

Wisconsin Veterans Museum
Research Center

Transcript of an
Oral History Interview with
Charles F. Curtiss
Theoretical Chemist, National Research Laboratory
World War II
2004

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Curtiss, Charles F., (1921-2007), Oral History Interview, 2004

User copy, 1 sound cassette (ca. 45min.), analog, 1 7/8 ips, mono.

Master copy, 1 sound cassette (ca. 45min.), analog, 1 7/8 ips, mono.

ABSTRACT

Charles Curtiss, a Chicago (Illinois) native, discusses his civilian service for the Geophysical laboratory in World War II. Curtiss talks about his work as a project associate for the Carnegie-Mellon Institute at the National Research Laboratory in Washington D.C. after graduating from college in 1942. He describes his theoretical chemistry work there as finding out what happens to gas and heat in a gun barrel when the trigger is pulled and the bullet leaves the muzzle.

Curtiss discusses work on recoilless rifles and smooth and rifle-bore cannon. He talks about acquiring a doctorate degree in only two and one-half years after achieving his bachelors at the University of Wisconsin. Curtiss discusses his research and teaching chemical theory there and collaborating on a textbook, *Molecular Theory of Gases and Liquids* (1964). Curtiss discusses doing research in tube missiles for George Washington University in Point Mugu (California) after the war. He concludes with talking about his early married life, children, and work with Joseph O. Hirshfelder.

Biographical Sketch

Curtiss (1921-2007) born in Chicago (Illinois), served in civilian theoretical chemistry research for the Geophysical laboratory in World War II. He retired from theoretical chemistry teaching and research from the University of Wisconsin in 1989.

Interviewed by John K. Driscoll, 2004.

Transcribed by John K. Driscoll, 2004.

Transcript edited by Daniel Birk & John J. McNally, 2006

Interview Transcript

John: Well, this is an oral history interview. I am John Driscoll and I am with the Wisconsin Veterans Museum Archives. And this is an oral history interview with Charles F. Curtiss, who was a project associate with the Carnegie-Mellon Institute, with the Geophysical Laboratory, working for the National Defense Research Council. Sitting in with us for the interview is Lois Curtiss, Charles's wife.

Charles: Working under a grant from the National Defense Research Council.

John: Okay, good. And today is May 14, and we are at the Curtiss home on the west side of Madison, and good afternoon, and thanks a lot for agreeing to the interview, Charles. Ah, can we start off at the beginning? Where and when were you born?

Charles: Chicago, Illinois, April 4, 1921.

John: Okay. Something about your family? Brothers? Sisters?

Charles: No. I am an only child.

John: All right.

Charles: Matter of fact, my parents separated when I was about five years old.

John: I see. One of the documents you've got here is pretty much a family history, a genealogy?

Charles: Not so much a family history as my history.

John: Your history. Okay, that's great. And Charles has said we can have a copy of this to add to the archives, which is great.

Charles: Is this a spare copy, Lois?

Lois: Yea.

John: Growing up in Chicago?

Charles: Well, until I was about five, maybe six or seven.

Lois: To about eight years old.

Charles: Eight years old? Was that it?

- John: Okay. And then where did you go?
- Charles: I went to live with my grandparents in Neenah.
- John: Okay. How about early schooling?
- Charles: Early schooling was in Chicago. I started about the sixth grade in Neenah, maybe seventh.
- John: Okay. What were your interests then, other than recess and ice cream and that?
- Charles: Well, I guess I was a little more interested in school than most of the people, I guess. I don't know if I studied harder but I at least absorbed more.
- John: Okay. How about high school?
- Charles: Went to high school in Neenah, too. I don't remember the very first years, particularly. I started in high school in Neenah, finished high school in Neenah.
- John: Okay. What year did you graduate?
- Charles: 1938.
- Lois: That was when you liked chemistry. Remember the chemistry teacher?
- Charles: Oh, yea. In fact, Carol Zabel spent a lot of--
- John: I'll stop every now and then. Can you tell me how to spell that?
- Charles: Z-a-b-e-l.
- John: Okay. And you were interested in chemistry?
- Charles: Yea. We had a very, I think, unusual chemistry teacher, chemistry and physics, in fact. I guess a lot of science, well, not biological sciences, physical sciences. He let us have the run of the whole place after school was out.
- John: That's very unusual for back then.
- Charles: Oh, yea. We went into the stock room. Took what we wanted and we didn't break very much. We broke a few things.
- John: I was a chemistry, an organic chemistry major, and I never touched a test tube or a Petri dish after I graduated. And I did not, I don't know why I took it. I didn't care for it.

- Charles: Well, I didn't do any wet chemistry. My thoughts, more or less immediately, turned to theory, even in high school.
- John: Oh, that's unusual.
- Charles: I was involved in the theory.
- John: And you came to Madison, here?
- Charles: Yes, after high school, I came directly down here. The chemistry course work. There were a number of courses I had to take. I wasn't particularly interested in them.
- John: How about outstanding professors, and that? People who might have had an effect on you in college?
- Charles: Yes. Well, I got quite close with Joe Hirschfelder. In fact, after finishing, after barely finishing, I went out to Washington and worked with him. In fact, he was really the leader of the group. The one chemistry professor in high school. Olson. I've forgotten his first name. Let us roam the laboratories, at least, after we took chemistry, the junior year. Physics, the senior year. So after the classes, we did what we wanted to in the chemistry lab.
- John: That's great. Okay.
- Charles: After physics, we did what we wanted to in the physics lab.
- John: Okay. When you got out of school, let's see, when did you graduate? You just had your bachelor's. When did you graduate? You said 1941?
- Charles: 1938, graduated from high school, and started college.
- Lois: You graduated from college in 1942.
- John: '42?
- Charles: Yea, I graduated in June of '42 but I really left about January, '42.
- Lois: You left right away for Washington, with Joe.
- Charles: Yea. Well, actually, right away. It was a little premature.
- John: Yea, I see. Now, you were a young man, hale and hearty. Did you get a deferment or something, because of this?

Charles: Oh, yea.

John: How did that work? I don't understand that.

Charles: Well, Joe was particularly good.

John: Joe Hirschfelder?

Charles: Yea. Every six months I got a notice of induction, and a few weeks later it was cancelled.

John: Okay, that's great.

Charles: It happened about every six months. And several times I came pretty close to getting inducted but I never did.

John: I've never heard a story like this. This is amazing. This will be great. What were you working on there, Charles? If you can talk about it. But that was years ago.

Charles: I think I can talk about it, after fifty years. I couldn't talk about it before.

John: Yea, I'll bet.

Charles: It was all classified. I am trying to remember what it was.

Lois: Well, remember that ammunition, I mean, not ammunition, gun powder.

Charles: Well, it wasn't so much the gun powder as it was what happens in the barrel of the gun between the time you pull the trigger and when the projectile leaves the muzzle. And that is a long story. The temperature rises, initially, to about three thousand or more, centigrade, and goes down to about sixteen hundred when it leaves the muzzle. And our job was, well, what we did was try to improve the ammunition. We could do it, but it wasn't very practical. The reason the ammunition began to fail was that the bullet would run freely for an inch or two, and then catch the rifling, and slow down, but it would catch the rifling very soon when the barrel was new. And when the barrel slowly wore, it would go out a little farther. And if we could change the ammunition, there would be no problem. But this was not very practical.

John: I see. This is amazing.

Charles: So, we tried to for a bit but we didn't succeed too well. And later on, I slowly drifted over to another group that were working on rockets.

John: Oh, wow.

Charles: Small rockets. They were these hand carried things that they put over their shoulder.

John: Yea, rocket launchers.

Charles: And we worked on those, not so much what happened after it left the barrel but what happened between the time you pulled the trigger, and you had to be darned sure the rocket was fully expended before it came out of the muzzle or the man would get a blast in his face. Not very comfortable. So, that was quite a challenge. And then we worked on recoilless rifles. Well, in fact, sometime somebody captured one from the Germans and brought it back to this country, and said, "What's this?" They found the rocket, all right. They knew what it was. But here was this tube over the shoulder. They would fire it. The thing came out and traveled. It was not a true rocket. Stuff came out the back end of the barrel, and the projectile went forward, and then it just kept going. But it was a recoilless rifle, and we were the first to identify this, and what they had done.

John: That is amazing.

Charles: They had developed a recoilless rifle which blasted the gas out the tail end, and the projectile went out the front end.

John: That is amazing. (laughs)

Charles: We not only identified it as a recoilless rifle, we designed our own. I don't know if they got into the war, or not. They came pretty close.

John: We had them after the war. A recoilless rifle.

Charles: You did?

John: Yea. It had a long tube and like a grate on the end. It wasn't solid in the rear. And you would open the grate and put the thing in, and close the grate. And when you fired it, you didn't dare stand behind it, because you'd get that blast.

Charles: Oh, yea. We designed the first ones that were used in this country.

John: I hauled one of them all around the Mediterranean and here I am meeting the man who designed it. That's amazing. What other projects?

Charles: Well, that was really the most startling one. The basic one was on the rifles, or not rifles, entirely. Rifles meaning there was rifling in them. We worked on both the cannon, which is smooth bore, and the rifling, and our big project was in

conserving them, keeping them from wearing. Because the real problem was if you put one of these rapid firing rifles in an airplane, and you get into a fight and fire the rifle, but the barrel heats up tremendously and eventually the barrel just sags. And after one battle, the main part, I don't mean the main part, but the rifling part of the barrel it just simply flops, and they had to replace it after each trip.

John: That is amazing.

Charles: And of course, what can you do about this? Well, the only thing to do was to change some of the metal, but that didn't do a heck of a lot of good.

John: So, what did you do?

Charles: That is the main thing we were working on.

John: Okay. While you were living in Washington, where did you live? Government facilities? Barracks?

Charles: No. I was a civilian, which means that I simply stayed in private homes, in a room, and there were several. I guess three or four. I don't know just how many. But I just had a room. I slept there, ate meals in restaurants. Not particularly conservative. In fact, I ended up the war with not much more than I started with.

John: Did you. Okay.

Charles: The salaries were pretty well fixed. They were, well, there were limits to what you could get, and I was not a Ph.D. at that time. I started my graduate work right after the war.

John: That must have been a busy place to live. Washington, D. C., during the war.

Charles: It wasn't so awfully busy.

John: I'd think, people coming and going.

Charles: Well, there were people coming and going, but they mostly stayed in hotels.

John: This is just amazing. I find it. What did Joe Hirschfelder go on and do?

Charles: He did the same thing. Well, we started off, I went there with him, and we were working together, for two years or so. Then he rather vanished.

Lois: He went to the Manhattan Project.

- Charles: He joined the Manhattan Project.
- John: Okay. That would put him out of sight, yea.
- Charles: He ended up, well, he did end up at Los Alamos, but I was left behind at the Geophysics Laboratory. But initially, there were three of us. Myself, Joe and Dick Kirschner. And Joe just sort of vanished. Dick Kirschner ended up working on rockets at George Washington University, and I was the sole survivor. With a bachelor's degree, you didn't know quite what to do.
- John: That is amazing. You are talking about the gas and the heat of the barrel. I carried an M-1, a Garand rifle, that picks up just a little bit of that gas and uses it to cock the rifle, you know. There is a little hole in the bottom of the barrel, and just as the bullet is ready to come out, there is a little blast of gas goes down the hole and hits a piston, and that works the, that reloads it. That is an amazing drop in temperature, though, in an instant.
- Charles: Oh, yea. It's over three thousand and it's down to sixteen hundred when it leaves.
- John: What would you describe yourself as, then? A chemist? A physicist? A theoretical chemist?
- Charles: Theoretical chemist is the best description, I think.
- John: Okay, and you said, you were more into the theory...
- Charles: Oh, I was entirely into the theory. I did a little laboratory work as an undergraduate, but none after that.
- John: Okay. Where was Carnegie-Mellon in the District?
- Charles: Carnegie-Mellon was a name for an organization, but the Geophysical Laboratory was a particular laboratory which, in normal times, was used. They were all geophysicists to start with, but with the beginning of the war they got, I don't know if the asked for it or what. Anyhow, they had a grant from the National Defense Research Council and Joe and I went there, and I guess Joe knew people at the Geophysical Laboratory before the war. We ended up there, working on this. And we were at the Geophysical Laboratory, and as I say, Joe sort of vanished into the Manhattan Project. Where was that? It was on Upton Street, which is a short, one-block street coming off Connecticut Avenue. Well, the Bureau of Standards was on the other side of Connecticut Avenue. It's not there any more.
- John: I came out of the service in 1958 and worked with fellows from the Geophysical Lab, but mostly, by then, they were into electronics, radiation and antennas.

- Charles: Where was this?
- John: I was in Alexandria, Virginia, when I worked with them, but they had come from the Geophysical Lab.
- Charles: Oh, they had come from the Geophysical Lab?
- John: Yea. Ken, Kenneth Kelleher, Art Varella, but they might have been a generation behind you.
- Charles: They were.
- John: I'm sure they were, but it is unusual for...
- Charles: I left there in, well, I was there for two years, or so, and I somehow, I guess I knew people at George Washington University, working on the rockets. And after Joe left, I slowly got involved in the rockets, and for a long time, I sort of migrated. Eventually, I joined the rocket group, but it was sort of my own pressure. And you had to be a little careful in those days, not getting drafted.
- John: Yes. Wow, that is amazing. Not being in the Army, you didn't get benefits, did you? The G. I. Bill?
- Charles: That's right. I didn't get the G. I. Bill.
- John: That's unfair.
- Charles: Hey, I thought it was unfair, but there wasn't anything I could do about it. I was teaching students, I came back here and got my Ph. D. rapidly, in about two years, and started teaching.
- John: Here?
- Charles: Here. And I had students in my class who were there on the G. I. Bill that I never could use.
- John: That's not fair. I had a fellow that worked for me who spent the whole war as a merchant marine sailor, and he was torpedoed once, and he never got. Now he did get paid an awful lot better than sailors got paid, but he got no benefits because he wasn't in the service. That is an amazing story. Well, when you came back here, what was your field of endeavor? Chemistry, and that?
- Charles: Theoretical chemistry.

- John: Here at Madison.
- Charles: Yea. Joe Hirschfelder and I were really the first two theoretical chemists here, and this was about the second university to have theoretical chemistry. There was Henry Eyring at Princeton.
- John: Princeton and here.
- Charles: He was at Princeton. I don't know when, but toward the end of the war he moved out, he was a Mormon, a staunch Mormon. In fact, he was a Mormon deacon and he moved out to Salt Lake City, and so he was out there, after that. He was Joe's major professor.
- John: Rest of your career was here, teaching?
- Charles: Yea.
- John: And doing research?
- Charles: Yea.
- John: What area, what field?
- Charles: Theoretical chemistry.
- John: Oh, of course.
- Charles: I started to say that Joe and I were the first two theoretical chemists here, and I think this is only the second university to have theoretical chemists, so we were really pioneers in the field. Now there are quite a few.
- Lois: You started to write the book here.
- Charles: Oh, yea, we started to write the book.
- John: What book?
- Lois: *Molecular Theory of Gases and Liquids*.
- John: Oh, [reading] *Molecular Theory of Gases and Liquids*, okay.
- Charles: By Hirschfelder, Curtiss and Bird.
- John: That last one was?

Charles: Bird. Bob Bird.

John: Okay. That is amazing.

Charles: We started the book about, well, I think we started the book at the end, maybe it was after the end of the war. But not much.

Lois: You didn't come back here until after the war.

Charles: No, we didn't start writing the book until after the war, either. But it was immediately after. That book was published in 1954. In fact, the book is still available from the publisher.

Lois: The publisher charges \$500.

Charles: Yea, \$500.

John: Wow!

Charles: It originally sold for \$20.

John: Well, that was a lot of money for a book, back then.

Charles: Oh, it was expensive, yea. It surprised us. It is five hundred pages.

John: That is amazing.

Charles: Yea, and it sold for \$20. The price slowly rose and now it is \$500, from the publisher.

John: We've got tons of time here. Then, when did you retire?

Charles: When did I retire?

Lois: 1989.

Charles: 1989, that is right.

John: I am used to talking to guys who were, you know, in the Army, and they drove a truck, and they got the G. I. Bill, and they came back and got married, and got a job, and your story is so unique. And this is just wrong that you did your contribution and didn't get any benefits.

Charles: I think it was quite a contribution but, boy, we didn't get anything. Incidentally, I appreciate your comment.

Lois: It's all pretty well, his role in the war, is written up. We did this for our kids.

John: That's great.

Lois: I did mine and he did his. He wrote more about the gunpowder. It's all in here now. You went to Minnesota for six months, nine months. After the war, you went to Minnesota for nine months.

Charles: That is when I got married. Almost immediately after the war.

John: Was it to go to school, or to get married, that you went to Minnesota? Or was it both?

Charles: Both.

Lois: There was one professor. Where was Joe at that time?

Charles: Oh, Joe was not back here then. He was still at Los Alamos.

Lois: And that is why, when Joe offered him a job to come here...

Charles: Well, Joe was at Los Alamos, and I thought he was going to stay there. There was no chance of working with him. So, after the war, I went to work with Bryce Crawford in Minneapolis. And it was right after Christmas, and we got to the summer, and he said, "Well, you will need a new appointment. I'll need some more letters of recommendation." I said, "Fine. I'll get Joe to write one." I wrote to Joe, and he said, yea, he'd write one, and he'd also give me a job.

John: That's great.

Charles: I said, "Great. I'll take the job." So I left Bryce Crawford and came here. Got my degree about two years after that. And I think I started, I don't know when it was. When did I start here? I started here in '46, I guess. Summer of '46, and graduated the summer of '48.

John: Okay.

Charles: Which is just about a record.

John: Yea.

Lois: It was two and three-quarter years.

John: Yea, bachelor to Ph. D., that's moving.

Charles: And it was just about the limit. You had to, technically, you had to have three academic years but I finished in two because I took summer school and filled it up somehow. Got three academic years in. Well, it was two years and a half.

John: That is an amazing story because it took so much to win the war, and there are so many stories that you just never hear. And this is one I...

Charles: It was strange because we were civilians. We did war research. We were working quite close to the military. I was in and out of the Pentagon a lot in those days. And at the end of the war, we didn't get any benefits whatsoever.

Lois: What did you do when you went out to California?

[End of Side A of Tape 1.]

John: Okay, we are talking about time in California, at Point Mugu. When was that?

Charles: That was right after the war.

John: What were you doing out there?

Charles: Well, at the end of the war we were developing, well, they had developed missiles, self-guided. They were self-guided once they got airborne, and the idea was, how do you get them airborne? So they were, actually, in most cases, launched from an airplane.

John: Okay.

Charles: But we decided we could launch it from the ground and we designed a long missile, a long tube, about four hundred feet long, I think, with tubes at spaced intervals. And a charge in each one. And we set off the first charge, next charge, and by the time it got out, the missile was traveling. And we designed this, so it was all designed. They were about to try it out in California and that was at the end of the war.

Lois: That is written in here.

John: Okay. That's great.

Charles: So we went out anyhow and watched them. Got them started. I don't know if anybody did anything with it. But we got them going.

John: Well, right after the war, they were also bringing Von Braun and his guys to Redstone and they were the solid fuel guys, weren't they? For rockets.

Charles: Solid fuel.

John: Solid. Okay. Yea, okay. I knew some fellows who worked with them and the story behind Redstone...

Charles: I knew Redstone.

John: It was a God-forsaken place nobody wanted to go to and that is where they figured they could hide Von Braun and his German scientists until things cooled down, I guess. The four-hundred foot gun, I guess...

Charles: Well, in a way, we were in competition with Von Braun.

John: Okay. Yea. At the same time, sure.

Charles: I never worked with him. I don't know if I ever met him. But I knew of him, and he was working at Redstone, and we were out at Mugu.

John: That's great. That's tremendous. Now, by this time, you were a government, well, you were always a government employee. You never were in the military.

Charles: I never was in the military and never was a government employee.

John: Oh, okay. Who were you working for out there?

Charles: At Point Mugu?

John: Yea.

Charles: I was still working for the Geophysical...

Lois: George Washington University.

John: Okay. All right.

Charles: I worked as a theoretical chemist at the Geophysical Laboratory and then I somehow slowly migrated over to George Washington University which was also in Washington. And joined this group who were working on the rockets. These were hand-held and what happened, anyhow, it was from there that I ended up going out to Point Mugu. Working for the George Washington University, really.

John: What an amazing story. I had a good friend who passed away, the author Stephen Ambrose.

Lois: Oh, yea. Read his books.

Charles: The author.

John: And I was sitting in a meeting he had with a bunch of World War II veterans, but you would fit into this also. Because a lot of them were saying they didn't really do a lot. And he stopped them and said, "You know, you fellows were giants. You went out and saved this world." And that is what they did. And you were very definitely a part of that saving this world. But I have just never heard this story. That is tremendous. From this point of view. That's amazing. Then, afterwards, you had a family and...

Charles: Well, after the war, I came back here. We got married very shortly after that. And I finished my graduate work in record time, about two years. Two and a half. I started right after Christmas and spent six months to eight months in Minneapolis, and then came here. And came here in the summer, and two years later I had my degree.

John: That is rocket speed!

Lois: All those graduate students. There were no days off, no vacations. Nowadays, all those graduate students, they go all over.

Charles: Boy, I didn't have any time off.

Lois: We didn't have any money.

John: Yea.

Charles: I got my degree in the summer and in the fall, I was teaching. And the first few years I was teaching, in many cases I had students who I had been students with.

Lois: Yea, I worked at the *Daily Cardinal* in those days.

John: Oh, did you?

Lois: I was a Linotype operator.

Charles: She was the one who put me through school. We were living in the old Campus Publishing Company, on Monroe, above that. But the *Cardinal* was published in the basement, and on the first floor. And we were living on the third floor. Well she got pregnant and we had a baby boy. And when she recovered enough, went downstairs to set Linotype, came back upstairs and fed the baby, and went downstairs.

John: That is wonderful. How many children did you have in all?

Charles: Three.

John: All boys?

Lois: One followed the scientific route.

Charles: Oh, Larry is pretty much doing what I am doing.

John: Where is he?

Charles: He is at Argonne. He is quite far up in Argonne.

John: In physics?

Charles: Chemistry. Larry is an engineer.

Lois: No, the second one is the engineer. Glen. He was in the Air Force for twenty years.

John: Oh.

Lois: Glen was in the Air Force for twenty years, and then he retired.

Charles: That's right. He was in the Air Force for twenty years.

John: What a remarkable story. Normally, as I say, I talk to fellows who were drafted and drove a truck or flew an airplane, or that. And this is a complete phase of the war effort I have never heard and I doubt if we have anything like this in the archives. This is wonderful.

Lois: Course, that Joe Hirschfelder, I mean, he was another one. He was way up, I mean, well, he is dead now, but he was very well known. He got the National Science Award.

Charles: He got the National Science Foundation, what is it?

Lois: National Medal of Honor, from the president.

John: Oh, that's...wow.

Lois: He was well known here, in Madison. Well, all over the country. All over the world.

Charles: Yea, he was well known, and got a lot of publicity, and so forth. I did the work.

Lois: Oh, now, come on.

John: Well, this is an amazing story. This is precious. It's great.

Lois: In that building, they have all kinds of different things, archives?

John: Yea, they have all kinds of things. What I am working on is just the oral history interview archives, but they have got the records on every Civil War soldier from Wisconsin. Is there anything you want to add, before we end?

Charles: Can't think of anything. There might be something.

John: Oh, probably, if you are like me, you'll think of ten things tomorrow. Well, this is great.

[End of Interview.]