# American Meteorological Society
# University Corporation for Atmospheric Research

## TAPE RECORDED INTERVIEW PROJECT

## Interview with Vincent Schaefer
## May 8-9, 1993

## Interviewer: Earl Droessler

Droessler: This is Earl Droessler, and it's the 8th of May, 1993, Saturday morning, 9:00 in the morning; it's a beautiful day here in Schenectady, and I'm at the home of Vincent Schaefer. This morning we're going to talk about Vince Schaefer and his ventures in meteorology.

Let me begin by asking you, Vince, how did you become associated with the field of meteorology?

Schaefer: It's a long story...just before World War II, Dr. Langmuir was a member of a very prestigious committee in Washington, which [was] anticipating problems ahead and trying to gear up some of the universities and industrial laboratories to cope with what we were pretty sure was going to happen. One of the first things that he came up with, when he returned to Schenectady, was to talk with me--I was his assistant--

Droessler: How old were you at that time?

Schaefer: This was in 1940, so probably 34.

Droessler: You had been his assistant for some time now?

Schaefer: I started in 1932, the year he got his Nobel prize.

Droessler: You were certainly working with a great man.

Schaefer: I sure was. And I knew that. And I did my best to stay ahead of the kinds of things he asked me to do. So this was about 1940. He had a strange combination of fibers that he brought to me, saying that they had been developed in Canada for filtering particles from the air stream. It was made of wool, and was impregnated with a waxy material, so I sort of took it apart and looked at it under the microscope and tried to devise a way to make it easier to fabricate. And I used glass wool. That seemed to work out pretty well. And in the process, I had to develop a smoke generator to simulate what we thought the problems might be

that needed filtering. So I used an artist's paintbrush, the kind they use for a little spray, and made a very simple and very useful smoke generator; made it within a couple of days. And this worked very well. We got some information and the behavior of this filter and he transmitted the information to people who asked him about it, and that was about the end of it.

We then got involved in many other things, submarine detection and such things. And then in 1941, a year or two later, he said, after returning from Washington, that the Germans had developed a fairly effective smoke generator and were hiding the **Bismarck** from our bombers in the fjords in Norway. Did anybody know how they could make a lot of smoke? So he gave me that job. He said, "Why don't you make a larger version of the device you use for testing the Canadian filter?"--which I tried to do, and it didn't work. To make a lot of smoke, which we wanted to do, this just overwhelmed the kind of device I had built. So I puzzled about what to do to approach it from a different direction. And walking down the hall, I happened to glance it one of my neighbor's rooms and saw a Langmuir diffusion pump operating. And I said, "That's the way to do it." So I just went and made a big diffusion pump. These pumps were used in mercury vapor, boiling mercury vapor, and in that way it exhausted the tube to a high vacuum.

As soon as I got into my laboratory room, I took an ordinary oilcan, filled it half full of oil, put it on the Bunsen burner, boiled the oil, kept some heat on the spout and I had a beautiful smoke generator. Smoked up the whole room. In fact, I got into some trouble with my neighbors.

Droessler: So you reduced the visibility in your room.

Schaefer: He couldn't see anything.

Droessler: You created a manmade fog out of smoke particles.

Schaefer: It was obvious that was the way to do it. And you could make it as big as you wanted to. So I immediately began fabricating a larger oilcan, and fortunately at that time, I still had my roots in the machine shop. I had the use of any machine that was vacant. And there were always quite a few vacant machines, so in a couple of days, I had a very acceptable smoke generator that I thought would work. I took it up on the roof--at that time the roof was very available--and tried it out and it worked just beautifully. I produced a tremendous amount of smoke. I think Langmuir was away at the time, so I just had to try to devise an easier way to do it than what I had put together initially, and was quite successful. In fact, it was so successful I got into a little trouble with the Fire Department. One of my friends, who used to be in the shop where I was an apprentice, was chief of the local Fire Department. And he said that when the call came that there was a lot of smoke coming out of the top of the building, he said, "I bet it's that Schaefer."

But they didn't believe him, so they hauled all of their fire equipment up seven flights of stairs, came up out of breath, and there was no fire, just a lot of smoke. He said he didn't believe it until people said they could see the flames coming out of the top of the building. So much for imagination. There was just no visible flare.

Droessler: So you were very popular with the Fire Department for making all that smoke up there.

Schaefer: So I was relegated to a place called "Down on the Farm," which was at the end of the G.E. [General Electric] Works complex. I used that region for several experiments and then went to a gravel pit up the valley and we filled that with a lot of smoke. By that time, Langmuir was getting quite excited about the kind of smoke that was possible to produce by this very simple method, and he suggested that we conduct a big demonstration for the military. So we decided to go to the Schoharie Valley, to Vroman's Nose, a place that I knew would be just an ideal place because you had the drainage flow down the valley and on top of a 600-foot cliff, you had a perfect view of the whole valley. I took Langmuir out there and he was very enthusiastic about it. We had a wood road to the top of the mountain so we could transport people and equipment up to the top, and we selected a date and Langmuir met the group, including Vannevar Bush and Alan Waterman and a lot of very interested people--Vladimir Zworykin from RCA and others, and all units of the military were represented by pretty high level people. The evening before we had the test scheduled, he met the whole group at the Van Curler Hotel and told them they had to get up about 4:00 in the morning to get out there in time to get sunrise, because we knew there would be a drainage flow down the valley and planned to have the generator upstream.

Meanwhile, about a month before, we had talked to the Esso Laboratories in New Jersey into building a big generator, using the principles we had developed, which used ten gallons of oil an hour. They built one that would handle 100. And all they did was build something ten times bigger. The basic idea was to take ordinary lubricating oil, which had a boiling point of about 450 degrees Celsius, and boil it. And then use a very hot vapor out of a manifold, having very tiny holes. And the oil vapor went out into the cold air and was quenched. The jet coming out of it was at sonic velocity, and it turned out that the particles that were produced were exactly the size we wanted. I had found, by a big cog box I built in the laboratory, that we needed to have something about 6/10 of a micron in diameter to reach the maximum screening efficiency of the smoke.

I should say that the aides of these generals and so on just felt that this was impossible. We just couldn't get them to get up so early in the morning. But they all got up; we had a bunch of Jeeps, which by the way was a classified subject at the time, from our local depot in Schenectady. We had all of them on the summit of the mountain before sunrise, hot coffee, some rolls, and a few things like that.

Then, just as the sun came up, we gave the signal to start the generator, which was located about five miles upstream of the flow of air. It was just a magnificent display, because it spread out over the whole valley, came right down the valley...So we were using a smoke tunnel about a mile wide and ten miles long, and a thousand feet deep, and it performed perfectly.

Droessler: And you completely restricted the visibility to the bottom of the valley.

Schaefer: Perfectly. You couldn't see anything, except with infrared. And Zworykin had an infrared telescope, the first one that he had devised, and he could see right through it. That gave them a big boost--

...Vladimir Zworykin--he was the inventor of the infrared telescope.

Droessler: You mentioned Vannevar Bush and Alan Waterman and so forth. I suspect what you had there that day was the "OSRD"--which Vannevar Bush headed up. The Office of Scientific Research and Development, which was associated with the Defense Department and was a rallying point for bringing scientific research and development into the Defense Department during World War II. So you really had the top of Washington there.

Schaefer: That's right. It just couldn't have been better. The other thing, we had our smaller generator--we had this ten gallon an hour generator--right down at the bottom of the cliff on the farm now owned by a friend of mine. There was a competitor in the form of an electric heater, which produced a black smoke. And they were using the same amount of oil, and we had them side by side. The black smoke disappeared within a few hundred feet, and ours just made a continually-expanding trail of smoke as far as you could see. So, a $25 million dollar project went down the drain by just a simple demonstration.

Droessler: Now your smoke, of course, looked white. It was white; it looked just like a natural fog.

Schaefer: Like a fog in a valley.

Except it persisted, and the latter part of the morning, the smoke went around the corner of Vroman's Nose, and came back again. But it was a little bit higher.

Well, I went to all that description because that was the basic thing that got us into meteorology, the measurement of particles. I had little gadgets that, like a settling chamber, which I could take right into the fog and measure the size of the particle by the rate of fall. That began to get us very much interested in particles and such things as how you measure them and all that sort of thing.

We needed to get into the winter period to look at clouds, natural clouds, and Langmuir, who had climbed Mt. Washington many years before, knew that Mt. Washington was an ideal place. So we went to see Dr. Brooks at Blue Hill [Observatory], and Dr. Brooks encouraged us to use the summit of Mt. Washington and arranged for us to go there. Now at that time, I was concerned with precipitation static, which is a static picked up by airplanes when they flew through snowstorms. And it was causing a great deal of trouble because young pilots would get confused, they'd lose communication because of the precipitation static, and they crashed. So it was a terrible problem. We got deeply involved in precipitation static. And that's why we went to Mt. Washington. And I rigged up a number of things to measure the degree of static generated by a snowstorm and so on, but then we found very quickly, at Mt. Washington, the first winter of 1943, that it was sort of a waste of time to make any measurements there because along with the snowstorm, there were always a lot of supercooled clouds. That got us interested in supercooled clouds. And we became very much intrigued with why it was supercooling, and--

Droessler: Why should you have water droplets below freezing?

Schaefer: Quite a bit below freezing.

Droessler: That was the question, why shouldn't it all be ice?

Schaefer: That's how we finally got into all phases of mountain meteorology and so on. About that time, I got involved with the Air Force in studying supercooled clouds. We went to Minnesota, that's when I first met Spilhaus, and at the airfield in Minnesota, we had a special plane, a B-24, which was equipped with expandable wings to shed ice--to get into a cloud, get iced up and then shed the ice and so on.

Droessler: Didn't we used to call those "little boots," and you'd pump them up with air and they were rubber, and it would expand and the rime ice had built up and that would crack and fall off.

Schaefer: We got into such heavy icing that the boots began to cause us trouble. We had quite a worrisome time before we finally got back on the ground.

Droessler: Of course, modern airplanes now they heat up the leading edge of the wing so the ice just doesn't form.

Schaefer: The heated wing came next. But in the process, Langmuir and I became very much interested in the whole business of supercooled clouds, and whether you could modify them. So we by our contacts in Washington obtained a number of papers written by Findeisen and a few other researchers in Europe who were also working on the problem, without much more success than we were having. And I

remember one of the articles by Findeisen suggested that we should have something like quartz. It tried all kinds of quartz, and it didn't work at all.

Droessler: You mean you dropped the quartz particles into the supercooled cloud. Well, how did you make the supercooled cloud?

Schaefer: One of the first deep freezes that General Electric built. I managed to get one and found that I could breathe into the chamber, and a nice cloud would form that was supercool.

Droessler: That in itself was an interesting experiment. As I remember, you lined the chamber with black velvet so that when you put a light in there you could see the particles that were formed, the water droplet particles.

Schaefer: I still have a chamber down in the basement in my laboratory.

Droessler: The old G.E. deep-freeze box.

Schaefer: They have given up, but I have a brand-new one I just recently got from the University, to continue my experiments. But anyhow, I tried every conceivable kind of stuff...our shelves were just covered with chemicals of every kind. And I went right through all of them, powdered materials, and none of them worked very well. A few would produce a few crystals, but with this cold chamber, you could see a single crystal living in the cloud.

Droessler: You were probably looking for a crystal that was compatible or looked like the frozen water crystal.

Schaefer: That's what my colleague, Bernie Vonnegut, figured out. I wasn't even that sophisticated at the time. But, on a particular day in 1946--it was a very warm, humid day and I was using my chamber very actively. And it began to get warm and it warmed up. And I decided to cool it down by putting some dry ice in it. And the instant the dry ice got into the supercooled cloud, everything was ice crystals. So I could see, I had the answer. It was a serendipitous event, and I was smart enough to figure out just what happened. So I took the big chunk out of the chamber and used the smaller one and a still smaller one until I finally found that by producing the supercooled cloud, and then scratching a piece of dry ice held above the chamber, a tiny grain would just flood the chamber with ice crystals. So I knew I had something pretty important.

Droessler: What were the physics of that, the dry ice was at about -80 degrees Centigrade...

Schaefer: -78 degrees, yes. We still really don't know, but Langmuir came up with a sensible answer: he figured that it was such an intense super-saturation that very locally the molecules were so crowded that they just assumed a different form of

ice, an ice that had been studied recently, and that particular type of ice only grew for a very short time in very strong dimension, and that as soon as it began to grow, it shifted back to normal ice, and it looked to me as though that was a very logical answer to it.

But anyhow, it was what we then called "homogeneous nucleation." I found that about -40 degrees was a critical temperature, that it was very easy to produce a supercooled cloud down to about -38, -39 degrees Celsius, and it turns out that Celsius and Fahrenheit are identical at -40. So when Langmuir came back from the West Coast, I showed him this effect and he was just ecstatic and he was very excited and said, "Well, we've got to get into the atmosphere and see if we can do things with natural clouds." So I immediately began to plan to use a small plane and to seed a natural cloud.

Droessler: With dry ice.

Schaefer: With dry ice.

Droessler: Crushed dry ice.

Schaefer: Yes.

Droessler: Fascinating, you know, such a simple thing, but it had to be observed and it had to be understood to the point of "here it something that equals something important, something new."

Schaefer: One of the very--to me, an amusing situation, I demonstrated this at a number of scientific meetings, and everybody got quite excited about it. Harry Wexler came up to me, and said, "You know, about ten years ago I was calibrating thermometers in a cold chamber using dry ice, and I wasn't smart enough to realize I had something important." Because he had everything that I had, but he just didn't observe.

Droessler: Harry at that time was a chief scientist for the U.S. Weather Bureau. And the U.S. Weather Bureau was a little concerned about the authenticity of the cloud seeding, whether or not this was a reality. Somewhat doubtful.

Schaefer: I know. We had many problems with the Weather Bureau.

By automatically generating smoke the way we did it, we got exactly the right size particle--6/10 of a micron. And they were all the same size.

Droessler: So that's the optimum size for best reflectivity of the light.

Schaefer: The curve is a very steep curve, and this peaks at 6/10 micron. Of course, that's the middle of the invisibile spectrum, so everything worked out perfect.

...most of the new ventures. I was invited to give talks all over the place, in England and Switzerland and other places.

Droessler: As I remember, you and Dr. Langmuir then became celebrities within the meteorological community. The American Meteorological Society paid attention to you, the OSRD in Washington paid attention to you, the National Academy of Sciences, and the U.S. Weather Bureau paid attention to you. You really moved in now into our field of meteorology and took a front seat, because you had found something new in cloud physics.

Schaefer: And of course that all went to Project Cirrus, which was a five-year--

Droessler: What was Project Cirrus?

Schaefer: Project Cirrus was a joint effort of the Air Force, the ONR and the Weather Bureau, who sort of had observers during our operations. But primarily the Air Force supplied us with two B-17s. And eventually a B-29, that were quartered out of the Schenectady airport. We carried on about 250 experiments in the five-year period. And finally, with the advent of the Korean War, all of our pilots were taken away from us, and since we had a terrible time training them to do the kinds of experiments that we needed to get quantitative information, I told Langmuir we might as well just close shop because it would take a year to get these new recruits trained to get the kinds of things we wanted.

Droessler: Now, were all these experiments under Project Cirrus carried out with crushed dry ice or did you use silver iodide?

Schaefer: About a month later, after I found the dry ice effect, Bernie Vonnegut came up with this silver iodide.

Droessler: I wanted you to talk about Vonnegut's work, too, because he was a close associate of yours and Langmuir. There was Langmuir , Schaefer and Vonnegut at the General Electric Research Lab. Now, what did he do, Vonnegut?

Schaefer: Vonnegut had been working on supercooling of tin, and working with an entire different group of research people--Herb Holloman and John Fisher. He was so intrigued with what we were doing that he asked if he could be transferred to Langmuir 's group. So we welcomed him, and he came up with the idea that there might be a molecule having a crystal very much like ice. He just went through the chemical handbook and found out that silver iodide was an ideal particle to try. He tried it and it didn't work. Later on, I helped him some, and later on he found that he had a very poor grade of silver iodide, and there was something

contaminated. I had found that just using iodine without any of the silver iodide, I could get some interesting effects, and I later found out that this was a reaction with the lead in the atmosphere, producing lead iodide. I didn't know about it for some several years later.

Droessler: So lead iodide then turned out to have approximately the same kind of crystal structure as ice.

Schaefer: Yes. But it has some disadvantages, so silver iodide was by far the best.

Droessler: So Bernie got some more pure silver iodide and it worked beautifully.

Schaefer: Yes. And produced about the same general effects, fantastic numbers of particles. About the same number per gram of material.

Droessler: So this led then really to a grand march forward in cloud modification and precipitation increase, "rainmaking," as it's sometimes been called. This spread not only to many parts of the USA but all over the world.

Schaefer: And it's still--I had a letter from Tom Henderson a couple of days ago saying that he just attended a big meeting in, I think it was in Vienna, where 25 different countries were represented describing their cloud-seeding activities. So there are lots of things going on in Europe. One of the most impressive is the operation in France. They almost have a thousand ground generators, and every storm that comes across their vineyards is seeded. Fantastic operation.

Droessler: What is produced by the ground generator?

Schaefer: Silver iodide...

Droessler: Why do they want to protect, are they protecting their vineyards, or are they trying to increase the precipitation?

Schaefer: Oh, no, protecting from hail. It's a big operation, and that's been going on for thirty years. Every year.

Droessler: Well, they must be getting some results, you know, this is a commercial operation, and they wouldn't be continuing it if they weren't getting results. So if you seed the cloud early, then you--

Schaefer: That's apparently the idea.

Droessler: Then you limit the development of the cloud vertically so that it doesn't go into the full robust thunderstorm and create all kinds of lightning and hail that can damage their crops.

You were going to talk about another interesting aspect of things.

Schaefer: I got to know Dr. Carl Rossby quite well. Many years before, I had become very much intrigued with certain cloud types in the cirrus levels, clouds that moved very fast. And when I began hearing about jetstreams, I began to wonder whether or not cloud forms in the jet stream could be used to learn something about the jetstream. So I met with Rossby at a dinner when he was president of AMS, and I asked him whether he thought that clouds could be used to identify the jetstream. And he thought a bit, and he said, "Well..." and he didn't say why not, but he had never thought about that particular aspect of things. So [he] then encouraged me to really pay some attention to clouds that might be in a jetstream. And without any question, I quickly found that if the weather map didn't show a jetstream where you see these clouds, the weather map was wrong. It was so perfect a relationship. It turns out that where I live here in Schenectady, is what they call the "exit zone" for the jetstream from across the United States. It comes in around Seattle, Washington, and exits over New England and fortunately over Schenectady, New York, very frequently, probably because of the configuration of the valley and other things. So I began to observe and gave it a rather nice paper that Rossby published in **Tellus**, the first colored picture he ever published in his journal of jetstream clouds. And there are four types of clouds I had identified, ranging from about 20,000 feet up to about 40,000 feet. I learned a great deal about characteristics of jetstreams in just looking up at the sky here in Schenectady.

Droessler: Well, we have covered pretty well your early days and activities in the field of meteorology, and how you moved into our field. What was it that got you interested in science generally?

Schaefer: It turns out that when I was about thirteen years old, I found an arrowhead, and that triggered off a whole series of activities which led eventually to meeting the state archaeologist. And when I was sixteen years old, he invited me to spend a summer with him in the field. It turns out that I probably knew more about local Indian settlements than anybody else because I was an inveterate roamer and there were very few places in the Mohawk Valley that I didn't know about. He apparently was quite impressed with the depth of my knowledge, which I picked up completely on my own, and had made it a plan to make a survey of the county in Central New York. He invited me to accompany him for a month. On the way to this location, which was in Keuka Lake, I saw a cloud, a very strange-looking cloud, and that, without my realizing it, got me interested in looking at clouds because it was such a strange-looking thing. I know now it was a jet stream.

For a month, we stayed at a lakeside log cabin. He did the cooking, I did the washing of the utensils, and every day we would go out into the field looking for arrowheads and Indian sites, and we pretty well covered Cayuga County. Dr.

Arthur Parker, the state archaeologist, was a Seneca Indian, very brilliant fellow. I hadn't known him from the standpoint of any aspect of things until this field trip. But we hit it off very well. In the process, he encouraged me to develop an inquiring mind and we just looked in every aspect of natural science. He taught me some Indian words, and called things--natural berries and so on--with their Indian names, and I became very much intrigued with the whole business. The month we spent in Cayuga County was one of the high points of my life, and I still think back in having almost a perfect setup.

Droessler: You say he was an American Indian.

Schaefer: Seneca. He was descended from Ely Parker, who was a chief aide of U.S. Grant in the Civil War.

Droessler: Would he have been considered sort of a standout at that time...

Schaefer: Yes, outstanding, and was quite involved with the Indian movement. I recently found references to his participation in conferences down at the Mohonk Mountain House, and a friendship developed between the two of us which persisted until he died. Whenever I went West--every year we went West, I took my family with me--we'd always stop at his place and spend the night. He had a farmhouse above Canadaigua Lake, which was a convenient stopping place on my way back from the West, coming back from the West.

Droessler: You were very fortunate to have met him, at such a young age, and then have him take an interest in you.

**END OF TAPE 1, SIDE 1**

# Interview with Vincent Schaefer

**TAPE 1, SIDE 2**

Schaefer: We were talking about the influence Dr. Arthur Parker had on me to get involved in science. As I said earlier, he was a very, very intelligent man. In fact, one time we were exploring a place in Cayuga County, and we were staying at a farmhouse, and a young girl somehow sensed that he was a pretty smart man. So she got out the Encyclopedia Brittanica and opened it at random, asking him questions. He could answer every one of them. He was just fantastic.

Droessler: Do you remember where he was educated, at what university...for archaeological--

Schaefer: I don't think he went to the university. I think he was pretty much self-taught...

One thing he believed was that one of the very important places that young people learned things was on farms. And he said one time he was addressing a large group of very intelligent people, and he asked them, "How many of you grew up on a farm?" He said practically everyone raised his hand. And of course this is very important because on a farm, you learn how to solve problems on your own when you're very young. You see your grandfather or your uncle or your father solving an urgent problem, finding a way to cope with a situation, and this is something young people don't get anymore. It's one of the very--

Droessler: Dr. Parker must also have been a very widely-read individual. He must have read a great deal. How else would he get all of this information except through his observation and then his reading?

Scahefer: That's what I learned from him. What I learned was, if you have a good library, you're way ahead of almost everybody because people just don't take education seriously until they're later on in years. So I have never hesitated to buy a book which I felt I needed.

Droessler: One of the unusual characteristics of Vincent Schaefer as I remember him over all the years is that he elected to stay in Schenectady. And then were many opportunities for you to move about the world, and about the United States. I remember at one time the chief of the Weather Bureau, Dr. Reichelderfer, was discussing with you a possible opportunity for you to come to Washington and to be associated with his cabinet in the Weather [Bureau]. Was this a true recollection on my part, and what other opportunities did you have?

Schaefer: I think to a degree it's certainly true. One of the things I learned from Whitney and from Langmuir was you should never stay with a particular subject for more than five to seven years, so that at the end of that period, you should be looking for something else to do. Because if you're with a particular subject for five to

seven years, things are becoming old hat. They've lost some of the initial romantic aspects and other attractive features and things become sort of routine. So I've looked over my life to see if I followed that, and sure enough, every five to seven years, I've changed.

Droessler: But you didn't have to move.

Schaefer: I didn't have to move...when I needed to get into a field in some distant place, I always had a retreat here in Schenectady, and this was probably ingrained in our family philosophy. My folks were local people and my two brothers and two sisters still live there. We think that this is just a wonderful place. I haven't found anyplace that I'd rather be than where I am now.

Droessler: But of course you were fortunate in being able to find different employment, while still staying here in Schenectady. Most people find, if they leave one job, to go to some other job, it usually involves a move. But you were able to bring the employers, of yourself, to Schenectady and hire you here. You left G.E. and...

Schaefer: Serendipity has ruled my life, without any question. Which is basically taking advantage of opportunities which you hadn't expected.

Droessler: But you take a very great risk this way, and most people are very reluctant to take that risk.

Schaefer: But you see, the key to the whole business was I served my apprentice; I became an expert toolmaker. And a toolmaker can find a job almost anywhere. Because it's a very basic trade, and it's a trade sought after by a lot of people. Things are beginning to change right now, but until very recent time, a toolmaker had, what you might say, money in the bank. So you could take a chance. You knew you had something to fall back on and that gave me a certain amount of confidence if a new opportunity didn't work out, I had someplace to fall back from. But I never had to resort to it.

Droessler: Carl Rossby had the same philosophy in life, that Whitney and Langmuir shared with you.

Schaefer: I think he did. He shifted when he saw opportunities.

Droessler: I remember we were in Woods Hole and we were sitting there on the waterfront, and he told me, he said, "Earl, you know one of things you have to remember is that if you have a job for five years, don't let that extend beyond ten years. When five years come up, try to reach out in front of you and put a block out there so there's a perturbation in your life; you have to go over it or around it." Very sound advice, and I look back over my life, and it's been happening very much like that.

But after you left the General Electric Research Laboratories, then who did you link up with? Was it the Munitalp?

Schaefer: Yes. For five years, then an extension of a couple of more years. And then I decided to go to private consulting. And this gave me complete freedom, but was taking a great chance, because I had a family by that time. I had a wonderful wife, and she seemed to be willing to take chances and we never regretted it. And about that time, because I was free, the opportunity to develop a program for bright youngsters came up; our education committee of the AMS was approached by Ken Spengler and Tom Malone to see whether or not we could gear up to take advantage of the need for getting young people interested in science, same as the kind of talk you hear today. But this was sort of the Sputnik era, and I was just a member of the education committee with Jerry Spar and Roscoe Braham and three or four others. We were approached to see whether or not we would be willing to take a chance in developing a summer institute for young people. I was the only one available to have the time to do this, and I told the committee that if they [would] leave me alone, I would take on the responsibility. So, with Tom Malone's help, we developed a program at the Loomis School. I wasn't at all sure that my ideas would work, so we had Professor Constant agree to give a course in physics as part of the day, so that if my ideas didn't work out, the students wouldn't be wasting their time--they would have a pretty solid physics background at the end of the summer. This was an eight-week period, and when I went to Loomis School, they were rather apologetic about the space they had available, which was a firing range of the school--the basement with just concrete walls, nothing else. I told them if they could give me forty tables for my students, and chairs, and a big table, that's all I needed. So I brought all my equipment from my home laboratory and got a lot of things from the hardware store and the ten-cent store, and set up a program of research. Before I left to Loomis, I made a list of 100 projects that I knew would be interesting for the students to do research on, and circulated these lists to the students, and had them make a list of ten projects that appealed to them. In checking over the lists they prepared, I found that I could give them their number one selection with equipment from my laboratory, which would put them in business. So I spent about twenty minutes with each one of the students, told them what they had to do and let them alone. It just worked out perfectly.

Droessler: So this was a hands-on experimental summer?

Schaefer: Hands-on experiment. In fact, one of the boys came to me at the end of the program and said, "I never knew there were so many things you could do with Scotch tape." It was a very exciting operation.

Droessler: Now how long did you carry on this program?

Schaefer: Eight years.

Droessler: And you called it the--

Schaefer: "Natural Sciences Institute."

Droessler: "NSI." And who provided the funds to--?

Schaefer: Initially, NSF, but after three years, I got the money from the Kettering Foundation. In fact, that process was very embarassing to Dave Barry who was director of ASRC at the time. I just wrote a letter to Ed Voss of Kettering Foundation. He came through with about $150,000. No standard procedure at all.

Droessler: No lengthy proposal, great budget and all that...Yes, that would be embarassing to the organization to have that money coming in and no proposal to back it up, no paperwork.

Schaefer: It was a lot of fun. The Kettering Foundation told me afterward that they never had a project which used so little money. Originally, I guess it was for three years, and it ended up about double that. But that's what got me into the university, because Henry Lanford, son of Oscar, had such a profound change to one period that Oscar said,

**END OF TAPE 1, SIDE 2**

# Interview with Vincent Schaefer

## TAPE 2, SIDE 1

Droessler: This is the beginning of side A, tape 3 [sic] of the conversation with Vincent Schaefer. It's 3 pm on May the 8th, 1993. Vince, let's talk about your relationships and discourse with the universities of our country.

Schaefer: Mmm hmm. Certainly, after I found a way to modify clouds with dry ice seeding, I began to see the possibility of using some of the contacts that were developing with me in western universities to help them start departments of atmospheric science. But I didn't have much of an opportunity to do this on a serious basis until I became director of research of the Munitalp Foundation in 1952. And at that time, one of the first contacts I had was with the University of Arizona. Lew Douglas, who was former Ambassador to Great Britain, and Richard Reeve, who owned a big ranch back of Tucson, approached me and wondered whether or not it wasn't possible to develop a cooperative activity with the university. And I encouraged them along this line, and sort of sowed the seed for something that finally became the Department of Atmospheric Science, or whatever it's now called at the University of Arizona. I spent parts of a week talking with the president and a few other people, and then nothing very much happened. But I stayed in contact with Doctor -- with Lew Douglas and Dick Reeve, and eventually, I learned that Frank Ludlum and B. J. Mason had been invited to sort of look over the kind of things I had recommended, and I guess they more or less approved it, and the department was formed, with Dr. Kassander as the chairman and...I can't remember what's the name of the...I can't remember the name of the -- one of the chief young scientists who went there.

Droessler: You mean Jim McDonald?

Schaefer: Jim McDonald. So I visited them several times after that, and it looked like they were getting something pretty good underway. And then you and I became involved with the formation of the Desert Research Institute, and I'll never forget the afternoon session we had up on the balcony above the river, where we sort of hatched the plans to approach Vice President Wood -- Walter Wood -- with a plan to form a research institute, which he enthusiastically supported, and asked us to try to help and -- to find a director. And we tried very hard to get Helmut Weickmann involved, but his wife didn't like the climate of Arizona -- of Nevada, I should say. And nothing much happened. Then I suggested they -- I knew that Wendell Mordy was interested in finding a job, and we approached Wendell, and he became quite enthusiastic. And being the top-notch showman that he is and operation person, he soon had the Fleischmann Foundation and other groups (laughter) supporting a very active group. And at the initial period, Wendell and Joy Leeland were the two persons in DRI, and that was the case for several years. But then with funds from the Fleischmann Foundation, he managed to get a very substantial program underway. But instead of taking my advice, which was to

support outstanding young scientists fully, he chose the other way: to use the funds he had to support them partway, and then depend on them to raise additional money. And I think that has plagued them forever -- ever since, because the principal scientists have always had to do some scurrying around to find funds, while I think that our ASRC was much stronger from the standpoint of stability and morale on the part of the scientists we had, the young scientists we had, because we supported them fully, and told them that if they wanted graduate students or special equipment, that was up to them. And that worked extremely well.

Droessler: You know, looking back, it may be that Wendell did not ask enough of the university and of the state of Nevada. Whereas here at ASRC, you had...

Schaefer: Well, he had a lot of money from Fleischmann -- several million dollars.

Droessler: So he had the money, but --

Schaefer: He had the money, but --

Droessler: -- he used it differently?

Schaefer: That's right. He spent himself pretty thin initially. He had the five different departments, and he sort of formed the departments before he got the people. Well, we just sought to get the very best people we could find -- young people -- and then leave them alone. So we had quite a difference in opinion about the way...

Droessler: He also built a very unique facility there called --

Schaefer: Oh, very much so.

Droessler: -- the -- what was that called? The "Atmospherium?"

Schaefer: Yes. But that only lasted a few years.

Droessler: Mmm hmm. But it was supposed to --

Schaefer: And then it was taken over by the university.

Droessler: Yeah. It was quite a draw. A lot of people just came to --

Schaefer: Oh, it was beautiful. A beautiful setup.

Droessler: Yeah. Came to the university to see it --

Schaefer: Yeah.

Droessler: -- and see the programs there.

Schaefer: Yeah. Had a very spectacular operation. And he pioneered the use of the -- what is now the Omnimax, or whatever it's called, this full -- huge screen presentation of some subject. He had the original concepts, and helped put that whole thing together. So he was an outstanding person with lots of good ideas. Then I became involved with the University of Colorado -- Colorado State University, and managed to get Herb Riehl very much interested in becoming head of their research department. Or chairman of the Department of Atmospheric Science. But then there developed some real -- very serious problems between Dick Schleisner (sp?) and Herb Riehl. Schleisner, who I worked with initially, was very enthusiastic about putting together a department, and got the support of the president. But then began seeking grant funds, as I remember it, and ran into a problem with Herb Riehl. And for a while, I guess, Herb wasn't buying any of the things Schleisner was doing. Finally, peace was declared, and Schleisner moved on to the School of Mines at Rapid City, where he became -- eventually became president, and has done a very fine job up there.

Droessler: He certainly has. He did a fine job at Colorado State, you know, and --

Schaefer: Yes, I know.

Droessler: -- moving it from zero on up, and...

Schaefer: Sure, sure.

Droessler: And if he hadn't had that difficulty with Herb Riehl --

Schaefer: Yeah.

Droessler: -- he would have made even faster progress.

Schaefer: That's right. Then I became involved with Montana State University, with Armon Super (sp?). They were carrying on a rather imaginative cloud seeding operation, trying to augment the snowpack in the high country. And I spent several days with him back in the... I learned how to run a snowmobile, and had a very interesting time in the backcountry, looking at some of their snow collecting equipment and things of that sort. But that didn't amount to a very large contribution. Then there was a group at the University of Wyoming. I can't remember the name -- John...?

Droessler: Bellamy.

Schaefer: Bellamy.

Droessler: From Chicago.

Schaefer: That's right. That's right. John Bellamy asked me to become involved with him, see if we could put together a group that would be involved with cloud seeding

and such things. And invited me to look over the Elk Mountain setup. I went to the summit of Elk Mountain with several other supporting people. They got funding from the Bureau of Reclamation. And previously, I had suggested making a observatory out of a -- just a two-doored structure like a garage, with moveable doors on either end. So when you wanted to sample the clouds, you just opened the two doors, you just opened the doors and the cloud would go right through. (laughter) And that was a wild place. The wind was always blowing very hard, about -- almost hurricane force. And I'll never forget one time we were trying to put out a balloon. And we got the balloon inflated, released it outside -- it went right back into the building! (laughter) But they called that the "Schaefer Shack." (laughter)

Droessler: (laughter)

Schaefer: But we had some very interesting times up there, and that was a wild place. And I don't' know whether it's still used, but it was an ideal place for some quantitative studies, because there are two peaks about a half-mile apart. You could do one thing at -- on the upwind site, and measure whatever happened on the downwind site. And then I became involved with RPI, and at that time, it was shortly after I left General Electric. I brought Ray Falconer with me, and we got quite involved in atmospheric electricity studies, and with the mountain or ridge station that RPI had east of the campus by eight or ten miles, carried out quite a few studies. But that was one of the things that didn't work out too well, because we found a conflict with the president's basic ideas and the way he wanted to see the academic programs move. I brought in Wendell Mordy to see whether he would be interested in becoming head of that group because Robert Fleischer, who was on the staff of the university, urged me to try to see what we could do about that. But after Wendell had met with President Falson (sp?), he decided that he didn't want to have anything (laughter) involved with him. And I could appreciate his attitude.

Droessler: And again, looking -- you know, in hindsight, looking back, that was a good decision, because it allowed the State University of New York at Albany to become more developed and --

Schaefer: Right.

Droessler: -- actually take on the responsibility for --

Schaefer: Yeah.

Droessler: -- atmospheric sciences in this region of the --

Schaefer: Right.

Droessler: -- U.S.

Schaefer: Yeah. Because a lot of the thinking that went into ASRC development was initially planned for RPI. Then I had some very nice relationships with the Bureau of Reclamation, with the head of the Bureau, Clyde Domeny (sp?), and Walter Gartzska (sp?). And Walter and I got along extremely well. I got to know him quite well when he built his mountain house up at New Brady (sp?), Colorado. And initially, our contact was with evaporation reduction from reservoirs, and I supplied them with a lot of the information we had -- Langmuir and I had worked on in preventing evaporation from a water surface. And they set up a pretty big operation in one of the Texas towns -- I don't know whether it was Houston or Dallas -- where they had a spectacular operation where, on a windy day, the monolayer that was spread out on the surface of the lake prevented any waves from happen- forming, just like a mirror. But again, we learned by the field operation that wind was a problem, because while it held for a while, after a while, a small difficulty would happen, and then it would progressively get worse, and after half an hour or so, the entire film would collapse. Then we went -- we became involved with the University College at Fredonia. Dr. Langmuir -- Dr. Oscar Lanford, who had been director of ASRC, came to me rather with a troubled look on his face and said he'd been offered the presidency of Fredonia. I says, "Well, by all means, take it, because that'll give us a chance to expand (laughter) our activities!" And this happened, and with Lanford's blessing, we embarked upon a big study of lake effect snowstorms. That was the first time there was a recognition that there was a special type of storm coming off the Great Lakes. And they accounted for these very heavy snowfalls at Jackson Hill near Booneville, and other big ski area near Turin. And some years later, that was -- study was...expanded, and quite a bit of information was obtained about the nature of such violent storms. And then, of course, we had a very strong relationship with Jack Workman (sp?). Dr. Workman was head of the School of Mines, but it was now called Mexico -- New Mexico Tech, and we began working with him very actively about -- in 1948. And we initially set up our programs and our project at "the Ranch," as he called the School of Mines, which is now occupied by the Los Alamos -- the Sandia Laboratories. They took over, condemned the land, and took over while Workman moved down to Socorro. And we worked very actively with Dr. Workman and his staff for a number of years, and helped identify the location, which is now occupied by Langmuir (sp?) Laboratories on top of the mountains.

Droessler: I remember that was a long and fruitful arrangement you had with Jack Workman, and he --

Schaefer: Well, I had a very wonderful time.

Droessler: Yeah. It's Soccoro, and for yourself, and for Langmuir, and for others, it gave you a place where you could operate from, and --

Schaefer: Yeah.

Droessler: -- in the Southwest whenever you wanted to.

Schaefer: And then I had a very nice relationship worked out with the University of Northern Arizona.

Droessler: Right.

Schaefer: And with the help of the Fleischmann Foundation, I managed to get enough money to put up a building for -- centered around students, young students. And ran that for a number of years. And it's -- was initially called "Fleischmann Hall;" (laughter) they now call it "Schaefer Hall."

Droessler: Is it, now?

Schaefer: Yeah. Still used as a adjunct apartment for visiting scientists, and I have the availability of it any time I can find my way clear to get out there. Which I haven't managed to do. But they had a very exciting research center, with all sorts of disciplines. And we carried out some very serious studies. Lake Powell, when Lake Powell was being -- just being filled, and that's where -- when I met Orson Anderson. And then of course, the development at Albany, which initially was a operation geared to relate to the entire system. We had a -- we still have a -- I believe, a arrangement with the central office to head up atmospheric sciences within the university system. But it turned out to be more practical to do this under the aegis of the university at Albany. And that's the way ASRC operates at the present time. So all in all, I -- while I don't claim to have influenced the departments of atmospheric sciences to a profound degree, I think I was somewhat responsible for the initial contacts with the presidents, because I had a stature at that time which permitted me to talk with them man-to-man, and in a number of cases, they took my advice.

Droessler: And that was so very important, too, to have a chief executive officer, the president of the college or university, become familiar with --

Schaefer: Yeah.

Droessler: -- atmospheric sciences --

Schaefer: Right.

Droessler: -- on his campus and what the potential was.

Schaefer: Yeah.

Droessler: And he was -- what a better way to do that than to have someone like yourself come on campus and meet with him, and others (inaudible). So to lead the way for the departmental people to --

Schaefer: Right.

Droessler: -- move forward.

Schaefer: Yeah. And during the -- that early period at SUNYA -- State University of New York at Albany -- we formed the department by taking advantage of the experience that John Scott had at the University of Wisconsin. And he pretty much copied the setup they had at the University of Wisconsin, and that became the -- you might say the "charter" for the department.

Droessler: Well, Vince, that's quite a fine recollection you have of your association and interplay with the western universities. I'd like you now to reflect on some of your activities in the offshore -- in the international sphere of meteorology.

Schaefer: First time I went to Europe, I was involved with a -- I guess it was the centenary celebration of the World Meteorological Society. And I was put up at Oxford University. Nearly froze to death. That's the coldest bunch of buildings I think (laughter) in the university.

Droessler: In England, you don't need heat --

Schaefer: Anyway...

Droessler: -- in your rooms.

Schaefer: (laughter) Had a little bit of a heating unit about the size of a pencil (laughter) and about a foot long. That was the source of heat for the whole -- your room. And I was so cold, I raided the -- all of the lockers that have clothing, and just piled the clothes on top of me (laughter) -- and was still cold! But that was a wonderful time. I met Sir Watson-Watt, who was credited with inventing the radar. And he invited me to give a special lecture before a physical society, I think it was. And they just gave me the royal treatment. And I met Ludlum and Mason, and most of the younger people, and a number of the older people. And that was right after the -- I discovered the dry ice seeding, so I had a rather interesting lecture I gave. About the same time, or maybe a year or so later, I was invited to go to Switzerland by de Quervain, and I spent about a week at their Snow and Avalanche Research Institute doing my own research, and found some very interesting relationships with the crystalline structure of ice.

Droessler: I thought -- was that "Davos?"

Schaefer: "Davos," yeah.

Droessler: Or "Devos?" And Roland...?

Schaefer: Marcel de Quervain.

Droessler: Yeah. He was there at that time. That's right.

Schaefer: Yeah.

Droessler: Yeah. Roland was moving on up, and Marcel was in charge.

Schaefer: He was at the University of Zurich, with Sanger.

Droessler: With Professor Sanger? Roland Liszt (sp?)?

Schaefer: Yeah.

Droessler: I believe he took over that laboratory after Marcel left, and then...

Schaefer: No.

Droessler: He didn't?

Schaefer: No.

Droessler: Oh, he had a --

Schaefer: This is snow and avalanche research. That was up in the mountains.

Droessler: Yeah.

Schaefer: I've forgotten who did succeed him, but it wasn't Roland.

Droessler: Mmm hmm.

Schaefer: That really wasn't his field. His field was more related to hail and --

Droessler: Mmm hmm.

Schaefer: -- wind tunnels and so on.

Droessler: Yeah. Well, he had a wind tunnel up there --

Schaefer: Yeah.

Droessler: -- that he ran, you know, up in the avalanche station, Roland did, because I remember he took --

Schaefer: I didn't know about that.

Droessler: Yeah. He took me up there to visit.

Schaefer: That must have been later on.

Droessler: Yeah, it was. When I went over to visit Sanger.

Schaefer: Mmm hmm. And then I spent some time in Scandinavia, first in Stockholm, then in Oslo and Bergen. During Project Shower, which occurred in the early period of my contact with the Munitalp Foundation, I was invited by Wendell Mordy to participate in Project Shower. And this was just a marvelous operation. We were there for about a month. Lived in the abandoned Officers Club. And it was a very exciting operation, because everybody was there with their objectives to do research. Duncan Blanchard was studying...

Droessler: Project Shower was based at the University of Hawaii, wasn't it?

Schaefer: Not really. It was in the Officers Club.

Droessler: Mmm hmm.

Schaefer: It was just a group of interested people that Wendell brought together. That was before they formed the Geophysical Institute, and in fact, I think he was related to the sugar association.

Droessler: Yeah: the pineapple growers.

Schaefer: Well, the pineapple and sugar operation.

Droessler: Mmm hmm.

Schaefer: We worked on the big island.

Droessler: So you were studying clouds and the rain mechanism?

Schaefer: Yeah. Up near the top of the clouds. Which you could do by going up the Saddle Road. And you could get up above the clouds, and then gradually, the clouds would creep up the mountain and engulf you. And we measured -- I measured the atmospheric electricity related to the formation of these clouds. Duncan was measuring the particle size distribution, and we spent a number of very enjoyable days together.

Droessler: Then, moving further west?

Schaefer: Well, actually, we had several interesting times at the university. I had -- at the Hawaiian Islands --

Droessler: Mmm hmm.

Schaefer: -- studying ozone and air pollution. I had my portable equipment, and made many measurements on the coast and up in the high mountains, including Mauna Kea, Mauna Loa, Haleakalā... And learned a great deal about the air qualities of that region. In fact, they are sort of benchmark stations -- benchmark measurements,

because I don't know of anybody who has made the intensive measurements that I made. One of these days, they ought to be repeated.

Droessler: So you were measuring atmospheric particulate? So if you're...

Schaefer: Mmm hmm. With a Gardner Counter.

Droessler: Gardner Counter, right.

Schaefer: And measuring ozone with the fluorescent device. And then I used the gas to particle reaction measured with a Gardner Counter to predict what the fluorescent ozone detector would say. And was able to predict it, to Broker's (sp?) surprise. (laughter) Because there is a fantastic interaction between particles when you have the right combination of chemicals that produce particles. And in three seconds, you can go from a background level of less than a thousand particles per cubic centimeter to ten million in three seconds. Such a powerful unit. And somebody, someday should really explore this possible -- these relationships, because they're still (hanging fire?). And Broker (sp?) and I made a number of stratospheric plates from Boston to the Hawaiian Islands at 43,000 feet, and measured the ozone concentrations and other particulates. Most of the time, the air was extremely clean, but every so often, we would find plumes of contaminated air. And then I did the same kind of measurements on the way to the Fiji Islands, and found that at the equator, it was very different relationships than on either side. And spent a week or two on a little island off the coast of Fiji measuring particles. I left my equipment with the native who I trained to make these measurements, and got quite a bit of information from him.

Droessler: Mmm hmm.

Schaefer: Then I spent several interesting days up at the Geophysical Institute up at the University of Alaska.

Droessler: Mmm hmm.

Schaefer: At the Geophysical Institute. And I made a profile of ozone from Anchorage to London. And at that time, there was no filter system on the Boeing planes, and the stewardesses were complaining of terrible headaches, and I got a headache just like they who were complaining about -- from ozone. We found concentrations ten times higher than were supposed to be allowable -- 1,200 parts per billion. And then on the way back from Heathrow in London to Boston, I was in touch with a captain. See, I made my measurements by tapping the little gadget on -- above every seat, which is used for --

Droessler: Bringing fresh air in?

Schaefer: -- ventilation.

Droessler: Yeah.

Schaefer: And that, at that time, connected directly with the outside.

Droessler: Mmm hmm.

Schaefer: So it was possible to get a direct measurement of the outside air. And in doing so, I told the pilot who I was in touch with that we must be approaching some contaminated source. He said, "That isn't possible. We have a clear run all the way to Boston." About an -- 15 minutes later, he sent word back that they were overtaking a (Comet?) that wasn't supposed to be there. (laughter) He was quite impressed!

Droessler: My goodness! I haven't heard much about headaches by crews or passengers on aircraft lately. Is that...?

Schaefer: No. See, they put filters in.

Droessler: They have filters? I --

Schaefer: Yeah.

Droessler: -- see. So the air coming in is filtered?

Schaefer: So you can't measure -- make the kind of measurements (laughter) I used to make.

Droessler: Mmm hmm. Well, that assures that the cabin air is --

Schaefer: Is pretty good.

Droessler: Is pretty good?

Schaefer: Yeah.

Droessler: And not --

Schaefer: Unless they have smokers.

Droessler: Yeah. And not toxic.

Schaefer: Yeah.

Droessler: Yeah. Smoking has just about disappeared now from aircraft, too.

Schaefer: Yeah. It used to be, you had a gift sample.

Droessler: Mmm hmm. Yeah, that's a long time ago. Did you ever conduct research in the Far East? You know, in Japan or...?

Schaefer: Oh, yes. I got a lot of information. (inaudible)

Droessler: On Hokkaido? Yeah, on...

Schaefer: Austin Hogan (sp?) and I spent quite a bit of time over in Japan with Miguno (sp?) and a younger Japanese. And we got measurements all over Hokkaido. Went up into the regions where they get the very heavy snows from the Sea of Japan, and then we went to the summit of Mount Heini (sp?), where the Japanese have a mountain station. Got measurements up there. (laughter) One of the amazing -- amusing things about that visit: when I got up to the summit, I found they had lengthened the bunk by three feet to accommodate me. (laughter) Because these Japanese were all from the -- probably poorer background, so they were very short people. The later Japanese are much taller.

Droessler: Yes, yes. They've got better diets.

Schaefer: Yeah.

Droessler: I think that's the secret.

Schaefer: Yeah. But I made a lot -- many measurements in the vicinity of the University of Hokkaido. I went back into the back country. I was invited to a ski lodge where there was supposed to be some hot springs to see whether they were anything like that Yellowstone operation, possible -- but found that it was a very minor hotspot. So that pretty much was the disappointment, but we were caught by -- in a blizzard for two or three extra days, and to this day, I don't like raw egg, which is what (laughter) the main breakfast specialty of the hostel...

Droessler: You mean they didn't boil it at all? Three minutes or --

Schaefer: Oh, no. Just raw. (laughter)

Droessler: Just raw? Oh, no. That's a bit much.

Schaefer: Yeah. (laughter)

Droessler: So --

Schaefer: But that was where we (laughter) were introduced to the communal pools, where the older and younger people congregate in these very hot tubs. Initially, you'd think you just couldn't stand it. Once you get in, it was just marvelous! And Dr. Miguno, who -- we were the guests of him, he...a very interesting fellow, in that he was always sort of reserved, but as soon as he got in a hot tub, he began singing, having the time of his life! (laughter) And the other interesting feature I observed with him was as soon as he got in back of an automobile wheel, he became a demon. He just was (laughter) one of the wildest drivers I've ever seen. (laughter)

Droessler: Interesting, isn't it?

Schaefer: I also got to know the daughter of Dr. Miguno, Dr. Nakaya (sp?). And she was a very brilliant engineer, trained in New York City. And she approached me with a request as to whether or not I had any idea how you can make a cloud -- what looked to be like a natural cloud. And it so happened that I knew Tom Meade (sp?) from El Medina (sp?), California had just discovered a way to make clouds of 12 μ diameter by using a very special nozzle and high pressure. So I introduced him to -- I've forgotten what her name was. And they hit it off very well. In a very short time, we had the Pepsi-Cola pavilion covered with a cloud. And now, she has passed this on to the park system of Japan, and she forms local clouds -- fantastic-looking things -- just to sort of -- like a Japanese garden, something unusual to --

Droessler: Part of the entertainment?

Schaefer: Yeah. I also had a wonderful time in Ireland. I wanted to see the places where Aichen (sp?) and others had done their initial air pollution measurements. So I visited the sites that they occupied, and got some very interesting measurements of ozone and air pollution from continental and maritime air. And then Austin Hogan and I went on the *Meteor*, the ship that the German Meteorological Society has. We were invited to go on a cruise up to south of Greenland, and we spent a marvelous time with the crew and scientists of this group. Very exciting activities. And Austin and I just got a lot of measurements of air particles and... So we had --

**END OF TAPE 2, SIDE 1**

## Interview of Vincent Schaefer

## TAPE 2, SIDE 2

Droessler: Perhaps last but not least is the continent of Australia. As I remember, you spent a considerable amount of time there --

Schaefer: Yeah.

Droessler: -- making measurements and conducting research?

Schaefer: Yes. I had a wonderful time. We were invited by Taffy Bowen to spend part of a month there at the University of New South Wales. And that's where I met Joe Woburn (sp?) and Pat Squires. I was given the use of their laboratory, and I had a wonderful time studying some new ideas, and which I had in relation to the development of techniques to work with particles. And developed some very nice techniques for replicating particles. We initially went to Canberra, and that's where the main meetings were held. And then after that, the group dispersed, and our group went to Sydney, and I got the use of Joe Woburn's laboratory, and spent some very enjoyable days there. At the time, we also got to know Pat Squires very well, and he invited us to his ranch, which we accepted, and Lois and I spent a couple of nights at his ranch, and enjoyed the citrus and all the other things he had planted. He had a magnificent place. In the process, I met a very fascinating mining engineer who had spent his retirement period studying the movement of water. And he had developed a method for getting almost every drop of water that comes from the sky. He had a series of little dams in every one of the valleys on his farm, and he would have them dammed, and he had them arranged so that he could run a trench around the ridge to another reservoir a little ways below the upper one.

Droessler: Mmm hmm.

Schaefer: So with each one, he -- and he had two or three dams in every one of these little streams, and he would conduct the water around the ridges so that this was a very simple way of irrigating ridges which nobody had ever done before. And in addition, he had studied the soil, and he developed a way of transforming this red, (leaderite?) soil into the most beautiful black soil you ever saw, full of worms and... Just a marvelous operation! He studied the behavior of cattle and how they would break through a fence. He solved that problem by putting barbed wire below the surface of the ground, because that's what they would do. They'd get their head underneath the wire, lift up the thing, and then, oh, well, it might hurt them a little bit; they'd ruin the fence. He solved that completely. No more (laughter) of this fence breaking. Then he had the paddocks scattered all over his 1,000-acre farm. And as he had -- well, he planted the fields to a annual grass with rather deep roots. And he would run his cattle until they had exhausted every bit of the -- one of the fields, and then he wanted to move the, he just opened the

gates to the next one. And they'd been eyeing this lush, green growth. And (laughter) as soon as they -- he opened the gates, they'd stream in for this new place. And he had the scrawniest cattle I'd ever seen to do -- that he would buy around the countryside, and he'd end up with the fattest, most delicious-looking (laughter) cattle you can imagine!

Droessler: (laughter)

Schaefer: He was one of the most remarkable people I've ever met. He called it the "key-line system," and I've never seen it duplicated anywhere else. I've tried to get our local people in Cornell interested. They just weren't at all interested. But there's a lot of property in this part of the world where similar conditions exist. But in the -- Australia, it is a fascinating countryside. One thing I discovered with Lois is that it's a hostile environment. The woods, the backcountry, are full of leeches, and as soon as you get down into one of these lower portions, the leeches begin to move over toward you. Hundreds of them. And it sort of horrifies you when you first see them. And there are also poisonous snakes, and...

Droessler: Well, the leeches attract your body warmth?

Schaefer: Yeah, right. So we had a few experiences with leeches, but not very much. And then there were the bulldog ants. As soon as you pick a place to have a picnic, they'd begin walking over toward you (laughter), and they give a vicious sting. So while we enjoyed the experiences, I had a feeling that it wasn't anything I wanted very much to do with.

Droessler: Just too much hostile nature there?

Schaefer: Yeah. The Australians, of course, are very friendly people, and they're all -- they're boat lovers -- build their own boats, and... They invited us to one of their beer parties right on the bay of Sydney. And they invited us to go out in a pretty -- what I thought of as a pretty rough sea. And we just got out a little ways, and Pat says, "Take over." (laughter) I'd never piloted a boat in my life! (laughter) And I made a lot of mistakes, but gradually learned -- rather quickly what you had to do to keep from tipping over!

Droessler: Yeah.

Schaefer: I said, "Well, why don't you wear a lifejacket?" He says, "There's so many shark that it's -- it isn't worthwhile!" (laughter)

Droessler: (laughter) That was comforting!

Schaefer: Lois never forgot that.

Droessler: Yeah, they always had shark warnings on the beach.

Schaefer: Yeah.

Droessler: And they had shark nets --

Schaefer: Yeah.

Droessler: -- out there to keep the sharks --

Schaefer: Right;

Droessler: -- out of the swimming area.

Schaefer: They provided us with a beautiful apartment quite high up in one of the local apartment houses overlooking the bay, and we had the great enjoyment of having breakfast watching the ships move back and forth.

Droessler: And the ferries.

Schaefer: Yeah.

Droessler: That's quite a harbor. It's one of the --

Schaefer: It's a magnificent --

Droessler: -- I think is one of the most beautiful.

Schaefer: Yeah.

Droessler: I don't know of a harbor that's more beautiful than Sydney's.

Schaefer: Yeah, yeah.

Droessler: It's really (inaudible) lovely (inaudible).

Schaefer: Closest to it is San Francisco Bay, but that's no comparison.

Droessler: No. It's such a different kind of --

Schaefer: Yeah.

Droessler: -- a harbor than Sydney. Sydney has the last --

Schaefer: Yeah.

Droessler: -- masses closer to the water, you see, and it's still a very, very deep and imposing channel for ocean-going liners to come right up and park down --

Schaefer: Sure. (laughter)

Droessler: -- in the center of the city. It's wonderful.

Schaefer: (inaudible) Bowen invited us to go up to see his big pioneering radio telescope. That was quite a sight.

Droessler: Yeah, that was.

Schaefer: And then we went up into the Snowy Mountains and saw their big operation, hydro operation.

Droessler: Yeah, that's a massive water movement.

Schaefer: Yes.

Droessler: Development in hydroelectric development. Vince, I always like to conclude an interview by asking the question, "Who is Vince Schaefer?" And the reason for this is just simple enough: that the students years from now, you know, will be looking at this tape --

Schaefer: Sure.

Droessler: -- and wondering, "Well --"

Schaefer: (laughter)

Droessler: "-- who was this gentleman --"

Schaefer: Yeah, right.

Droessler: "-- called Vince Schaefer?" Yeah. So could you give us some biographical information?

Schaefer: Yeah. My folks were from Europe. One side, my father's side, were German; my mother's side were Holland/Dutch. One group came from a little town called Rhine (sp?), and the other from a town called Zuppen (sp?) in Holland. They came over in 19- 1858. A father, mother, and two children. And we just recently learned about some of these things. The father was named Solomon, and it's unclear whether they landed in New Orleans or in New York City. That's still a question. The family tradition was that they landed in New Orleans, came up the Mississippi, and on the way, Solomon was taken with scarlet fever and died, and was buried along the river. His widow managed to get to Albany with the two children, and with relatives of some sort. And my father's father was named Xavier -- Francis Xavier. He was a tailor, and my father's job as a youngster was to make buttonholes. And he just got so fed up with buttonholes that he decided he'd never become a tailor. So he was inclined toward the priesthood, and he went to Canisius College over in Buffalo, became a star pupil. Prior to that, he was at Christian Brothers Academy in Albany, and was the top student. Took all

the prizes and had a good time, apparently. Then he went to Canisius and graduated from there, and while he was there, he was the coach of the baseball club, which is still a pretty good one. He then went to Innsbruck to do some advanced studies, became somewhat of a mountain climber, but then his health failed. And he took treatments with the Father Knipe (sp?) water treatment, which technique he remembered until his dying day, when he died about 19- 92 years old. But he was never a very healthy person, nor was my mother. Both of them had all sorts of afflictions. My mother had cancer, pneumonia, asthma, hay fever -- just about everything you could think of. And all of their money more or less went to doctors. So as a young person, we had some pretty rough times. Never went to bed hungry, but often were surfeited by having a lot of bread and butter to sustain us. They were wonderful people, and my mother was a very remarkable woman. She was a singer, a beautiful singer, but devoted that phase of her life to the Catholic Church, where she ran -- she sung the requiems. And until she was 87 years old, almost every day, she sang a requiem mass at Madeleine Sophie Church up in -- between here and Albany, going there by bus, winter and summer. A very remarkable person.

Droessler: Really.

Schaefer: I know all of that because my sister had just collated all of her letters. For 30 years, she wrote a letter every week to my sister, and she saved them all. So it's just a fascinating thing to read these epistles. She was quite a good writer, and embellished everything with observations of nature and things of that...

Droessler: Sorry about that.

Schaefer: I was always of an inquisitive mind. When a boy and I -- my friend and I were about 13 years old, we decided to publish a magazine, which we did -- and it went through 21 issues over a period of three or four years -- called *Archaeological Research*. And that got us in touch with the local mayor, the state archaeologist... I talked a little bit previously about working with Dr. Parker. It was through *Archaeological Research*, this little magazine, that we were invited by him to come to Albany, because he was curious about what these youngsters were doing. Our -- the first issue of *Archaeological Research* had to be set up and demounted, the text -- the type redistributed 16 times in producing four pages. (laughter) But we learned an awful lot in the process of doing this.

Droessler: Sure.

Schaefer: And the reason we did this: this was a tribe paper. We belonged to the Lone Scouts, a organization like the Boy Scouts brought over by the same guy who brought Boy Scouts to America, W. D. Boyce. But he aimed this at the farm boys, or those boys that weren't interested in becoming Boy Scouts. We had a really wonderful operation, because the Lone Scouts had to do everything on their own honor. There weren't any guides or advisors, or anything of that kind of an older

generation. And the friendships that we made at that time persist today. We have a magazine which comes out every month, edited and written by former Scouts after -- and most of them are between 80 and 90 years old. And there are still about 200 of us left. (laughter) So there were a lot of these very interesting little tidbits which I became involved in with the encouragement of my mother. She was very much involved with guiding us, primarily to keep us out of mischief, I'm sure. But as long as it was anything related to natural science or anything of that kind, she would encourage us to do everything we possibly could. And it was through this that I got to know Arthur Parker, the state archaeologist, and some of our local historians, and a number of these old timers guided me a great deal, and so that I got to know the history of the region, and I found very quickly that older people are a wonderful asset if we take advantage of their goodwill because they appreciate a young person having a desire to learn more. I also had very good teachers in the public schools. But then I had to leave school when I was halfway through high school, and I became involved with the GE apprentice course. Learned to become a toolmaker after four years, and that was the best thing I ever did because it gave me a sense of confidence that I could take gambles in other areas. It was something I could always fall back on if I had to.

Droessler: Yeah. You always had a job.

Schaefer: But I never had to do that. (laughter) But it was always necessary for me to maneuver myself so I could bring some money into the family, because the family was quite poor. And even when I became a tree surgeon, I went to a school in Ohio where they actually paid you as you were attending school. Then, in the spring, you went out and became involved in pruning (inaudible) trees, and becoming involved in high-level operations.

Droessler: So you had a tree service business for a --

Schaefer: See, I --

Droessler: -- for some time?

Schaefer: -- wanted to become a forester initially.

Droessler: Mmm hmm, mmm hmm.

Schaefer: I wanted to go to college and become a research forester.

Droessler: Mmm hmm.

Schaefer: But when I realized I couldn't do that because of my family's situation, I kept that always in mind and eventually, after spending about five years at General Electric, I decided to see what I could do in the outdoors in something related to trees. But I soon discovered (laughter) that isn't what I wanted, because I found myself using my spare time indoors --

Droessler: Mmm hmm.

Schaefer: -- rather than outdoors, because I was so fed up with the outdoors (laughter) during the working days,.

Droessler: So then do you return to GE as a toolmaker?

Schaefer: I was -- well, I was invited to become a research -- a partner in a big nursery business.

Droessler: Mmm hmm.

Schaefer: This fella had the -- enough money. But he knew I had the expertise, which I had learned with the (Davy?) people. So I went back to the old laboratory, had a long talk with the superintendent, and asked his advice as to whether this is a smart thing to do, which I always tried to do if I possibly could. And he said he advised against it. He said, "I think we're having -- going to have economic troubles ahead." This was in 1929, so that was very good advice.

Droessler: Yes. Good foresight.

Schaefer: He said, "Come back to GE, and we'll give you a better job than you had." So I went back and worked in the machine shop as a model builder until the day when Dr. Langmuir came down and invited me to come upstairs and join him as his assistant.

Droessler: Well, had you made some things for Dr. Langmuir --

Schaefer: Oh, I made --

Droessler: -- and his experiments?

Schaefer: -- a lot of things --

Droessler: I see.

Schaefer: -- for him, and for Katie Blodgett.

Droessler: I see. So they knew of you, and...?

Schaefer: Yeah.

Droessler: They decided, "We'd better..."

Schaefer: And it worked out extremely well, because I had the run of the machine shop. I could use any machine that was vacant. So whenever there was a need for a research -- a piece of research equipment, I could go down, and a couple of hours, have built it. That was something that nobody else had.

Droessler: So Dr. Langmuir came down to the machine shop and asked you to come up to his laboratory to work with himself and Dr. Katie Blodgett.

Schaefer: Well, actually, I learned later, we had a final party for Katie Blodgett when she retired.

Droessler: I see.

Schaefer: And Dr. Whitney's one and only secretary was there. And a couple of days later, I got a long letter from her. And she said, "I don't know if you're familiar with what happened when Langmuir decided to invite you. He said Dr. Whitney came into the office one day with a pensive look on his face, and he -- she asked him what was troubling him. He said, "Well, Langmuir has quite a job. He -- his assistant, an old Englishman, is retiring, and he's looking for somebody to take his place." And she said without any hesitation, she said, "Well, Vincent Schaefer." He shook his head, went down, and talked with Langmuir, and Langmuir came down and invited me to come up. And of course, I had been working with Dr. Langmuir some time before with the winter sports club. He was a very active skier, and he and I in his two-seater plane went out together looking for ski slopes. So I got to know him before that quite well.

Droessler: Mmm hmm.

Schaefer: And we just hit it off very well. And I --

Droessler: Was that --

Schaefer: -- was able to do all the things he asked me to do.

Droessler: And so that started your years and years at Langmuir University?

Schaefer: Yeah. (laughter)

Droessler: Where you received one of the best educations in the country.

Schaefer: Couldn't have been better, because as I was told later, he could have had the pick of the Ph.D.s of the very best schools. And yet he selected me.

Droessler: Well, you had your love for writing, you had your love for reading.

Schaefer: Yeah.

Droessler: That was --

Schaefer: You see --

Droessler: -- given to you by...?

Schaefer: -- I had --

Droessler: Yeah.

Schaefer: -- all of that.

Droessler: Given to you by your mother, really?

Schaefer: Yeah.

Droessler: And your family. And any other --

Schaefer: And then the other interesting feature is that the thing that attracted Mary Christie, who was his secretary, as one of the first things I did when I went into the laboratory was to request permission to attend the (inaudible) every Friday afternoon given by outstanding scientists. And my interest in archaeology fit right into Dr. Whitney's interests. So we had some -- many kindred interests, and she saw this, and she was my -- one of my best friends. Well, we better be thinking about getting off to church.

(break in audio)

Droessler: Well, this is Sunday morning -- Satur- or Sunday morning, the 9th of May, 1993. And we're continuing our interview with Vincent Schaefer in Schenectady, New York. Vince, this morning, we might talk about the American Meteorological Society and your associations with the Society over the years.

Schaefer: Yeah.

Droessler: Would you like to recall some of that for us?

Schaefer: Yes. I look back with great fondness in recollections of my contacts with AMS. It started with a visit to Blue Hill and Charlie Brooks, who was the mainstay of the Society from its -- I think from almost its forming. Brooks was a very persistent scientific meteorologist, and many of the things that -- on which the Society and the whole field of meteorology rest on his shoulders. He was a very fascinating man, a great husband and a father of a bunch of kids, and... I'll never forget one of the interesting things I saw was a water fight between him and his boys, with pistols -- with water. (laughter) And he acted just like a youngster in the fighting that went on. Generally came out as a draw. (laughter) But he extended great cooperation to Dr. Langmuir and me. Well, when we visited him, we went up to the observatory on the summit of Blue Hill, looked at the view, looked through his stereo long-distance finder, and in general just had a good time. He made contact with Joe Dodge, who was one of the founders of the Mount Washington Observatory, and just made it quite feasible for us to get there to see what (inaudible) was all about, how Joe Dodge ran everything, and visited the summit in September of 1943. Out of that came a very, very intensive

research program which still has to be written up. There were about seven observers at the time, a number of them in uniform, and lead by Victor Clark, and ably supported by Ray Falconer. And it was at that point where I began to sense the amazing ability of Ray Falconer, to the point where I got him to join the General Electric company and our group at Schenectady. I was very active in the early period of the Society; was elected to the council, and participated quite actively in some of the things that developed over the years. Was a member of their Education Committee; was quite active there. And when I left...let me see -- how did that work out? There was a period when I was doing consulting work, and I guess it was between the time I left the Munitalp Foundation and the time I went to the University. And I had time on my hands, although I was quite active in consulting with many different large companies, including the Boeing Aircraft people. And out of that came the Natural Sciences Institute, which I formed and had a wonderful with young people, showing them what research was all about. And although these were outstanding young people -- the "cream of the crop," you might say -- my main objective was to show them how little they knew, and show them that they have to work very hard if they're going to really make a success of their lives. And I think I instilled in them a desire to learn, which is so important with a young person, and to get them to understand that the world is full of older people very anxious to help them if they show the proper motivation and desire to learn something.

Droessler: Of all the years you were associated with the American Meteorological Society, you had a close association with Ken Spengler, the executive director.

Schaefer: Very much so.

Droessler: Yeah.

Schaefer: In fact, I was sort of involved quite -- I don't quite remember just how much, but in the selection of Ken. Dr. Brooks ran everything as a tight ship, and it became obvious with time that we needed a younger person doing a lot of the odd jobs that were so important. And the Society was getting so big that Dr. Brooks couldn't cope with it all. I never forget, he always had a whole bunch of either cards or pieces of paper in his pocket, and he'd pull them out, and this was sort of his --

Droessler: His file?

Schaefer: -- activity (laughter) for the day.

Droessler: (laughter) I see.

Schaefer: And -- but it just became too big for his single control. And Ken Spengler showed up and in a very short time had everything under control, and he still is very active. And in my view, Ken Spengler *is* the American Meteorological

Society. He does so many things, has such fantastic connections, and has a program that is just an amazing operation. I still am almost bewildered as to how detailed he runs things, and permeates not only this country but every other part of the world where meteorology (laughter) is considered as an important science.

Droessler: I think he's one of the most popular and well thought of and well respected meteorologists throughout the world.

Schaefer: I agree. Wonderful!

Droessler: Mmm hmm. And he hired some very good people at AMS, too --

Schaefer: Yeah.

Droessler: -- and to do -- help him with his work.

Schaefer: One of the most important people is Evelyn Mazur, his very active assistant, who seems to be wherever things are happening. And I have great admiration for her abilities. And of course, Tom Malone continues to show as a extremely important person, not only because of his attitude and understanding, but his worldwide connections and high respect that everybody has for him.

Droessler: Which he has earned.

Schaefer: What's that?

Droessler: I say, "Which he has earned."

Schaefer: Oh, he has earned in many ways.

Droessler: Mmm hmm.

Schaefer: And the vision of Tom Malone has shown throughout his -- all the time I've known him, it's just inspirational.

Droessler: Well, some of the other presidents of the American Meteorological Society I think you were very familiar with. One was Captain H. T. Orville. Do you remember --

Schaefer: Yes.

Droessler: -- him?

Schaefer: I remember Captain Orville very well. And in fact, I hired one of his sons in our research activities at Albany. Richard Orville. And I have great admiration for Howard, who has been in the West. One of the pioneers in modeling of convective clouds and all that part of the science. And of course, the dynamo of the groups that I knew was Carl Rossby. He -- wherever he appeared, things really happened. He didn't stay very long in any one place, but he (laughter) just -

- wherever he was, there was a vortex of activity. He popularized the jet streams, and I learned a great deal from him.

Droessler: Well, another past president of AMS is Francis Reichelderfer.

Schaefer: Yes. I knew --

Droessler: You had many associations with him.

Schaefer: Reich was a very interesting fellow. He played everything close to his chest, and was somewhat cold, but when you got to know him, you began to appreciate his character and the way he did things, and the complete control he seemed to exercise over the U.S. Weather Bureau.

Droessler: And Harry Wexler, one of his chief scientists?

Schaefer: Yes. I knew Harry very well. Almost always had arguments with him. (laughter) I'll never forget: I was on the first transcontinental flight of the B-17. This was called the "Dash-80" as it emerged from the floor of the Boeing (inaudible). And we planned to make a transcontinental flight from Seattle to Andrews Air Force Base near Washington. And I was privileged to be one of the very few people on the flight, and I set up a time-lapse camera to take pictures all the way across, and obtained a very interesting series of photographs with this movie camera. And I showed this at a AMS meeting, and got into a big argument with Harry Wexler, because he just couldn't believe that clouds were as orderly as they were. (laughter) And -- but I had the evidence, and he had to accept it.

Droessler: Well, and all of us became convinced about the orderliness of clouds in --

Schaefer: Yes. (laughter)

Droessler: -- when we saw the satellite pictures.

Schaefer: Right.

Droessler: Then we all --

Schaefer: But this was way, way ahead of that. (laughter)

Droessler: I realize that, yeah. So it took another generation of --

Schaefer: Right! (laughter)

Droessler: -- and another instrument to prove to all of us that there was a great deal of orderliness in the cloud formations, and one cloud formation sort of led into and --

Schaefer: That's right.

Droessler: -- fed another.

Schaefer: Yeah.

Droessler: Joe George was another important --

Schaefer: Yeah, in...

Droessler: -- person in our lives.

Schaefer: Joe George, and Art Merriweather.

Droessler: Mmm hmm.

Schaefer: Henry Harrison.

Droessler: Henry Harrison, the great aviation meteorologist.

Schaefer: They were a wonderful group, and worked together very well. And the inputs from -- and the contacts with the -- these remarkable people made it very easy for a person like myself to find a way of getting a seat in a airplane, and not excessively help, but to the degree that it made it very easy for us to adapt. I learned, for example, that you could measure the outside air by hooking onto the ventilator up over the head -- over the -- overhead in the -- by the seat of the -- the airplane, and obtain thousands of measurements of the outside air up in the stratosphere. And that led to a study of -- from Boston to Hawaiian Islands of the levels of ozone from coast to coast and across the Pacific Ocean.

Droessler: Now, Eugene Bollay was another president --

Schaefer: Yeah, Gene was --

Droessler: -- of the AMS that you worked with.

Schaefer: -- one of my dearest friends, and I have known him every since his activity as a -- I think the pioneer radio -- television forecaster of meteorology in the Los Angeles television station. Gene has been one of my major contacts on the West Coast, and when he became involved in weather modification as the head of the North American Weather Consultants, we had lots of fascinating times, and I served as a consultant to his small organization, working at Steamboat Springs and other places in the West. And of course, the AMS activities involved a lot of attempts to develop short tapes that could be used for instructional purposes by departments of meteorology in the various colleges, and was quite involved in developing some short tapes, working with a professional organization that did movies for television. In those days, we didn't have the camcorders or anything of that kind, so that every minute in operation, if you didn't have a good take, you could see a lot of money just going down the drain. And I was very frustrated,

and operating before the camera when -- because the studio was near a streetcar terminal, and just as we think we had a perfect run, there'd be a screech of the streetcar messing up the whole operation. (laughter) And I could just see the monies going down the drain, because I felt partly responsible because I wasn't doing a good enough job.

**END OF TAPE 2, SIDE 2**

# Interview of Vincent Schaefer

## TAPE 3, SIDE 1

Droessler: And we continue the interview with Vincent Schaefer, and this is the beginning of cassette number four. Just before the end of the last cassette, Vince, I was going to ask you to talk about industrial meteorology, because you and Joe George, Orville, Bollay were -- Henry Harrison, you were all part of a small group within the Society who had a belief that the industrial area, a great deal of the future progress of the meteorologist and the American Meteorological Society was to be found. And that certainly has proved to be of -- that has certainly proved out, because today, one-third of the membership of the American Meteorological Society and something like 40-45% of the job opportunities in meteorology are now in the industrial area. That includes radio, television, and all of the major industries of the United States of America, private forecasting services which were, you know, unknown at that time, and which you fellows were just opening up. So if you would just speak about the beginnings of industrial meteorology, and some of the people you were involved with at that time.

Schaefer: I think probably the pioneer in industrial meteorology was Irving Krick. He was a professor at Caltech, highly respected forecaster, and a good friend of mine. And I have -- by becoming involved in making money in consulting activities, he not only pioneered industrial, but in the process, got into lots of trouble with his colleagues. Because in those days, it was considered to be sort of off the beaten trail to become a person who would get involved with industry and something other than the academic pattern. And I've always had a soft spot in my heart for his welfare, because he had a very rough time with the scientific community, and is still, I think, somewhat off in the corner. And he didn't help himself by becoming involved with weather modification. And this is a whole region of -- I guess you'd say problems in public relations and everything else related to that. But at the same time, a few of us become very convinced that it was extremely important to raise the level of concern by everybody toward the importance of industrialization of the science of meteorology. And as a result, a very active program which ended up as being a activity which developed a procedure that recognized the abilities of certain people to become certified industrial meteorologists -- what they called a "CCM." And a series of procedures were developed which permitted a person to be -- become recognized, and to receive a stamp of approval as being a person with the ability to become involved in industrial applications of forecasting and many other things related to meteorology. With the development of -- or the recognition of the validity of consulting meteorologists, it opened up the opportunities for many, many people to become not only good scientists, but an area that -- where they could make a very respectable living doing consulting work for -- in a fantastic area of meteorological applications. Ranged all the way from testifying before judges to some very practical applications of understanding the ramifications of the

atmosphere and its many manifestations, including things like whether or not there was a danger of a lightning strike when a space shuttle was to be launched. And it almost boggles the mind as to the many, many applications that were found to be very successful to activities by these consulting meteorologists. And dozens and dozens of small organizations developed based on that. And I'm continually amazed to see how the field continues to expand. A whole host of things happened after weather modification became an area that merited some attention, and I can't help but mention Tommy Henderson as being one of the pioneers in this field, along with Bob Elliott. North American Weather Consultants and Atmospherics, Inc. were some of the very im- early groups that became involved in attempting to get some additional moisture out of the atmosphere. And there was a big controversy developing between some of the farfetched claims of ambi- very ambitious salesmen in the Midwest and the far West as to what you could do with cloud seeding. And one of the pioneer people was Jim Wilson. Jim Wilson formed an organization that attempted to legitimize the kind of things that were going on, where a salesman would approach a group of farmers and say how much additional moisture they could get, or how much hail they could prevent, and all that kind of thing. I got to know Jim Wilson very well, and I cautioned him about some of the high-pressure operators that were selling farmers on things that I knew they couldn't do. Jim Wilson is -- was a college professor. He was a very fine fellow. And over -- as a young man, he went across Africa -- the Whitest part of Africa -- in a motorcycle, and (laughter) wrote a book and lectured for a number of years on his experiences very successfully. Then he became a English professor at Colorado State University. Was -- had a farmer background. His folks were farmers in Nebraska, and -- but he was very successful: English professor, and a pioneer in encouraging foreign students to become related to the American scene. And he and his wife would entertain them on a -- very much like Walt Roberts did, where special programs that were attractive to young people were held at their homes. And because of his contacts with foreigners, he was judged to be a communist, and got into lots of trouble with the authorities at Colorado State University, to the point where he actually quit, became a farmer, and was the pioneer grower of native grasses. Had 300 acres of native grasses that he harvested every year, and many of his seeds were responsible for the development of some of the restoration of the prairies. And one of the most interesting things to me was that he is the guy that came up with the saying, "If it ain't broke, don't fix it." He worked for a old Swedish bicycle repairman, and the admonition he was given. (laughter) "If it ain't broke, don't fix it." And he wrote a very fine article about that, which was published all over the country. And that -- out of that came this saying, as far as I can see. But there's so many fascinating relationships that developed between the AMS as the official representative of the science of meteorology and the general public, and the whole organization -- which has prospered extremely well -- is responsible for that, guided by Ken Spengler.

Droessler: I think you might want to close your remarks on industrial meteorology by taking

note of -- and mentioning who is the current president of the American Meteorological Society, an industrial meteorologist, and where did he get his degrees in -- and his instruction in meteorology.

Schaefer: Who was that?

Droessler: Bob Ryan.

Schaefer: Oh, yes. (laughter) Bob Ryan is one of our favorite students at Albany, and Bernie Vonnegut, who was one of the real pioneers in weather modification with his silver iodide discoveries, was his mentor at the State University of New York at Albany. And Bob Ryan was known all over the world for his abilities as a TV personality. Was one of his first students, and it was obvious the way he went at things that we were going to hear more about him. And that has happened. (laughter)

Droessler: After three days, Vince and myself have come to the end of this very, very pleasant interview. One of the -- it's going to be, in my mind, and is already one of the remarkable events in my life. I have known Vince Schaefer for over 40 years, and have always found him to be one of the most outstanding gentlemen and scientists, a person who has an interest in anything and everything about him, and particularly the young people that he comes in contact with and has so encouraged them, and -- to become all that they can become through their education and through their hard work. He is just one of the finest people that I know and have had the opportunity to be a friend of in this world. And Vince, I want to thank you for having me here and giving me this opportunity --

Schaefer: (laughter)

Droessler: -- to sit with you, and...

Schaefer: I've been looking forward to it for many years. (laughter)

Droessler: So, so long for this time.

Schaefer: Right. It's been an experience.

## END OF INTERVIEW