. I went to graduate school, and she worked off and on.

COHEN: Did you enjoy UCLA?

MARSH: I enjoyed UCLA a lot. I enjoyed the crystallography in particular.

COHEN: Were there people there who were interested in crystallography?

MARSH: There were people right there. There were two or three grad students doing it: John Bryden, and I guess the one who had left just before I got there—Gabrielle Hamburger.

COHEN: A woman?

MARSH: A woman. She became Gabrielle Donnay later on, but she graduated from UCLA as Gabrielle Hamburger. Then she went back to MIT for her PhD with Martin Buerger. Also active in the field was—I don't remember his first name—a guy named [Charles W.] Bunn. So there was a Hamburger and a Buerger and a Bunn, all very active in the field. [Laughter]

COHEN: I see your sense of humor got the best of you. So you spent four years at UCLA?

MARSH: I spent three years at UCLA. I had one at Tulane, and I got out of UCLA after three more years.

COHEN: And did, I gather, a thesis on crystallography?

MARSH: I did a thesis on crystallography and got out in the spring of '50. By then we had had our first child—I think she was born in '50. That's embarrassing, but I don't know off the top of my head.

COHEN: OK. You finished and then—

MARSH: Then I took a postdoc over here.

COHEN: So you did come back to Caltech, and then they were happy to have you.

MARSH: I came back as a postdoc and I have been here ever since. I don't know if they were happy to have me, but I came back.

COHEN: I see. Now, who did you do your postdoc with?

MARSH: I did it under one of Pauling's contracts. I did some work with Pauling directly the first couple of years. I guess my main boss was an older postdoc—two years older—David Shoemaker, who was working on a program of intermetallic compounds. This was one of Pauling's programs.

COHEN: Now, Pauling had a whole bunch of people working for him.

MARSH: He had a whole bunch of people scattered around over in Crellin. I became one of them. There were a whole lot of very interesting people there then.

COHEN: How much did Pauling have directly to do with all of that? I mean, how often did you see him?

MARSH: Oh, he was around all the time. We saw him all the time. There were so many people doing so many things.

COHEN: Did he really have a handle on all these things?

MARSH: I think so. I don't remember exactly, but I think we got together on the things I worked with him on at least once a week. I always had a lot of trouble communicating with him. I could never be comfortable. He knew too much.

COHEN: But he must have been pleased with you, or you would not have had the position.

MARSH: I don't know. He just knew everything about everything, and I knew nothing about anything. All my life I was uncomfortable talking with him.

COHEN: I see. Even when you were established?

MARSH: I never could call him anything other than "Professor Pauling."

COHEN: Was there some sociability? Did you go to the Pauling house?

MARSH: Occasionally. Not a lot. He would have chemistry division parties. That's about all. I don't think we were ever there in a two-on-two or eight-on-two group at all.

COHEN: I see. So, how did you know what to work with? Was it at the suggestion of this older postdoc?

MARSH: Yes, and Eddie [Edward W.] Hughes was there.

COHEN: He had come with Pauling?

MARSH: He had come, I guess, more or less with Pauling. [Hughes joined the faculty in 1938, nine years after Pauling—ed.] He was a big help.

COHEN: He came from Cornell, didn't he?

MARSH: Yes. Jerry Donohue was also there; he later went to USC and then to [the University of] Pennsylvania. There was Bob [Robert B.] Corey, Verner Schomaker. There were all sorts of fine people around.

COHEN: So there was a lot of work going on?

MARSH: There was an awful lot of work going on in crystallography. It seems like most of the main floor of Crellin was occupied with that—maybe not *most* of the main floor, because

[Richard M.] Badger had an office there, and [Don M.] Yost did, too. Maybe everybody else on that first floor and down in the basement were crystallography types.

COHEN: Now, this group didn't do any teaching, particularly. Did you do any teaching?

MARSH: No. Occasionally, particularly a little later on, I would take over Pauling's lectures on the nature of the chemical bond when he was indisposed or out of town or something.

COHEN: That must have gone on a lot—I have the impression—that somebody had to take on his lectures.

MARSH: Yes, I think so. Well, you know, he had a lot to do. I remember one time when he got stuck on a ledge up at his ranch overnight. He climbed up on a ledge and decided he didn't want to climb down again. He was there all night. He didn't show up Monday morning.

COHEN: Was that up in Big Sur?

MARSH: Yes. [He had] a ranch there. Apparently that was a very traumatic experience for him.

COHEN: About when would that have been?

MARSH: Oh, mid-fifties or so. [Pauling spent the night on a ledge in Big Sur in January 1960—ed.]

COHEN: But he didn't mind telling everybody about it? Did he actually have to be rescued?

MARSH: Oh, he had to be rescued. I guess Ava Helen [Pauling] missed him, but it was dark by then. I think it was not until the morning that they got someone out there to get him. I kind of thought that he was the type who would laugh something like that off a little bit. But apparently not.

COHEN: How were you made aware of this? Did he talk about it?

MARSH: Well, it was probably in the paper. Probably Ava Helen called the school. We knew about it by Monday morning. And I think by that time he had been found. So the incident was over by the time we learned of it. But I remember talking to him about it later. I was kind of expecting him to joke about it, but he didn't.

COHEN: It was a bad experience for him.

MARSH: Yes.

COHEN: Now, when did the competition [discovering the structure of DNA] start going on with [James D.] Watson?

MARSH: Oh, that was a very sudden one-time event. That was later on. When was that?

COHEN: In the fifties.

MARSH: Yes. Pauling was dreaming up these structures of biological polymers, like the alpha helix, and started to work on DNA as being one of them. He had Alex [Alexander] Rich trying to make fibrous crystals of DNA. He [Rich] never could get very good diffraction photographs, so Pauling never had much in the way of good data on DNA. But he fussed around and got a model with these phosphate groups on the inside instead of the outside and never was very happy with it. He and Corey wrote a paper saying, in effect, "This may be the structure, but we are not very happy with it." That was published in the *Proceedings of the National Academy of Sciences*.¹ And at about the same time, Watson and Crick came up with the correct structure.

COHEN: Well, there's something in the romance of this whole affair, with Pauling running back and forth.

MARSH: My memory is that this was very much overblown by later generations.

COHEN: So it wasn't a cause célèbre here, is what you're saying?

¹ Linus Pauling & Robert B. Corey, "A Proposed Structure for the Nucleic Acids," *Proc. Nat. Acad. Sci.* 39:84-97 (1953).

MARSH: No, it was not. I remember seeing models of Pauling's DNA thing and talking with him and Corey about it. And Schomaker recalls saying, "Oh, this probably can't be right, because things are too close together." Pauling and Corey kind of agreed that it probably wasn't right in all details, but they thought it was at least close to being right.

COHEN: Because Watson in his book tries to make a big thing of it.²

MARSH: Oh, yes, to sell a book. [Laughter] Maybe Pauling felt very differently, but I never felt there was a problem.

COHEN: So then, how about this story that had Pauling getting over there and seeing [Rosalind] Franklin's photographs, and then not getting his passport? I guess this is romantic stuff.

MARSH: I'm sure that's romantic. If Pauling and Corey and the rest of us—Jerry Donohue was here—if we had had her pictures, I suspect that the Pauling-Corey structure would have come out differently, but who knows?

COHEN: Well, "what ifs" can't be proved.

MARSH: I certainly don't remember any proofs.

COHEN: So then, after the years of your postdoc, you remained on?

MARSH: Well, I have never been anything other than a postdoc. [Laughter]

COHEN: I mean, you had to take on another title after the postdoc.

MARSH: Right. I was a research fellow. And I've stayed all these years in research. That branch of the faculty system has disappeared now, I believe, essentially.

² James D. Watson, *The Double Helix: A Personal Account of the Discovery of the Structure of DNA* (New York: Atheneum, 1968).

COHEN: Who were you here with in that position, then? Did you look after postdocs and graduate students?

MARSH: Yes. After about '53 or '54, I worked pretty directly with Bob Corey, who was the small-molecule biological crystallographer working on amino acids and peptides and that sort of thing. He was my direct supervisor. There were others doing the same thing, but gradually, as he became less active, I became more in charge of that affair.

COHEN: Was Verner Schomaker still here, or had he already gone?

MARSH: He went to Union Carbide for a while and then to Seattle. That was in '56, maybe. [Schomaker left for Union Carbide in 1958 and went to the University of Washington in Seattle in 1965—ed.]

COHEN: Right. I have talked to Verner.

MARSH: Yes, I know you have. Verner was mainly working in electron diffraction, but he knew a lot about almost everything else, so he was a big help to us, too.

COHEN: Did the group that formed then have to be directly supported by Corey having grants or Pauling having grants?

MARSH: It was supported mainly by Pauling grants, and then, after Pauling left, by Corey's grants for a while. Pauling got a big one from the NFIP [National Foundation for Infantile Paralysis].

COHEN: They had a lot of money.

MARSH: Yes. Of course, after the war the navy had all this money, for obvious reasons, and they were getting rid of all their people. So they had to find a place to spend their money to justify their budget to Congress. So they were very free and easy.

COHEN: So the ONR [Office of Naval Research] supported you?

MARSH: The ONR supported us a lot. They would literally call up and say, “We’ve got some money. Can you think of a way to spend it?”

COHEN: They supported astronomy here, too, you know.

MARSH: Right. Those were gossamer days for government support.

COHEN: And Pauling was still here. Was he doing more of his political work by then?

MARSH: By then he had gotten a lot into politics. In the biological stuff, Corey was the main overseer. He would write the grants and do the nitty-gritty of it.

COHEN: Was it a big group?

MARSH: It was a fairly big group, often with some very strange members. This is certainly a big exaggeration, but Pauling would go out and give a popular lecture somewhere, and someone from the crowd would come up and talk to him afterwards. He would listen to them, and then they would say, “Well, gee, I have this wonderful theory, and I would like to do this.” And Pauling would say, “Oh, come work with me.” So that person would come, and he would be farmed out to Bob Corey to find something for him to do, get an office for him, and so forth.

COHEN: So Pauling just sort of hired people off the truck?

MARSH: It just seemed to me that he hired odds and ends of random people.

COHEN: And you then had to accommodate them?

MARSH: We’d have to accommodate them.

COHEN: Because whatever he did, that was it?

MARSH: Well, he had the money.

COHEN: OK.

MARSH: There certainly was resentment within the division.

COHEN: That this was going on?

MARSH: Yes, that was certainly part of the Pauling breakup.

COHEN: In talking with Verner, I had the feeling that he [Pauling] was always teaching somebody something and not getting on with his own stuff.

MARSH: Yes, and maybe building too big an empire within a small school. I mean, the chemistry division was really almost an extension of him.

COHEN: So then you just continued working on the crystallography projects that you and Corey would agree had to be done?

MARSH: Right.

COHEN: And enjoying yourself?

MARSH: Yes. [Laughter]

COHEN: Did you do outside work concurrently? Did you do any consulting?

MARSH: No. I've done very little consulting.

COHEN: By then you must have moved to Pasadena.

MARSH: By then we had moved to San Marino. In fact, as soon as I was hired here as a postdoc, we got a little cheap house in San Marino, because we had heard the schools were good.

COHEN: You've been there ever since?

MARSH: We've been there ever since.

COHEN: So Pauling left [1963-64], and the division must have changed radically after that, because many other things happened.

MARSH: Yes. Of course, being in the research end as a research fellow, I never got involved in departmental politics. That was above and beyond me.

COHEN: So, as you say now, you really occupied a niche that doesn't exist anymore.

MARSH: Right. I kept being successful in getting government grants from the Public Health Service to continue my program of research and take on a few grad students and postdocs.

COHEN: Was there any particular phase of crystallography that you could call your own?

MARSH: Small-molecule crystallography. But from the mid-fifties until the seventies, it was small biological molecules—first, amino acids and peptides, and then I got into nucleic acid derivatives for a while and fussed with them.

COHEN: I'm trying to understand the changes in the chemistry division you saw in the years you were here. Were you involved in them, or aware of them, or touched by them?

MARSH: I was aware of it. I suspect I was touched by it, surely, but I was not part of it. I was allowed, even as a researcher, to teach a class and get my own students and my own contracts and operate very much like a faculty member but without the administrative—

COHEN: The title.

MARSH: Without the title, without the formal tenure, without the administrative duties.

COHEN: But were there periodic looks at the people like you who were here, to say, "Shall we continue this person"?"

MARSH: I'm sure there were. If I had not been able to get government funding, I would have been out of here.

COHEN: You had to fund yourself?

MARSH: I had to fund myself, certainly. I think I never had a year that I didn't have my own funds.

COHEN: So, is there any sort of high point in your work here that you particularly enjoyed?

MARSH: I've enjoyed it all. [Laughter]

COHEN: So you've enjoyed being at Caltech?

MARSH: Yes. I've certainly enjoyed crystallography, and I've been active in the field.

COHEN: Did you formally retire at some time?

MARSH: Yes.

COHEN: How did that go?

MARSH: I couldn't tell you when it was. It was five or six years ago. [Dr. Marsh became senior research associate, emeritus, in 1990.—ed.]

COHEN: Of course, you've just continued working.

MARSH: I just have continued with it.

COHEN: And now you have an office here. Do you have a lab anywhere?

MARSH: No. I've really never had a lab. I didn't like grungy chemistry, so I've never really done much in the way of laboratory work. We have equipment, diffraction equipment, and I guess that qualifies as a lab. But we don't mix nasty chemicals.

COHEN: Where do you keep all this stuff?

MARSH: Our lab is up on the first floor of BI [Beckman Institute].

COHEN: It's right here? I'll have to see that sometime.

MARSH: Sure. It's right down at the end of the hall.

COHEN: So, do you envision going on like this?

MARSH: Yes, yes. I have a nice room. I have projects to work on and keep busy. I'll just continue to have a good time.

COHEN: If you look back at this to say who influenced you here, I have a feeling that it would have been Professor Corey.

MARSH: It was Corey, a lot, and certainly Pauling and Verner Schomaker.

COHEN: I mean, the world of crystallography has really changed with the computer era coming in.

MARSH: Yes it has.

COHEN: Would you want to say something about that?

MARSH: Well, it's taken a lot of the fun out of it. [Laughter] But actually, in a way it's maybe added to my fun, because in the last fifteen years or so, my thing has been to find errors in the crystallographic literature. People now just push the button and don't think about what they're doing. It's pretty easy to do something wrong.

COHEN: And what do you do then? Do you write a letter to the journal or to the person?

MARSH: Right. I publish a little paper. I've made a collection of a hundred or so of these errors.

COHEN: So you're a bloodhound.

MARSH: So I'm a bloodhound, I guess. [Laughter] Yes.

COHEN: Did you have any other chores to do here?

MARSH: I've been on a few of the institute committees.

COHEN: You didn't grow crystals, did you?

MARSH: Yes, some, but not in a professional way. I took stuff and dissolved it in water and let it evaporate to see what happened, but I didn't make a chip or anything like that.

COHEN: Did you do any professional work outside of the institute?

MARSH: No, only committee work with the crystallographic community, that's it.

COHEN: Well, that sounds good.

MARSH: It's not very exciting, but it's been a whole lot of fun.

COHEN: Would you say it's been satisfying?

MARSH: I'd say it's been very satisfying and a lot of fun.

COHEN: I know you're a tennis player.

MARSH: I'm a tennis player of sorts, and a golf player of sorts. I do think back to my undergraduate days, to Officer Newton. You've heard of Officer Newton?

COHEN: No. Who's Officer Newton?

MARSH: "Fig" Newton. He was the campus police department.

COHEN: In your undergraduate days?

MARSH: Yes. He was about the best-hearted soul. Whenever he walked under or close to any building on campus, you knew he was going to get a bucket of water on his head, and he knew it. He just took this bucket of water on his head, day after day it seemed like, with a smile.

COHEN: And he'd just go on?

MARSH: Yes.

COHEN: He sounds like an idiot to me. [Laughter]

MARSH: No, no. He was just a good-hearted soul.

COHEN: Of course, those were quieter, smaller days. In thinking of your undergraduate career, you remember Officer Newton better than some of your professors.

MARSH: Holy cow! That's a mean one. [Laughter] Well, I had a lot of fun here. I didn't take my classes all that seriously—that certainly is true.

COHEN: Do you feel sorry about that?

MARSH: Not in the long run. I felt guilty later on, in my later formative years. I well remember standing out on the basketball court shooting baskets as my professor would come walking down the Olive Walk, going to the class I should be at. And he would look at me and he would smile and I would smile. He would keep walking and I would keep shooting baskets.

COHEN: That's interesting. Of course, I know this is not completely so, because you wouldn't be here if that were the case.

MARSH: No, no. I stayed up until three o'clock in the morning a lot of times, writing papers.

Begin Tape 1, Side 2

MARSH: In the late thirties or early forties, the student houses were playing, among themselves, eleven-man tackle football. You've probably heard about this.

COHEN: No.

MARSH: Students from the four student houses—Blacker, Dabney, Ricketts, and Fleming—each played on an eleven-man tackle football team, and the houses would play one another.

COHEN: Intramural sports.

MARSH: Yes.

COHEN: You enjoyed that?

MARSH: Yes. Think of the percentage of the student body that was playing tackle football then—there were 160 in my freshman class, so about 550 or 600 students in all, and each of the four houses probably had twenty guys playing intramural tackle football, plus there was the varsity team—and now you can't field one team for the whole school.

COHEN: Well, the emphasis has changed overall.

MARSH: That's the point. Certainly students today are much more serious about their studies.

COHEN: I had the impression that your professors at that time were as demanding and the standards were as high.

MARSH: Yes, they could have been. The standards were certainly high. No, we worked hard. I don't mean to suggest otherwise.

COHEN: Yes, you did work hard.

MARSH: But we had a lot of fun.

COHEN: Is there anything in your career or people you have known that you'd like to mention as part of this record? People who have been quite significant to you?

MARSH: Well, certainly Jimmy McCullough, my graduate advisor at UCLA. And Verner Schomaker.

COHEN: You keep coming back to Verner.

MARSH: Well, that's because he has been here in the last ten years, off and on, and I have worked so closely with him. I've come to understand how much he really knew about everything.

COHEN: He knew a lot?

MARSH: He was a bright fellow. Gee, I'm sure I can think of lots of other people, but I have not thought about it yet.

COHEN: Nothing comes up that was that significant? How do you feel about the way Caltech has grown? I mean, the new departments and buildings and things like that.

MARSH: I think we all bemoan the passing of simpler times and yet all realize that it's absolutely a necessity.

COHEN: Now, you've said actually very little about the three years you spent at UCLA. That would have been quite a different experience than here.

MARSH: Yes, I guess I did not feel as attached to the place as I did to Caltech. But I think when you're an undergraduate student, you just feel different. I was there as a graduate student, and I

knew I was going to leave. I knew what my job as a student there was, which was to do what I was told to do.

COHEN: But it was not unpleasant?

MARSH: Oh no, not at all unpleasant. I enjoyed it and learned a lot, but it isn't the same as being an undergraduate student. You don't have the same student-body involvement.

COHEN: Well, I guess that's it.

MARSH: OK. Thank you.

COHEN: Thank you!

[Tape ends]