American Meteorological Society
University Corporation for Atmospheric Research

TAPE RECORDED INTERVIEW PROJECT

Interview with Jerome Spar
22 September 1990

Interviewer: Julius London

London: This is an interview with Jerry Spar for AMS-TRIP. The interviewer is Julius London, and we are doing the interview in Glen Rock, New Jersey, 9/22/90. What we'd like to do is get Jerry's impression of his own involvement in the development of meteorology in the United States and elsewhere and to get his opinion as to the advances and the important problems that have been made in meteorology in the last 30, 40 or 50 years. Let us start now. Jerry, what got you interested in the field of meteorology? Tell us how you got involved.

Spar: I got into meteorology in 1940 after taking a degree in physics at the City College of New York. I was looking around for some application for physics and I don't know how I came across meteorology. I think there was a Civil Service examination for junior meteorologists being offered at that time. Somehow or other, I heard about a meteorology program that had just gotten started at New York University. So I went up to NYU and met Athelstan Frederick Spilhaus, who had just about a year before that started a meteorology department at NYU. Spilhaus was a very good salesman; he convinced me that meteorology was a very interesting and exciting profession, so I became a graduate student there in September, 1940. Shortly after that, I became a graduate assistant, and then a teaching fellow, and at that time, they were just starting the meteorology cadet training. The war had broken out in Europe and the U.S. was not involved yet in the war, but the meteorology cadet program had already begun. I became an instructor in the program as well as a graduate student. I stayed there until April 1942, when I was commissioned in the Air Force. (It wasn't the Air Force--it was the Army Air Corps Weather Service.) Then I went off to California, became a forecaster at Mather Field in Sacramento and then went to Great Falls, Montana, where I was a forecaster. But eventually I came back to NYU as an instructor.

London: During that time, you spent some time in Greenland, didn't you?

Spar: No. After I left NYU sometime in 1943, I was sent to Presque Isle, Maine, to the Eighth Weather Squadron, as it was called then. Arthur Merewether was the

commander of the Eighth Weather Squadron. They were responsible for the forecasting for the trans-Atlantic ferrying operations of B-17s and B-24s to England. So I was weather officer at Presque Isle, Maine, then I was sent back to Goose Bay, Labrador, where I was a weather officer. I was in Goose Bay until the end of the war. I came back to New York at the end of the war and resumed my studies--I came back as an instructor at NYU. I had been an instructor before going to Presque Isle. I came back as a civilian instructor after the war.

London: So you were an instructor during some of the war courses?

Spar: I was an instructor during several of the war courses at NYU. I came back after the war as a civilian instructor. At that time, there was just a civilian program. I took my Master's and Doctorate degrees at NYU. Got my Master's in 1943, and my Ph.D. in 1950.

London: Can you remember any of the other faculty people at NYU at the time?

Spar: When I first came to NYU, the faculty members for the war courses in the meteorology department were Jim Miller, Bob Culnan, Herman Wobus. Those were the three I remember along with Gardner Emmons. He and Spilhaus and Ray Montgomery had organized the department.

London: They came down from MIT, didn't they?

Spar: Spilhaus had studied under Rossby at MIT. So had Emmons. and I guess Montgomery probably had too. But the three senior faculty members of the department were Spilhaus, Emmons and Montgomery. And the junior faculty members were Miller, Culnan, and Wobus who had come from the Weather Bureau, all three of them. And Conrad Mook also from the Weather Bureau, was one of the instructors. That was during the war. After the war, Miller and Culnan stayed on with Emmons and Spilhaus.

London: Spilhaus and Montgomery, didn't they study under Haurwitz at M.I.T. before they came to NYU?

Spar: I thought it was Rossby, but maybe Haurwitz had been an instructor or professor. I don't know if Haurwitz taught at M.I.T.

London: Yes.

Spar: I can't remember. I understand Spilhaus was a student of Rossby's.

London: Maybe they took courses with both Rossby and Haurwitz.

Spar: Probably. I really don't know much about what happened at M.I.T. before the meteorology department at NYU was established. I know Spilhaus was responsible for setting up the meteorology program at NYU.

London: I dimly remember that there was a meteorology program in Aeronautical Engineering.

Spar: There was something called an "air transport-option" in the Aeronautical Engineering department -- it was the NYU School of Engineering, which included a program in meteorology and that's the way meteorology got started at NYU. Spilhaus was brought in to run the meteorology program at NYU as part of the air transport option. Later, meteorology was established as a major program, a degree program in its own right.

London: While you were at NYU, after you got your degree, you had a number of research programs. One program sort of fascinates me by its name, and I just thought about it recently. You were head of Project SCUD.

Spar: Project SCUD was a weather modification program. My memory is very dim at the moment, Julie, I'm trying to remember what I did on SCUD. This was long before Stormfury. It was shortly after Langmuir and Schaeffer had started their weather modification experiments at the General Electric Company -- Project CIRRUS was the project they started.

London: That was their project, yes.

Spar: The meteorological community became interested in weather control, weather modification and the Navy asked us to do an experiment to test Langmuir's hypothesis that weather could be modified at a considerable distance by cloud seeding. So we set up a program in which we put out silver iodide generators and also dry-ice seeding from aircraft along the East Coast to see if we could modify East Coast storms. Charlie Tilden worked with me on this. I don't know if you remember Charlie Tilden?

London: Yes.

Spar: I have to dig into my old publications and records. Anyway, the net result of the experiment was that there was no credible evidence that cloud seeding had any significant effect on large-scale weather systems along the east coast of the U.S.

London: This was in the early 1950's?

Spar: The fifties, yes. We worked with a committee -- there was a very well-known statistician at Princeton University -- What was his name?

London: John Tukey.

Spar: Max Woodbury was one of the people involved at NYU and there was another fellow named Leo Tick.

London: Leo Tick, yes.

Spar: The guiding spirit in the design of these Project SCUD experiments was John_Tukey at Princeton. And it was John Tukey who convinced us that we should have a randomized experiment, with secret randomization, so we wouldn't know which storms had been seeded and which had not. Because we did a well-designed randomized experiment, we were able to draw credible conclusions about the efficacy, or in this case, the lack of efficacy, of cloud seeding experiments. We published this result in a monograph which was edited by Sverre Petterssen. Project SCUD was actually part of a larger program of weather modification studies.

London: This was out of the University of Chicago, wasn't it?

Spar: I don't remember, I'd have to find that monograph. But our experiment was one part of a whole series of experiments testing various hypotheses by weather modification. Langmuir had really created a furor with his claims that a modest amount of seeding could have very large-scale effects on the atmosphere. We were part of a very large weather modification program which involved Captain Orville of the Navy, Sverre Petterssen of the University of Chicago, and a lot of other people I can't remember anymore. It was a big program, and Project SCUD was the East coast storm/cyclone modification part of this large program.

London: There was another part of that general project out in the Northwest, wasn't there, in Oregon?

Spar: There were pieces of it all over the place. There was the "Orographic Seeding Experiment"--

London: That was in Oregon.

Spar: Was it in Oregon? I don't remember. it went on for several years and the net result was a publication under the general editorship of Sverre Petterssen, the Project SCUD report.

London: Was this a Navy publication?

Spar: No, it was an AMS monograph. That's another point--Project SCUD was originally a classified experiment. The Navy wanted it to be classified as secret, and it was carried out as a secret experiment. If there were any significant effects of cloud weather modification, the military significance would be considerable. So the Navy wanted to protect any military information, or any military utilization of cloud seeding weather modification that might come out of this experiment. So they classified the whole experiment, the Project SCUD experiment, as either confidential or secret. I think it might have been secret. So was for a long time there was a classified experiment. We were running cloud seeding from aircraft, dry ice seeding from aircraft, and silver iodide seeding from ground generators all over the East Coast. After it was declassified, an AMS monograph was published in which we described results of Project SCUD.

London: It was an AMS monograph, it described the whole weather modification program. It was a multi-faceted weather modification program of which Project SCUD may have been the only classified part of that whole program.

I remember one funny incident at that time, where one of your secretaries put the stamp that said "Secret" into the vault because it was "secret."

Spar: I don't remember that.

London: You were looking all over for the stamp and couldn't find it until you realized--and she said, "Well it said 'secret,' so I classified the stamp."

Spar: I remember it was very difficult to get telephone service installed at the time, and I was able to get a telephone because we were out at a secret, militarily-supported experiment.

London: I think this is particularly interesting in view of the present-day situation in terms of cloud seeding.

Spar: I don't know what the present situation is.

London: The present situation, as far as I know, is that there is very little support--that almost all of the research efforts have indicated that there is just no indication--

Spar: The only positive results I ever saw or reported were the orographic seeding the Western part of the U.S. where experimenters claim to have found a 10-15% increase

in precipitation. Our results showed there was no detectable influence on East Coast cyclones or the precipitation from East Coast cyclones, either along the coast or farther East.
Later, I got involved with Project Stormfury, which was another weather modification experiment. Project Stormfury was an attempt to find out whether cloud seeding could modify the behavior of hurricanes.

London: You worked with Ed Fisher on that?

Spar: I worked with Ed Fisher on Project SCUD actually, I can't remember if Ed was involved in Project Stormfury also.

London: Was Vic Ooyama?

Spar: Vic Ooyama was involved in Stormfury. He designed a hurricane development model--a computer model of a hurricane as part of an investigation into the--to provide a theoretical background for hypothesis about modification of hurricanes by cloud seeding.
Bob Simpson was involved in the Stormfury Project, and the Weather Bureau actually carried out the seeding of hurricanes.

London: Did you make forecasts for the trajectories of the hurricanes at that time so that the planes could fly over the hurricanes?

Spar: I was part of the Stormfury advisory committee. I even have a plaque thanking me for my contributions for Project Stormfury. We divided the project into an NYU group and a Weather Bureau group. The Weather Bureau and the Navy actually carried out the seeding operations. NYU did some of the analysis.

Ed Fisher was involved in hurricane research--both Ed and Vic Ooyama were involved in hurricane research. He had a hurricane research project that was related to Project Stormfury.

London: This leads me to another question. This was your research at that time. During this time, you also became involved with the AMS. You were on the AMS Council at one time--

Spar: I served on the Council for one term. [I don't remember what I did.] At council meetings I would draw doodles, and one of my doodles was actually published in the AMS Bulletin.

London: Ken Spengler used to say you had wonderful doodles. Do you remember any issues

that came up with the AMS resolutions?

Spar: No. [I have to dig into the files to remember that.]

London: Let's continue with your work at NYU. You were at NYU from then until--

Spar: I became an assistant professor at NYU after I got my Ph.D. degree in 1950. I stayed at NYU almost continuously from 1950 until 1973, actually it's from 1946, after I got out of the Army Air Corps Weather Service. That was in '46, I went back to NYU and I stayed there till '73. In 1964-65, I took a leave-of-absence from NYU to become research director of the Weather Bureau in Washington under Bob White, who was then Chief. I spent about 15 months in Washington as research director. Aside from those 15 months, I was professor of meteorology at NYU until 1973. In that year, the department of meteorology at NYU terminated because the campus at University Heights in New York City was closed; it was sold to City University. The department broke up and I went to City College and joined the faculty of the Earth and Planetary Sciences at City College.

London: Before we get to the City College interim, let me ask you just a few questions about NYU. First of all, just so we can put it on the record, your thesis was on Atmospheric Tides, wasn't it?

Spar: It was actually on the theory of annual pressure variations.

London: Global--

Spar: The global oscillation between summer and winter.

London: Did you ever do any follow-up work on that problem?

Spar: I published a number of papers after that on the so-called Annual Tide, annual pressure oscillation. I did my thesis under Haurwitz and he was interested in atmospheric tides, so I published a number of papers on that topic.

London: Of those published papers, are there any you particularly remember?

Spar: I published one paper on the geographic distribution of the diurnal -- semi-diurnal tidal oscillations in the atmosphere, which was of some interest. It's been quoted a few times. Actually, in 1957, I became interested as a consultant to a company called Isotopes, Inc., in the distribution of radioactive debris from hydrogen weapons tests. Although I was a member of the NYU faculty, this had nothing to do with NYU at the time but we actually established the residence time of radioactive debris in the

stratosphere. At that time, something like a year.

London: You calculated large-scale diffusion --

Spar: Yes. We calculated large-scale diffusion of strontium-90 in the atmosphere. This was part of a program called Project HASP -- High-Altitude Sampling Program, in which U2 aircraft were used to -- I designed the sampling program and did the analysis. We had U2 aircraft from Plattsburgh Air Force Base, SAC aircraft, collecting radioactive strontium and other radionuclides in the stratosphere. The U2 aircraft would fly up to 70,000 feet. That was a highly classified investigation.

London: But those results were later published.

Spar: Later, it was de-classified and we published results.

London: A paper with Feeley --

Spar: Actually, I gave a paper in Germany then.

London: But the Feeley and Spar paper is still being quoted.

Spar: The Feeley and Spar paper was quoted quite extensively. That was the paper in which we constructed a qualitative model on the diffusion of radioactive debris from the stratosphere across the gap in the tropopause into the troposphere. So that although the radioactive debris was ejected into the equatorial stratosphere at a high elevation above the equatorial tropopause, the lateral diffusion of the debris carried it poleward in both hemispheres and then at the equator went through the gap in the tropopause into the troposphere, and this is how the short residence time of the radioactive debris in the stratosphere was established. At that time, it had been argued that the residence time of radioactive debris in the stratosphere should be something like 10 years. There was a physical chemist --

London: Libby.

Spar: Libby had been arguing that the residence time for radioactive debris in the stratosphere should be very long because of the stability of the stratosphere. What we showed was that the residence time was actually only about a year, and this material came out of the stratosphere and into the troposphere in a much shorter time -- the residence had a time of about a year through this mechanism of transport through the subtropical gap in the tropopause. That, I think, was an important result.

London: Now sometimes talked about as tropopause-folding; the kind of thing that Ed

Danielson --

Spar: They had another mechanism for the same proceeding. What we stressed was the fact that horizontal-lateral diffusion in the stratosphere was enough to bring the material into the vicinity of the subtropical gap in the tropopause, and then horizontal diffusion would carry the material into the troposphere underneath the equatorial tropopause. The rapid vertical diffusion in the troposphere would carry it down to the ground through precipitation-scavenging.

London: So that the actual lifetime was much shorter --

London: The High Altitude Sampling Program actually demonstrated through cross-sections -- what we set up was a meridional cross-section of sampling. We're having U2 aircraft flying across the equator. We have one set of aircraft operating out of Brazil, another set out of Plattsburgh, NY, and they flew at four altitudes back and forth across the equator. So we were able to construct vertical profiles of the radioactive strontium-90. And successive radioactive profiles. We could see the decrease in the concentration of radio-strontium in the stratosphere. We constructed this qualitative model of how this had happened, how the debris had gotten out of the stratosphere and into the troposphere and down to the ground. Lester Machta of the Weather Bureau was also arguing at that time for a short residence time for radioactive debris in the stratosphere.

London: Didn't he and Gus Telafadis do some work on this problem?

Spar: Yes, I believe they did. I remember a meeting in which I got into an argument with Libby about the short as opposed to his argument of a long residence time in the stratosphere. I think we won that argument.

London: I think that argument has been won and certainly now in terms of actual observations.

Spar: What I was most proud of is that we had a synoptic model of those phenomena that could account for the rapid removal of debris from a hydrostatically stable stratosphere into a hydrostatically unstable troposphere through the gap in the tropopause. I was rather pleased with that result.

London: Let me get back a little bit to your NYU days again. During all of this time, you had been teaching. I don't know what the teaching mode, something like: two courses per semester or sometimes three courses.

Spar: Oh, at least two or three. More than two. Later on, the teaching load became smaller, but originally I think we used to teach four courses. People would revolt [if they had

to teach] four courses and do research.

London: Having to do that much. You had many students --

Spar: Don't ask me to remember all my students.

London: Can you remember any who were memorable, that is, of all of those students, can you name one or two who you thought were really productive?

Spar: Vic Ooyama was one -- although I was not his thesis adviser, I was one of his instructors, and I was very proud to be his instructor. Vic Ooyama was, I think, one of our most brilliant students. Kuo-Nam Liou, who has published a book on atmospheric radiation -- I still hear from him.

London: Let's go on to City University. What kind of department did you get into?

Spar: The department at the City University of New York was originally a geology department. The man who brought me into the department -- he died recently --

London: This was somebody in the geology department?

Spar: He taught meteorology and geology both. He published a book on meteorology -- about maritime meteorology. Anyhow, before I came into the department, they changed the name of the department to Earth and Planetary Sciences from the Department of Geology. I had a small meteorology program in the department and several of us from NYU joined the department. Neumann went there, and Pierson.

London: Ben Davidson wasn't alive then?

Spar: No. Ben Davidson had died long before then. It was in 1973 that things folded up at NYU and Jim Miller went to the Polytechnic Institute in New York.

London: In Brooklyn?

Spar: It was at Brooklyn Polytech.

London: It was called NY Polytech, I think.

Spar: I don't know whether they changed the name before that, or after that. What was originally Brooklyn Polytech later became Polytechnic Institute of New York. Other members of the department went elsewhere. Dick Schottland went to Arizona. Jim Friend, atmospheric chemist, went to Drexel. Vic Ooyama went to NCAR.

London: What type of meteorology program did you have?

Spar: It was originally an undergraduate program. We set up a master's program in meteorology later. We were able to bring some graduate students into the program, but only at the master's level. We didn't have a doctoral program, not in meteorology.

London: How many meteorology students did you have, approximately?

Spar: At City College?

London: Yes.

Spar: The undergraduate classes were -- there might have been twenty undergraduate students in the program and a half-dozen graduate students. It was a small program, much smaller than they NYU program. NYU was a good-sized, full scale meteorology and oceanography program.

London: At its peak, how many students did the NYU program have? About?

Spar: Thirty graduate students?

London: Of course, it had a large number --

Spar: A large number of undergraduates.

London: When you were at CUNY, you then took up a program working with GISS (Goddard Institute for Space Studies) on some general circulation problems.

Spar: GISS had adapted a general circulation model that Yale Mintz and Akira Arakowa had developed at UCLA. They had adapted this model for --

London: Was this just a general circulation model?

Spar: There was a reason for it. I'm trying to remember the names of the people at GISS who were involved in this program. It was Jastrow and --

London: Was Jim Hanson involved?

Spar: Only peripherally at the beginning. What was the name of the guy who worked with Jastrow?

London: He was more than a programmer -- the person who did the numerical work, the computer work, who went to Goddard--Milt Halim.

Spar: Yes. I knew him well and worked closely with him. I got interested in the program in terms of the question of what would the influence of the sea surface temperature of aeration be on the general circulation of the atmosphere? We did some experiments with the GISS model. The GISS model was an adaptation of the UCLA model, and they had a very powerful computer system at GISS, which could be used for the general circulation model. I'm trying to remember what the motivation for the whole thing was.

London: Was this to test some of Bjerknes' ideas of feedback, of the biennial feedback?

Spar: Bjerknes and Roundtree?

London: Yes. At that time, Bjerknes --

Spar: Bjerknes had been arguing that the sea surface temperature variations would have a significant effect on the global general circulation. But why did NASA get involved in this? I can't remember now.

London: When did you retire?

Spar: In 1983 or 1984. I've really been out of meteorology since then and I've never looked back.

London: Let me go back to one or two things before we get on to the final years. You published at least two books on meteorology, maybe more --

Spar: I published a book called Earth, Sea and Air, which was an elementary textbook, an introduction to the geophysical sciences, which I used as a textbook at NYU.

London: That was one of the earliest textbooks on the applications of general geophysics to the atmosphere and to the connection between the solid Earth, the atmosphere and the oceans. As I remember, it was a very popular book, used very, very widely. Do you know what the publication record on that was, about how many books --

Spar: I don't recall. I think about 25,000. It was quite popular for a while, a slim book published originally in a hardcover edition and then in a softcover edition. It wasn't very expensive and it was a nice book to use in a one-semester course in geophysical sciences.

London: But you never wrote a second edition.

Spar: Yes, actually I published a second edition. It wasn't much different from the first edition. We just corrected some errors. It was translated into Polish and Dutch.

London: I never saw the Polish or Dutch copies. Then you wrote a book on --

Spar: I wrote a book, The Way of the Weather, which was a popular book for young people.

London: This was under the auspices of the Museum of Natural History?

Spar: The museum was a sponsor of that publication. The publisher was an outfit called "Creative Science Publications."

London: What kind of distribution -- ?

Spar: On that one, we sold a quarter of a million copies.

London: Really?

Spar: People who sold that book had a tie-in with encyclopedia sales, so it sold very widely. About 250,000 copies the last time I saw.

London: Is it still available?

Spar: No, don't think its available anymore. It was translated into Spanish: La Ruta del Tiempo.

London: Did you publish any other hardcovers --

Spar: No. Those are the only two books. I published a children's book, which I wrote for my daughter, called Willy: The Story of Water. That was not a textbook nor a serious science book, but a children's book.

London: Thirty-five pages or so?

Spar: Something like that.

London: Lots of pictures? Who did the drawings? You?

Spar: They were actually done by an artist from the Disney Studio.

London: During all of this time -- as a matter of fact, talking about drawings, you had an interest in art, you used to do a lot of drawing. Did you ever do any meteorological drawing?

Spar: No. Except for doodles at AMS Council meetings.

London: Let's tie this part up. You spent some forty odd years--

Spar: It seems like forty years of wasted time.

London: Does it?

Spar: No, not really. I enjoyed the years in meteorology. But I can't remember what I did that was very significant. I think the cloud-seeding experiment, the Project SCUD experiment, was useful. I think the work on the distribution of radioactive debris in the stratosphere was useful. I think I did some fairly good work on atmospheric tides. Probably the most useful contribution I made to meteorology was as a teacher. My students seem to have enjoyed my teaching.

London: And that gave you kicks?

Spar: I enjoyed teaching.

London: In terms of the profession itself, could you single out a few, not just a single one, but any areas where you have, during the time you've been in, seen some real significant type os advances? Certainly, we're not back now to 1940 -- we've made progress. What do you regard as the progress we've made?

Spar: I think the most significant progress that I've seen has been in computer modeling and forecasting. I did get involved in computer modeling myself. I designed one numerical prediction model, and I think from my own experience the most significant advance I've seen in meteorology has been the development of numerical weather prediction. I made a small contribution to numerical weather prediction, too.

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