

**MC.0356**

**Interviews of the Margaret MacVicar Memorial AMITA Oral History Project**

**Caroline Herzenberg** – Class of 1953

(interviewed by Tina Garrett)

May 9, 1992

## Oral History Project Interview

Dr. Caroline Herzenberg  
May 9, 1992  
Chicago, Illinois

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*This is an interview with Caroline Herzenberg on Saturday May 9, 1992 in her home.*

**To start out can we discuss some biographical information? Where you were born, when you were born...**

I was born in East Orange, New Jersey on March 25, 1932. And when I was about three or four years old, my family moved to Oklahoma. It was the depression. My mother and father were out of work and so they went out to Oklahoma to live with his sister. Well, not to live with her, but a family member that could provide some support and help people get oriented. So, I grew up mostly in Oklahoma. I don't remember hardly anything from New Jersey.

**You started school in Oklahoma?**

That's right, public school.

**What was your parent's work?**

Well, a good deal of the time, while I was a kid, they were unemployed. My mother apparently had worked in office work before I was born. My father was in the import-export business. And she was some sort of, I guess what would now be considered a fast track young person in New York. Came down from a farm in Vermont and was enjoying the big city, but when the depression hit, they were both out of work. And my father never really worked again after that. He'd been a veteran of, you're not going to believe this, but he was in the Spanish-American War and also World War I. And so he had a veterans pension. And when I got to be about twelve or so, my mother went back to work in office work with Black Siralls and Bryson which was a firm in the petroleum support industry. But neither one of them was in science. Neither one of them had any interest or knowledge in science.

**That is interesting then, that you not only had interest but you've gone this far in science.**

Yes.

**Did you have any brothers or sisters or other relatives that were interested in science?**

No, only child. There were some scientists, scientific people early on, actually Lord Kelvin Wm. Thomson, the famous 19th century physicist. Kelvin was some sort of distant, very very distant relative, from way back when on my father's side. And there was a very well known physician on my father's side, also, lived in Edinburgh, Sir Henry Littlejohn. And he, it turns out, was one of the people on which Sherlock Holmes was modeled.

**That's fascinating.**

Yeah, he was in forensic medicine. But in my immediate family, why there was nobody in science and engineering at all.

**Was school really important, was it stressed in your family?**

Yeah, yes it was. That was very helpful.

**Can you tell me about some of your school experiences in school in Oklahoma?**

It was a public school and I was always a very good student. But, I had very little social life. You know, I was odd! I was interested in science. I was interested...

**...girls interested in science!**

Right, it was pretty awful in those days. But I was extremely fortunate. I was one of the winners of the Science Talent Search when I was a senior in high school. And that, together with a good deal of work, got me a scholarship to MIT. And actually, my parents didn't want me to go to MIT.

**What were their reasons? I have heard that from a lot of female friends of mine at MIT -- that their parents and teachers discouraged them from going to MIT.**

My mother thought, well, she wanted me to go to Barnard or Radcliffe or one of the well known women's colleges. But I was such an anti-social creature that, you know...

**...MIT sounded just great!**

Yeah! (Laughs) I wanted the technical work and I figured I just couldn't survive the social life, so, finally, I prevailed. And I went there, and it was a wonderful experience.

**Did you do any extra-curricular activities in high school?**

Not much. I was involved with the science club. But not very heavily, and it wasn't very much of a science club. Not a whole lot. Unfortunately, I am not musically inclined. Music ran back in the family a long time ago. I had a grandaunt, I guess it was, who was a concert pianist, but absolutely zero of it trickled down to me. So, and I was sort of interested in journalism, and I worked on the school paper a little bit. That was in junior high school. But, again, it didn't amount to an interest that really increased.

**Ummm, so what were your summers like when you were still living at home? Did you work?**

Well, when I was living at home I...my father was into hunting and fishing. So, I spent a lot of time out of doors. Oh, weekends and summers, even if it wasn't the season, we spent a lot of time out of doors. And when I got a little bit older, I got sent to a campfire girls summer camp. And then later on my aunt, who was somewhat better off financially than we were, sent me to a private camp in Colorado which was kind of a fun time too. So, I got away from the family and got some new experiences in the summer.

**So, do you still fish?**

No, I don't. I didn't actually do all that much fishing. I was sort of a buddy that went along to help carry things and that sort of stuff.

**I think that's how my little brother views me -- someone to pull up the anchor.**

Yeah, that was me.

**So, after high school and summer, you get to MIT. What was that like coming from Oklahoma? Did you live in a small town?**

I was in Oklahoma City -- it was pretty large. I don't know, a hundred thousand or so.

**But there was, I am sure, a difference.**

Oh yeah! I nearly got run down in the traffic!

**Me too, Minnesota to Boston -- my friends had to pull me off the curb more than a few times.**

Yeah, it was a big change, but I liked it a lot, and I enjoyed the whole time I was at MIT. And I got along better with people. I joined the Outing Club and, you know, socialized with the other students. It was great!

**Where were you living then?**

At first I lived at what was then the women's dormitory on 120 Bay State Road. That was across the river in Boston.

**How many women lived there?**

I don't know, it was just a small house. I think it was two or three, maybe three stories. And, how ever many they could fit into the bedrooms kind of thing. That was required the first year I was there. And after that, I moved out and lived in rooming houses the rest of the time I was at MIT.

**So, do you know about how many women there were in your class?**

I really don't. Very few, very few. I think there was only one other woman in physics. She was deciding between physics and geology. In my own class.

**In the entire department or in your own class?**

In my class, my year. The class I went through on. And one of the other women I got acquainted with it turned out was Leo's cousin. Inka Allen. She was just two years ahead of me. She was majoring in Chemistry. So, I got acquainted with his cousins before I ever met him. That was interesting.

**How and when did you choose a major? Had physics been something that you had wanted to do or had you a more broad interest in science?**

When I went to MIT, I was already almost settled in on physics. It was physics 1, math 2. When I...math as a minor. But I didn't do too well in Math. So, it gradually went into a hundred percent physics major.

**Where did your interest in physics come from? Was it your high school experience?**

Well, I'd been interested in science throughout my life and I think it was more a matter of an exclusion of the other areas...and then, also physics seemed much more fundamental. You know, if you really want to examine the nature of the world...

**...it's a good field to do it in.**

Yeah. The most fundamental is Mathematics, of course, but it doesn't interest the real world out there quite so well as physics.

**Yeah, they say they have application, but I'm not so sure! Is there anything else about MIT that has impacted your life? Are there any people or professors that were particularly influential?**

There aren't any who I keep in touch with. But I think my favorite professor was Francis Friedman who I believe is passed on some years ago. He was my young enthusiastic professor who was always...he was just full of energy and interest in physics and looked at fundamental questions. And he'd lead us students into traps that we'd have to figure our way out of. He was a good teacher. Prof. Weiskopf was there -- I don't think I ever had a class directly from him. And I worked with Prof. Ingard -- it was a very good faculty. I was very fortunate that way.

**What did you do in your summers during college?**

Let's see, I worked, I guess I worked a couple of summers and went to Europe one summer. You know, the usual business of student with a backpack and...

**...a Eurorail pass?**

...hitchhiking -- I don't think they had Eurorail passes back then. Finding youth hostels to stay in -- that kind of stuff. And that was interesting, the first time I got out of the country. I guess I'd hitchhiked into Canada and how I ever got into Mexico? Just across the border or something, but you know, that was the big trip out of the United States. But other than that, I worked on the cyclotron and oh, I did some calculations. I punched a calculator. That was before we had the kind of computers we have today.

**It was much more of a laborious task.**

Oh, it sure was. Yeah, they had some work going on tracking meteors and it took a lot of calculations so they got gangs of students to work on it. And I worked in a darkroom for a while developing emulsions for particle tracks. And carrying lead bricks around the laboratory. You know, the usual things students get to do.

**We still get to do things like that in the UROP program.**

What's that?

**The Undergraduate Research Opportunity Program.**

I see. Yeah, well I don't think I got any academic credit but it helped pay the way over the summers.

**Was that on a volunteer, credit or pay basis?**

No, it wasn't volunteer. They payed some nominal rate to go do these things. Helped you survive over the summer.

**So, then MIT led to the University of Chicago...**

...One thing I guess I was thinking just as you switched over was when I was at MIT they didn't have any athletics for girls at all. They wouldn't let us into the gymnasium.

**Really? That I didn't know. I recently interviewed a woman who played women's athletics before Title IX and coached Division I after Title IX. And so she had a lot of interesting perspective on just that issue.**

Yeah, at the time I didn't regret it, because I thought, oh some much more time to study, but, but... There may have some possibility of getting in

there but it wasn't a...the guys had physical ed. and the girls didn't, basically is what it amounted to. So, you know....

**Was it required for the guys?**

Yeah, I think it was at the time.

**Do you remember if you had to take a swim test to graduate? Because that is one thing that I have been told has been around for a long time and I was wondering if that meant for men and women or only men?**

I don't remember. I don't think so. I learned how to swim in junior high school or something. I don't recall having to. They did have sailing back then, and it seems reasonable that they would have asked you to take a swim test before that, but I was never a member of the team or anything. I just went along as ballast occasionally.

**That's the best way to go.**

Yeah. But when I went along to The University of Chicago for graduate school that was really interesting too. Enrico Fermi was still here and they had a lot of bright lights of physics at U of C when I came here for graduate school.

**What other places were you interested in for graduate school? Was U of C your first choice?**

Let's see, yeah, I applied to U of C and I applied to, let's see, was it...I've forgotten. Princeton and Cal Tech both, I think...I've forgotten a little bit but I remember I applied to both of them and when I wanted to go into undergraduate school, I forgotten which way it went, but let's see, it was Princeton because girls weren't admitted to undergraduate and then when I went to graduate school why Cal Tech wouldn't admit me because women weren't admitted for graduate school. Maybe it was the other way around -- I've lost track. But I applied to several places.

**How did that feel to be categorically denied entrance into graduate school because you are a woman? Did you think about it much?**

Well my, you know, I 'd grown up in a rather repressive society already so it was just one more of those things. We weren't smart enough in those



days to do anything about it. So, you just tried to find an avenue in which you could move and do things rather than, you know, fight it. And it was a great relief when feminism came along and started making some changes. But anyhow, U of C admitted me and so I came here.

And I had a tougher time at The University of Chicago than I did at MIT and in part it was probably personal problems. My mother died when I was at MIT and my father died when I was at University of Chicago. But, partly it was that at MIT the curriculum was very structured and they gave you this homework -- you were expected to do this homework, and expected to do the problems and work through things rather systematically. And in graduate school, well, it was all pretty different. There are some classes but you wander in or wander out. And they had a pass/fail system.

**Was that throughout the University? I know that exists in the Medical school now.**

Gee, I don't remember. I don't recall. I don't recall any grades in Physics. It was just a matter of coming in. Some of the classes were really interesting and some weren't so. But I didn't -- the graduate structure didn't involve me the way it did in undergraduate school. But then it improved after I got into research. Samuel Allison who was one of the bright lights in those days, not quite the level of Fermi, but he's the Allison of the Compton and Allison team, and he co-authored the leading work on X-rays. Anyway, well, Leo worked with Sam Allison too, I guess that's how I first met my husband. We were both working in Allison's laboratory. And so I switched over to experimental physics at that point. I had been interested in theory, but I wasn't getting anywhere with it. And Allison said I could join his group and do a thesis -- or hopefully do a thesis in experimental work. So, I did.

**What was your thesis topic?**

I was looking at energy levels of Nitrogen-17. It was measurements with low energy nuclear physics. We had a couple of accelerators, a Kevatron and when I got into Allison's group they'd recently acquired a small Van de Graaff accelerator which had belonged to some biologists who had tried to do some very tricky work with it and hadn't succeeded and got disgusted and decided they wanted to do something else. So, it was basically a hand-me-down accelerator. And our group started into some different stuff. One of the fellows in the group developed a Lithium ion

source, so we had lithium ions. Those were the original heavy ions, very little mass today but they were the original heavy ions. Until that point, people had just been using alpha particles and protons and deuterons for the bombardment. So, we had a whole new field of heavy ion nuclear physics. We started out on, I did a bunch of survey measurements about the different types of reactions that could occur and I ended up looking at the energy levels of Nitrogen-17.

**And that was your Ph.D thesis?**

Yeah.

**Did you do a separate Ph.D and Master's thesis?**

Didn't have to do a Master's thesis at that time. You just passed an exam.

**How long did the Master's degree take?**

It was two years. But I was kind of surprised because for undergraduate I, at MIT, had had to do a thesis. So, I thought, what is this? A degree and no thesis? But the Ph.D work was much more substantive.

**What was your living situation at the time when you were working on your Ph.D?**

Well, when I first came to the University of Chicago, I lived in a dormitory, but then a bunch of us, three other women and I moved out and found an apartment. And after that, it was apartment after apartment.

**So you were pretty much on your own. Did you go home much during graduate school?**

No, my...there wasn't any home left basically. My mother...my father'd been gone throughout my childhood and he was pretty much, well he was totally hospitalized in VA hospitals by the time I was in graduate school. And my mother passed on when I was in undergraduate school.

**So where did you spend holidays or special days? Would you spend them here?**

I went to...I made one more trip to Europe, and I went down to see an aunt in Mexico, one that I'd never met, my father's brother's wife...she lived in Mexico City. My uncle...he was a civil engineer. Gee, there was one

engineer in the family, but unfortunately I never met him. So, that was what I did. And that was...one time I got back and found that my grandmother had died and I hadn't left a forwarding address. So, I got back and I had missed the funeral, no one had been able to get in touch with me.

**So, at that point, who was your support network -- with most of you immediate family gone?**

Well, mostly my roommates, I guess. And later my spouse.

**That's one of the things I found hardest about going off to college. All those people that were always there were suddenly a thousand miles away.**

Yeah, things were different.

**So, where did you go after you got your Ph.D?**

After leaving University of Chicago went out to Argonne National Laboratory. Which is where I am now. And I spent two years out there. That was really interesting. I got to do some more low energy nuclear physics. And about that time, Mossbauer, in Germany, had discovered the Mossbauer effect. But nobody had discovered him. And one of our group found the results interesting, and were they real or not. And so did the work and there was a Mossbauer effect. And he, subsequently, got the nobel prize. And I spent a couple years there and then I moved to Illinois Institute of Technology as a faculty member.

**Where is that?**

Here. Near downtown -- south side. And I was there as an assistant professor for several years. And by that time Mossbauer spectrometry was burgeoning new field. Rudolph Mossbauer got the nobel prize. Everyone started doing it. And I'm not a very competitive person, so, I moved off into an obscure corner of it. I started looking at, namely...I started looking at minerals, rocks and soils. It was a very timely thing to do because at that point they were gearing up to...

**When was that?**

Oh, I gave you those numbers in that stuff. Let's look. That was sixty-one to sixty-six. Unfortunately I didn't get tenure when I was at IIT which

was a real blow to me. Here I am this fun of a person with such interesting research!

**What was the reason they gave? Did most people get tenure?**

Well, it wasn't entirely clear to me at the time. I wasn't into thinking much about what other people were doing. But, that was a big blow. But I had this project with NASA to use Mossbauer Spectrometry to characterize lunar samples.

**How did you get involved in that? How did they choose you?**

I'd published some papers on Mossbauer spectrometry and rocks and minerals. I guess it was probably the paper. I suggested, well this is an instrumental technique, it's non-destructive and the equipment is rather light and wouldn't it be nice to send off to Mars or something. At that point the people at NASA were very concerned that they might have very small return of rocks and soil and so they were looking for non-destructive techniques that could analyze material without destroying it.

**So, did they just call you up or how did you find out? That must have been exciting.**

Well, there was a letter designating me principal investigator. It was really exciting to hold pieces of the moon in my hand. A little bitty piece of moon!

**Where did you do this research?**

At IIT Research Institute. I'd had my disagreement with IIT by that time. And I talked to a lawyer about what I should do about this. I tried to get the ACLU interested and they hadn't heard about this type of problem before. Subsequently they got interested. But my lawyer took me on, basically pro bono, against IIT. So, I was able to continue at IIT Research Institute for a while.

**And the disagreement was?**

Oh, just because they wouldn't give me tenure and I thought I deserved tenure. And so I was beating on the table and they were saying, "Never."

**Did they give you any reasons?**

Well, I don't know. It was sort of all around. If it wasn't one thing, it was another. You're not doing good enough research, so I'd do some research. Oh, you're not doing good enough teaching, it was this, it was that, it was the other thing. Whatever you're strong on now, it was the other thing.

**Were there any tenured women there?**

No. Well, there was one...no, I think there were two women on the faculty there. One was in Mechanical Engineering and one was in Chemistry. And the one in Chemistry, I think she got tenure but got very discouraged and left. But there weren't any women in Physics.

**[Break in Tape]**

I remember Vera Kistiakowsky, she's at MIT.

**Yeah, I know her. She was my first year advisor. I love listening to her talk about women at MIT. She's got a lot to say!**

Yeah! She was the president for The Association for Women in Science for several years before I was. I'm still involved. I'm heading up the International Relations Committee.

**Is that an international organization?**

Oh yeah, we've got a bunch of chapters all over the place. Over thirty chapters in the United States and, we've got requests from USSR, Brazil, Canada, Mexico. A lot of places. We try to do a lot of support.

**What ended the NASA project?**

Well, the money ran out. I worked through Apollo 11, Apollo 12 and Apollo 13. But there wasn't much success with thirteen. And the money ran out and they had done so much work...they figured they didn't need quite such of crowd of investigators. And I went to University of Illinois Medical Center. And that was interesting, but that was a temporary appointment. And after that, I had another temporary appointment out in California. At Cal State -- Fresno.

**How did you get that position?**

Well, the American Physical Society has a list of employment opportunities. And actually, and someone who was affiliated with APS heard of that. So, I got a call. And that was a lot of fun.

**So, at that point were you looking for something permanent?**

Yeah, but not finding it. Spent lots and lots of years not finding it. So, I was out there, teaching elementary physics. It was interesting. I had time on my hands so I got involved in aviation. Got my pilots license.

**That sounds great.**

Yeah, it was.

**Did you ever learn to fly with instruments?**

No, I got to the point where I was trying to learn instruments. But, it was difficult and I could see I wouldn't have the time to continue and it's expensive. So, I gave up when I came back here. California was perfect for flying -- the weather was good. I figure, I'll probably get into it again if the circumstances are easy, but not here.

**And where was your husband at that time?**

He took a job in western Illinois. In Freeport. And I continued in this area and Karen lived with me for a while and then she went out to live with Leo.

**How did it work having two careers and a child?**

Oh, busy! Busy. Be sure to line up a good source of...a spouse who's supportive before you try raising a family. So, we shared things. And every time I was between jobs, why, I'd go out there.

**So, when was your second daughter born?**

In Seventy-nine. Older daughter is living on the north side now. And younger daughter's on a trip to Washington.

**So, she's thirteen?**

Yeah, just turned thirteen.

**Where is she in school?**

She's at the Lenart School. It's a public school here in Chicago for gifted kids. Partly because she's a bright kid and partly because it's so crowded, they suggested she went to one of the special schools for gifted kids.

**[Tape 1B]**

**We were talking about your younger daughter.**

Yeah, we were talking about my younger daughter. Yeah and she's thirteen and in...what, grade school still in a gifted program.

**What grade is she?**

What's she now? Seventh grade, I think. And off in Washington until Monday. Otherwise she'd be all over. She's going to go to Law school too, she thinks. She wants to become a lawyer when she grows up.

**And she'll probably change her mind a million times -- look at me, MIT and a Math degree to Law School!**

I was interested in Math for a while when I was there. Dirk Struik was one the professors and he was very well known. He was differential geometer. I sort of struck up a distant acquaintance with him and was sort of interested in the topic. But he was, it was the McCarthy Era and he was having some problems. He was, I don't know if he was a Marxist or what, but something along those lines. And they labeled him a "pink" and, he'd originally come from the Netherlands I believe, and so there was a lot of to do with the department. It was difficult. And then he wasn't there and I've forgotten the name of the guy who ended up teaching differential geometry. But I didn't find him very inspiring. Got discouraged about math.

**Were the attitudes of the McCarthy Era big at MIT?**

Oh yeah, it was all over the country.

**I always think of MIT as being somewhat isolated from politics...**

Well, to some extent yeah, and I think there were some people who were fairly supportive of him. And Harvard was having some problems at the time, too. It was a bad time.

**So, was it after the Medical Center that you started again at Argonne?**

After the University of Illinois, at the medical school, I went out to Fresno for a year. One of the faculty members was on sabbatical and they needed a replacement. So, I was out there and I got to be a Californian for a year. And for a while, I guess, I was hoping we might move out to California. And Leo made several trips out to California talking to people in semi-conductors as part of his work. And I was saying, hey, find a job, find a job! But that didn't work out and I got the job offer from Argonne. That sounded real good because I enjoyed being at Argonne before.

**Did you go right from California to Argonne or were you not working for a time in between there?**

I was off for a time. I've forgotten exactly how it worked out. I was off for a time. I guess I didn't get the job off, but I started getting acquainted with some interest in negotiation kind of thing. And there was a stretch of some months in between when I was in Freeport as usual.

**So you were hired at Argonne as a physicist?**

A physicist. In a program supporting the development of instrumentation of fossil energy. That was during the Carter administration and they were looking at alternative energy sources and in particular how to utilize in a more satisfactory fashion, the large coal reserves in the United States. And the thought was coal liquifaction and coal gasification and cleaning coal were directions the country should be going in. But utilizing coal is kind of messy. It's a very heterogeneous material and it's solid. And while we're set up for dealing with liquids like petroleum, we're not set up for dealing with messy materials like coal. So, there wasn't, there basically was a good deal of work on development of psuedo-...of dealing with coal. There wasn't suitable instrumentation at the time for on line coal analysis. You could have a slurry of coal going through a pipe, for example, and it would be nice to find out what's inside. So, we worked on a nuclear instrument for analyzing the coal. And that was basically from the outside interrogation with nuetrons and look at the gamma rays that come out. And worked on the development of a flow meter using nuclear methods.



The project came to Argonne in part because I think we had expertise in nuclear methods. After all the work that's been done on reactor development out there. So, we worked on that for a stretch, and that was a lot of good clean fun. We...the instrumentation got adapted to other uses also. But, then when the Carter administration ended, the next administration was not at all interested. They were trying to shut down the Department of Energy. So, the funding for the work on instrumentation for coal went away and I found myself working in other areas. And I did a little work in arms control and I've been working on nuclear safety and...the section I'm in now basically supplies people to work for other agencies of the government. When other agencies of the government need technical personnel -- specifically the Federal Emergency Management Agency. Among their other activities, they deal with safety at commercial nuclear reactors throughout the country. And FEMA has a lot of personnel but mostly they develop the expertise in dealing with floods and hurricanes and that kind of stuff, and they don't have many nuclear people. So, they put out a contract to Argonne to supply some people with expertise in nuclear and allied areas.

**You said you got into arms control. Was that always an interest?**

Yeah, it was an interest. I never really did much in the way of paid work in it, but was interested in the topic. I did a little work in support of DOE efforts to basically enable arms control activities to go on within DOE without interfering with other DOE activities. And I got interested in, when SDI was a big number, got interested in looking at SDI lasers and basically secondary effects of the lasers. And, I did a paper on examining what would happen if lasers of the characteristics that were being considered for SDI were directed at earth instead of at enemy targets. Turned up the fact that they could very easily start a lot of fires. And this got some headlines in papers around the country and around the world. But, unfortunately, it got me in the doghouse with my management, because, oh, don't quote me on that for several years.

**Okay, when you get this, you can edit that part out.**

Basically, well, what happened is that Argonne, as well as every other company around the country, was trying to get some work with the SDI organization and the fact that I had done a paper that had got some hostile attention did not make me popular with my management. But then I've had a...well, that's neither here nor there. But that's the kind of arms control stuff I've done. And then for a while we looked at, I was working with other colleagues at Argonne, look and see what you can do to

remotely examining lasers that are, might be used as anti-sattellite, try to figure out what the brightness of the laser was and how it's capability would be as an anti-satellite device without being too intrusive and being within the ... the laser itself. And recently I've been doing some, helping out the army in trying to destroy chemical weapons. We've got a rather large number of obsolete chemical weapons around the country in storage at those army bases around the country. And for several years now, why there's been an effort to try to get rid of these weapons. And they became concerned about what to do if an accident should occur in the course of these operations. Since we'd developed some expertise in working with FEMA, how to cope off site with accidents with reactors, why they called us in to give them a hand on how to cope with accidents with chemical weapons. I've been working with the army on that too.

**How did you get involved with that? What that something that was assigned to you at Argonne?**

At Argonne, yeah. It's pretty much been assigned. I'm not much of a go-getter. I'm not a manager person at all. I just don't have the talent and then I'm not much of a go-getter for bringing in contracts. So, I've been working on contracts that come into the laboratory for the last few years.

**What are some of the issues involved with destroying chemical weapons?**

There's a good deal of political problems. I wish the problems were all technical but they're not. There were a lot of chemical weapons in Germany which they managed to move successfully out of Germany to Johnston Island in the Pacific. We have a big storage depot for chemical weapons out there. And an incinerator has been built out there. And there have been some practice runs, I guess you could say, of incineration of weapons there. The plan at present is to build incinerators at eight sites around the country where the weapons are stored. But first, check out the techniques at Johnston Island, which is far away from any neighbors.

**Is that in the middle of the South Pacific.**

Yes. But unfortunately, fortunately or unfortunately, some of the neighbors of the installations in the United States aren't too thrilled with the prospect of having the incineration going on nearby. It's really a tradeoff. As the weapons get older, they become...more and more of them leak and the explosives become somewhat unstable. So, it's a tradeoff

between leaving them there and dealing with it. Eventually, you have to deal with it.

The National Academy of Science has looked into different methods for destroying the weapons and incineration came up as number one. They're taking another look at the situation now. So, there may be some changes.

**I noticed in one of the short biographies that you gave me that you did something called "Camera on Science". Could you talk about that?**

Yeah, that was a little television program I ran for a while. When I was not gainfully employed for some months when I was in Freeport. It was a local cable program. I had a lot of fun. I'd bring in speakers and interviewed faculty...

**It was local in Freeport?**

Yeah, local in Freeport. I got videotapes and films from National Labs and places and interviewed science students when they had science fairs. So, it was a lot of fun doing it. In a very minor way I was a local media person. I've been interested in science education, and education in the broader sense reaching the public at large, as well as teaching for many years, and that was just one aspect of it that came up at the time.

Are there any other things along that line that you have worked on?

Yeah, I've tried to...well, as an example I've run a number of symposia at the American Association for the Advancement of Science, which isn't exactly the public at large, but you reach a lot of scientists and people who are interested in science outside the specific field you're running in. And several of them...I've done a number of them on women in science. Bring in people to speak on women in science and the history of women in science. And a couple years ago I did one on Einstein in his younger days which a good part of the material dealt with his first wife, Mileva Einstein. She was a physicist. And prior to that hardly anybody knew anything about her. A lot of people got real interested in her. There's a good deal of evidence now that she actually worked with Albert Einstein on the Theory of Relativity and some other areas.

**I wonder how much of that there actually is in history?**

Yeah, there's been a lot of exclusion of women's work in the history of science. I've tried to improve on that by writing one book and lots of

articles on the history of women's participation in science. That's another area of reaching the public.

**The book you wrote, *Women Scientists from Antiquity to the Present*, that was published in eighty-six?**

Yeah, eighty-six.

**What sparked that? It seems to be a really broad scope.**

Well, how I got into that, well a number of the women scientists in the Chicago area, it was our chapter of the Association of Women in Science actually, we'd been pushing for a while at The Museum of Science and Industry, which is right across the street, to get them to do a display of women in science. And finally, after many years of pushing and shoving, they decided yeah, they'd do something. But then, what they suggested was that they'd put something out if we did all the work. I paraphrase what they said. But, so, we got involved in trying to help them set up a display. Both in identifying modern, contemporary women scientists and in trying to develop some material on the history of women in science. And a whole bunch of us did. And I got really interested then. So, I started this list and collection of information on the history of women in science. And the next thing you know, it sort of took off. I put it on the computer and ended up with more and more. And eventually, we got the display over there, and they decided...

**Was that the one with displays of individual women scientists?**

Yeah, "My Daughter, The Scientist". Here, I'll bring you a copy of the...I wasn't supposed to do that was I? Walking away in the middle of an interview.

**That's fine.**

Here's a guide to the exhibit, "My Daughter, The Scientist", which ended up a travelling exhibit that went around to a bunch of museums around the country. It was a really good exhibit. They got some professional people to take it up.

**I recognize this one!**

Yeah!

**There's a big picture of her (Shirley Jackson) up in the infinite corridor.**

Yeah, yeah. So, it turned out to be a successful exhibit. And as a side effect it got a bunch of us, you know, more informed or more interested in what's going on with women in science and the history of women in science than we were before. And one of the spinoffs was my book. After I had this big list of women from the history of science and thought about it for a bit, why, the book came out and a bunch of articles. The latest article I did was on women of the Manhattan Project.

**Yes, we talked about that briefly in January. How is that coming along? You were to give a paper, I believe?**

We gave an initial presentation at the meeting of the American Association for the Advancement of Science -- the annual meeting in Chicago in February. And, it was a small audience for all of the nuclear energy sessions, but it was very well accepted and I just got a call from a woman at the Smithsonian Institution a couple days ago and she wanted some material from that. So, they're going to some sort of display on twentieth century science and it will include some information on women scientists from the project. Yeah, it's coming along.

**That's terrific. Do you think maybe another book will come out of that?**

I think so, yeah.

**Where did you get a lot of information for the earlier book and articles?**

You mean the sources?

**Yeah.**

Oh, just digging. It's, fortunately University of Chicago has a good library. They have a science library, Crear, and they also have a good general purpose library for the humanities. And it sort of...one thing leads to another. You look at all sorts of books you'd never think you'd ever be looking into. Just following around, tracing and tracking the people.

**How did you have the time to do that with everything else?**

Well, I've been around for sixty years! After you've been around for sixty years you find some cracks and crevices of time in which to do things.

**Okay, I'll buy that!**

And recently, I got awarded an honorary Ph.D at The University of Plattsburgh. That was really nice.

**How did they come up with you as a candidate for an honorary degree?**

I don't know. Well, I'd been invited up there the previous year to give some lectures. And I guess that helps. I also got a letter a couple weeks ago. I'll be one of the people on the final science selection committee for the Bower Award for, it's a new award in science. I think it's only been around for a couple of years. They have two awards given out each year, as I understand it, one in business and one in science. And it's like a third of a million dollars this year for the lucky recipient. I'd rather be the recipient...

**...I was going to ask!**

...than on the selection committee.

**I suppose you can't select yourself.**

(Laughs) Yeah, but it'll be fun. It's a new area for me. I've never been on a selection committee for a big award before. It'll be kind of fun. It seems like there's always more different things to do.

**That's great. There were a couple other things I was interested in when I was looking through some of the short biographies.**

Oh, I had sent you some material before, that's good. I couldn't remember whether I sent it to you or not.

**Yeah, one thing on your CV, the League of Women Voters. I am interested in what your involvement with that organization was?**

I haven't really done much with it. When I was in Freeport, there was a dearth of science related activities to do, and when there's a shortage of science, I spread myself out in other things. I decided to run for local public office and I got involved with the League. And I connected in with

The American Association of University Women. But, I don't know how it survived on there. It was not a major activity. I think it's a very worthwhile activity, but it hasn't been a major activity. But, maybe it will be in the future. Depends upon what avenues are open and what you can do to support the areas that interest you.

**How about the Chicago Women's Hall of fame? I understand you were inducted into that recently.**

That's down in city hall. Some of the other women at Argonne recommended me for that and it was a big surprise.

**That's terrific.**

I'm glad that they're doing that and giving recognition to women and particularly women in science. It's still not as easy for women to be involved or recognized in science. One of the things I regret is that I haven't been able to accomplish more things in science recently. But, I don't know, maybe one of these days.

**What would you consider your greatest accomplishment in science?**

I would say the lunar sample work was a highpoint in terms of scientific work. But, I trust that this will be bimodal or trimodal or whatever and we'll have some more high points.

**Do you work long hours during the day at Argonne?**

I usually get up at five in the morning and drive out to Argonne which is about thirty miles from here. And basically work through most of the day and I leave around half past four and come back to the neighborhood. So, I put in a pretty much standard day, when I'm there. But, from time to time, we have big periods of travel, and I go off to a nuclear power plant in some other part of the country or I go off to an army base or something and then the schedule gets pretty irregular.

**How does that work raising a family?**

That was kind of hard to do, kind of hard to handle, when Karen was little. I had an awful lot of travel then. She'd spend sometime with her babysitter and stay over at Edna's. Then, not too long ago, I had my second daughter, and as a big kid now, why she's been independent and Leo's

been spending some time in Chicago. So, she's had some supervision and somebody to be with when I travel.

**So, Karen must be twenty seven now? What is she doing?**

She went to University of Chicago, but she got too involved in the social life. Didn't keep up on her studies and don't quote me on that, she'll never speak to me again.

**Sounds like my sister. Five years at Madison and she has about two years worth of credit.**

Yeah, Karen went on to The University of Illinois and finished up and got a degree in teaching. A Bachelor's degree in education. She did a little teaching, but it was mostly substitute teaching and she seemed to have bad luck and get sent to difficult schools. And she got discouraged.

**She was a public school teacher?**

Yeah, public school teaching in Chicago. That's hard. That really is.

**That would be hard. I've done some teaching in Roxbury one summer.**

Oh, my! That's some rough neighborhoods there.

**It was a combination summer job and remedial education program.**

Well, we've got a lot of those in Chicago, unfortunately. Teaching would be a pleasure when people want to learn. But when you end up just being the security force within the classroom. You're not teaching anymore.

**Yeah, I did the work in Roxbury the summer after I had worked at Dana Hall. An all girl's private boarding school.**

I think I've heard of it, yeah.

**That was day and night.**

I bet.

**I went from honors calculus to basic arithmetic.**



Sounds like a discontinuity.

**So, back to, where were we? Oh yes, you were talking about Karen.**

So, Karen, she's working as a waitress...working at the corner bakery. And she brings us some wonderful breads from time to time. But she isn't in a career at the moment. She and her boyfriend have something going. They're working out their lives.

**Your youngest is more interested in academics? You said she wanted to be a lawyer.**

She's a social person too. She's a very determined kid. We figure if she continues to want to be a lawyer, she's going to be a lawyer one way or another. I'm not sure she's going to go that way. She's got a lot of determination and drive. We'll see what happens. We've got to get her to college and law school and whatever it is.

**And once she hits college, who knows. There's med school, grad school, law school -- everyone I know changes their mind several times.**

Yeah, that happens to a lot of people. I have a cousin who decided at a fairly late age to go to med school after being a housewife for some years and doing minor things and helping out.

**How old was she?**

How hold is Audrey? Thirty-six? Yeah, thirty-six.

**That's interesting, a friend of mine at University of Chicago Med School, a lab partner of hers is thirty-four.**

Oh my!

**There's also a nuclear engineering professor from MIT who decided to change careers and is in my friend's med school class at U of C.**

Wow! Talk about transitions! It's nice people have the freedom to change careers. Years ago I think the attitude was that you go and you get into a career and it's a lifetime job.

**Do you feel like you, personally, have more autonomy in your career than would have been possible twenty or thirty years ago?**

No, actually, I think the situation in science is worse in many ways with respect to autonomy. I think we're being, at least from my vantage point at the lab and I've seen a lot of other situations, is that, probably not in academia, is that there's more and more contract research. The industrial style approach to doing science. And somebody in Washington or in the upper levels of industry basically decides the direction that research will go and all of us working scientists on down the line salute and we're given our marching orders and we're given the budget and the schedule and....

**...and you go to work.**

Yes. I'm afraid that there's not as much autonomy in the kind of science I do as there used to be some years ago. And I think that's very unfortunate. I do. I would much prefer to see scientists given our head and given some funds and said "Go and do science."

**So, what was the funding situation like in the past? Was it vastly different than it is now?**

Well, it, maybe I lived a more sheltered life but it seemed to me that the funding situation was better in the past than it is now. And, once you're in a University again you're expected to bring in contracts, but you have somewhat more freedom of decision as to what you're going to do.

**Would you like to get back into academics?**

Yeah, I hope to do a little teaching, maybe on the side. I don't know. Maybe get an adjunct professorship or something. It'd be fun. Too many things I'd like to do and too little time to do them in!

**I feel the same way.**

Yeah.

**Another thing I recall you've been involved in -- The American Physical Society. Could you tell me a little bit about that?**

See, it's a professional organization for Physicists in this country. I've been a member of the APS since...since I was a grad student. And I've headed up the committee on the Status of Women in Physics of the American Physical Society. I was on it for some years and then I headed it up for a couple years. And basically tried to improve the situation for women in physics. I was going to say, Vera Kistiakowsky headed it up too. And more recently I was elected secretary/treasurer of the American Physical Society's Forum on Physics in Society. So, I'm going to be busy with that too. And I'm also a member on the Forum on Education and The International Forum. Basically, I try to get into a lot of mischief -- as time permits. Yeah, I'll be going to New York next weekend for the American Physical Society. It's going to be easy. It's a training session for those of us who just became secretary/treasurer and get acquainted with the bureaucracy of the APS. Get indoctrinated with the proper methods -- that kind of thing. APS is an institution that's been around for many years. And initially it was to, all about publishing the American Physical Review and sister publications and organizing meetings for physicists to get together periodically. But it's branched out into other areas. It's an institution that's there and so everybody tries to use it to their own ends. The women of physics are trying to get the APS to help make life pleasanter for women in physics.

**Are there any specific changes you can point to that have specifically helped women in physics?**

Specific changes? I don't know about that? Gosh, I don't know if there were any women in physics when I was a student. If there were, I didn't know them. The committee did surveys of who was where and where the women were on faculties and Universities. And well, once you get the data, it's of some help in applying pressure. And trying to encourage people to do the right thing. What we perceive to be the right thing. And what they will eventually perceive to be the right thing! And APS fortunately hasn't fallen into the difficult and embarrassing situation that the Canadian Journal of Physics came into. Apparently recently there was an article very hostile toward women that was published in the Canadian Journal of Physics.

But, that hasn't happened in this country, fortunately.

**What was the topic?**

I haven't seen it yet. I haven't gotten a chance to dig it out of the library yet.

**So, the journal of Physics has a lot more than just technical content.**

There's a whole bunch of journals. Our popular journal is Physics Today. There's Physical Review and Physical Review Letters that just have technical papers. But the popular journals have articles and letters to the editor, of which I am the author of many. And this kind of thing. Information on what's going on in physics in this country and in other countries. There are journals in other countries that serve the same function.

**Do you know the general content of the article? Did it imply that women weren't suited to be physicists?**

I think that was...yeah, one of the approaches. I'm going to have to get a copy. And make a response. I keep making noise about a bunch of things. There's so much happening I can't keep up with all of it.

Hey Leo, do you have anything to pitch in? To inform her of any of the nasty things I should've told Tina?

(Leo) I think you covered it pretty well.

It's your great opportunity to shoot me down!

(Leo) Mostly, I guess, you being too modest.

Like I said, you should have a supportive husband. Leo was born in Bolivia. He and I were at The University of Chicago at the same time. And I met him at the University of Chicago. And we've been together ever since.

**It's a long time.**

Yeah, yeah, it's been a while.

**You met in the same lab?**

Yeah, I think I actually met him the first time we were out at The Point. On the lake. He wasn't scared off that I was a woman and had gone to MIT.

**Did you encounter that a lot? Men being scared off by an MIT woman?**

Yeah, but I think the hostility increases...the further you go along in a career, the more hostility you find. I found the big discontinuity at the level of tenure. And I hope it's moved on from that now. I don't know.

**I've heard some discouraging things about that -- friends of my moms who are quite prominent in their field not getting tenure.**

I think as long as you're not a threat to whoever's in power it's fine. When you're an undergraduate why they welcome you. When you're a graduate student you can help support somebody's research program. But the people who find you threatening are the ones who tend to make life difficult for you.

At the University of Chicago when I was there I was very fortunate in working with Allison. But there were some faculty members who were just awful. Not simply to the women grad students but just awful in general. And to protect the reputations of those alive and dead, I won't mention any!

I was glad to hear that MIT was doing this archives. I'll probably dig into it myself sometime. At one point thinking of doing some more on Ellen Swallow Richards, but didn't follow up on it. I thought, MIT archives is such a great source to dig up information.

It's a fairly young project. I've only been working on it this past term. I think there're about five or six completed interviews.

You ought to do my cousin, Inca Allen. She's right in Massachusetts, Framingham.

**What does she do?**

Chemist.

**Well, someone's probably got a biography on her already!**

**Okay, great! Out at Framingham State.**

**Oh, I was out there for a game -- the basketball team played them this year.**

**Hey, you're into athletics, good for you. Keep your body in shape -- you'll be glad later. Quite a schedule I bet. You know someone else who should be interviewed. When I was at MIT there was a graduate student from China named Hilda Hsieh. And she went back to mainland China and I think she's become quite a VIP since that. She's physicist.**

**She was there when you were there?**

**She was a graduate student when I was an undergraduate. And now I think she's quite important in mainland China. Someone ought to chase her down. And who knows, you might get a trip to China out of it!**

**I doubt it!**

**Excuse me for just a second.**

**I think I've covered a lot of the things I was interested in. Is there anything else you would like to talk more about.**

**No, I think we've covered it. Thank you for coming.**

**Thank you -- I enjoyed it.**