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TAPE RECORDED INTERVIEW PROJECT

Interview of Ferdinand Baer

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Interviewers: Joseph Tribbia and Michael Chen

Tribbia: We're at the Center Green facility in Boulder, Colorado, part of NCAR. I am Joe Tribbia with me is Mike Chen, and Ferd Baer is the topic of our conversation today. We're on side 1 tape 1 of this interview, and I think we should just get right to it. Ferd you were born in Germany is that correct?

Baer: That's correct.

Tribbia: And that was, what year was that?

Baer: That was in 1929.

Tribbia: Okay, what recollections do you have of your early childhood—your parents, your brothers and sisters, insofar as they've influenced your career decisions?

Baer: Well, it's hard to say whether they influenced my career decisions directly, but clearly they had a pronounced influence on me, and my early childhood experience probably had a pronounced influence on me too, although I can't really tell you how that works. You know, that was just around the time when Hitler started his activities in Germany, and my family, we were living in a tiny little town in Southern Germany called _____, and some time in '32 or something, Hitler moved in from Austria. We were, this is north of Munich, and was pretty close and my father seemed to have been working with the Underground somehow or other, and of course he was Jewish and that didn't do him much good either, but when the Nazis came into this little town, the townspeople put my father into protective custody.

Because the Nazis were looking for people like him. So when the Nazis left then I think my family decided to get out, to get out of the country, and they started proceedings, and we had some relatives in Scranton, Pennsylvania, who were helping up as well. My mother's sister and her family, and my

parents went to, I think it was Brussels, with one of my mother's sisters to stay. I have one brother and he was with them, but they didn't have room for me so they left me with an aunt who was working at an orphanage, and so I was kind of _____ orphan for a few years. I don't have any recollection of it specifically, but I suspect it was a very unhappy time. Well, anyway, in 1935 we all got together and came to the States and went to Scranton, and we, they started regular life there. My parents, my father worked with my uncle, who had a radio shop for a few years and trained himself as an accountant and opened up his own practice and he was reasonably successful. It was sort of a middle class life in Scranton. And then I, you know, grew up there, I guess, an average kid, didn't have too much trouble. Then I graduated from high school I think it was in 1947.

Shall I continue with Pennsylvania? Then I went to the University of Chicago, and I did that because my brother, he was about five years older than me, and he was actually in service during the war, and he was a reasonably clever guy. He took some kind of a test while he was over in the South Pacific so that he could get into West Point and he was chosen, so he came back to the States. That was pretty wise of him, and then he got to West Point, but he couldn't stand the regimen, so he suddenly got a trick knee, and he got a medical discharge, and then he went to Cornell for a year, then he went to the University of Chicago, and he ranted and raved about what a great school it was. And at that time there was a man named Hutchens, who was the head of the program at Chicago, and they had an early entry program for kids in the second year in high school. They had a very interesting program in college _____. And I made out an application for that actually in my junior year, but I didn't get in because there were a lot of people coming back from the service. So, I went for a year to Syracuse, and it was that time I got interested in philosophy. We talked about that the other day…but then I realized that I'd rather go to Chicago. Syracuse didn't really turn me on, and then I was accepted there.

Tribbia: -huh.

Baer: And that is how I got to Chicago. I went through the college program there, but I had already graduated so it took me a couple of years to finish the program, to get a Bachelor's degree there, and then I got interested in astronomy so then I decided that I would, you know, take some courses, but in Chicago, the astronomy program was up in Yerkes, up in Wisconsin, and so you just sort of took your basic physics course, and then after a few years they send you up there. So I just started on the physics program, and at some stage I kind of realized that I didn't have the resources to go to Yerkes, and I had gotten married then and had a kid, and so someone told me that, and the Korean war was moving, and so someone told me that—you know, I never knew anything about meteorology, but the Air Force had a program where is you signed up for officers' training in meteorology, then

they would give you a commission, and then you would just have to give them three years of service, but you got a degree out of this thing, and got some training. So I thought, it didn't sound like a bad idea, I didn't know what this discipline was all about, so I went over to see the meteorology department, and I met George _____ who was the counselor for students at that time, and he said, do you really want to go into the service, and I said no, but you know they are drafting people, and he said well, if your records are okay, we'd be happy to give you a scholarship or fellowship, I can't remember the _____. So I sent my records over there and apparently they liked them, so they offered me this, and so I took it, and that's how I got into meteorology. It was very incidental, and it turns out that my draft board in Scranton never called me, so…

Tribbia: I want to go back a bit. You got a Bachelor of Arts at Chicago, but were you interested in physics?

Baer: Yeh.

Tribbia: At that time or—

Baer: Well, see I was actually interested in philosophy but it kind … I had some skills you know in physical sciences and mathematics and all, because I've taken sequel of courses. They gave _____ in those days, and so that's how I got into the idea of astronomy kind or maybe it was astrophysics, I don't know, but I didn't get into it in great detail, it just interested me and I think that was the closest to cosmology and philosophy that related to the physical sciences. Clearly I had a _____ for it, and I mean I didn't think about it in great detail.

Chen: Well, Ferd when I look at your c.v. you got your Masters degree in meteorology. That was in 1954.

Baer: Yep, I did. 1954, that's correct.

Chen: But your publications up to 1960, and then you _____ _____…

Baer: Oh, well, I didn't tell you yet about my program in meteorology.

Chen: Right.

Baer: Let's see, I got the degree in '50, and I studied physics for a couple of years and then I shifted over to meteorology, and so I started taking courses, and in those days you know they had courses in synoptic meteorology. That seems to be a bad word these days, and gradually became a bad word; they had a synoptic course where you went into a laboratory everyday for four hours. And there was a guy there named Larry Hughes, and he kind of ran

it, and I think if I am not mistaken at that time Horace Byers was the chair of the department, but there was a man named _____ _____ —you probably heard of him, he has written a book, and he came ultimately, and shared that department a little later, and of course he was a synoptic type guy. So anyway, so we did this kind of stuff, this synoptic work. I must admit that it never really turned me on. I'm not good at maps and drawings. I'm not a geographer, I'm more of an analytic kind of a guy, but I did it, and as a matter fact the publication came out of that because there was this big storm, Hurricane Hazel, which I suppose people still study, we got a group of us—I remember Ed Birchfield was one of the guys. He was kind of my colleague there in Chicago, and somebody else I can't remember. Maybe it was what's his name Kayler, Bob Kayler was he involved in that?

Tribbia Kayler, yes.

Baer: Yeh, Bob Kayler, you know he worked with Al Fowler in Chicago for many years, and he never did get a PhD, but then he also went to Maryland, and at one point. I think that might have been at Fowler's instigation at one time, and then Fowler of course stayed in Maryland, so, did I say Fowler?

Tribbia: Yes.

Baer: Yeh, I think that's a mistake. I mentioned Fowler at Chicago, but that I mean Kayler did work with Fowler, but I don't think that that's relevant at that time.

Tribbia: Right.

Baer: I mean Kayler was just a student there, oh he worked with Dave ?Fultz that was it. Right, and you know he is sort of a laboratory kind of a guy, and actually _____ said Fowler did similar things. They had dish pans and tanks, and water tanks and such. So that's how I got a publication out of that, but I also got a assistantship with Roscoe Braham and he was _____ physics guy. So I did a lot of physics stuff and I remember we had this big column and we were wanting to find out how you get sea salt off the surface of the water into the air, because sea salt is apparently a hygroscopic agent, and you know that thought in those days I suppose its still true that you get enough salt around, you're going to get condensation. They act as condensation nuclei, and you start getting precipitation elements, but this was kind of pioneering stuff in those days, and so we had a tank and, and I actually did this little study with a parallel plate condenser where we had jet of water came through the top, and then you turned up the potential…

Tribbia: huh.

Baer: —you know there is a charge on the particles, and if you turn the potential high enough, the particles turned around and went back up to the upper plate, defying gravity. It was kind of cool because they had a something called a _____ camera ,which in those days it was really state-of-the-art stuff where you shot about 5,000 frames a second.

Tribbia: Yes.

Baer: That was really incredible, I mean I suppose now you just do it electronically, I have no idea what these people— So we were able to stop this, this jet, watch when it broke up into drops and watch these drops as they came back up. So that was one of those experiments, and I think there was a publication, Jim Lodge was doing that, I was doing that in his lab.

Baer: Anyway, so that's how I got into what was called physics, and then I went and in 1954 I got my degree, and Roscoe had just started a new Atmospheric Sciences Center together with Kassander, and Jim McDonald it was, who was a really well known physicist at that time, working in atmospheric physics, and they had just started down in Tucson this laboratory, at the University of Arizona, and so he said well, why don't you come down and so I thought, what the hell, ... I mean I didn't have any real plans ..... it was kind of funny I was just studying and learning. So I went down there for a year, and then I worked, and of course Roscoe stayed in Chicago most of the time, but McDonald was down there, McDonald was really a top notch scientist, but VERY quiet, independent sort of a guy, he didn't pay attention much to other people's work. Kassander was, he came from Iowa, he was a pretty well known guy too, but he was more into the management of this lab. So I was really pretty much at loose ends, and I could just do what I wanted to, but I didn't have enough training to become .... an independent researcher, and it was kind of frustrating, but I did this one experiment in which I was looking at cirrus clouds, but from the development contrails, because there was this Davis-Monthan base down there and they were sending these jets all the time, they were B-47's or something, huge things, and some days you know you would see the sky is clear in the morning and in the afternoon it'll be all surface covered, but it was just from the contrails, and so I got a couple of cameras, and I got a big base line of a few miles and I set these cameras up, and I triangulated the photographs and the contrails and watched them grow, so I wrote a paper on that. .... Really my first, my own paper—

Chen: That was in the Bulletin?

Baer: It was in the Bulletin, right, and then , during the year I had correspondence with George _____ who said he was getting an NSF grant to study modeling, and he had been in Princeton with Charney, and he had been working on spectra model using _____ series. He was going explore that,

and so he got this grant and asked if I would like to come back to Chicago and work with him on it, and so that's how I got back to Chicago.

Tribbia: I want to backtrack a little bit once again. You had done some course work in physics, and then you transferred into the meteorology program…

Baer : Uh-huh.

Tribbia: You mentioned Gene Brooksfield as being one of your classmates at that time.

Baer: Right, yeah.

Tribbia: Any other notable people you ran into and …

Baer: Well.

Tribbia: Who else was teaching in the department at the time?

Baer: Oh God, it's hard to remember. Of course _____ was there, and Dave Fultz was there, Byers and Braham , I'm trying to think of who else was there.

Tribbia: So I ….

Baer: Doesn't come to mind, but there were other people

Tribbia: At the time Rossby was still somewhat connected with the

Baer: Rossby used to come in for a visits, he had, you know, started his treks around the country, and actually he may historically have had some impact on the development of this program…

Tribbia: Right.

Baer: in Chicago. You know it was during the war so he was moving around and he started _____ places, the program at MIT, and I think he started in Chicago, and then at UCLA.

Tribbia: Right.

Baer: And so he came in quite regularly and visited, and I can remember sitting in _____ office as a young student, just quietly watching the interaction between _____ and Rossby as they discussed deep philosophical and scientific problems.

Baer: Marveling at these people, but at that time I had no idea who Rossby was or of his reputation or anything, you know, I mean it was just so like he was there, and I was there and I'd listen to—I doubt very much that like in my in my older years where I interrupt everybody and always had something to say. I doubt if I ever said a word.

Chen: Well, Ferd, during that period of time Chicago produced many very _____ scientists.

Tribbia: Yes…..

Baer: Well, yes, there were a lot of people around there. Joanne Simpson, I think was around, but she was, it must have been just about finished. As a matter of fact, I don't remember Norm Phillips being there. I think he finished up just before I got into Meteorology in '52 – '53…

Tribbia: You're probably right.

Baer: —or something, so I didn't see Norm there so, but I mean it's just that when I came back in '56 to work with George, he had also recruited ____, and Ed Birchfield was there, and then there was another guy who nobody really knows, ~~John~~ _____, a very bright student who actually I think had some serious psychological problems **[I recommend you not name this person because of potential for libel—*DR*],** and ultimately, I mean he got a PhD and he did really interesting things, but he just couldn't deal with the real world, and he was always in on the edge of things, and unfortunately he took out his frustration on George.....and really made life miserable for George, and George was such a nice guy, you know. He would, I mean this _____ had actually gotten a Master's degree at MIT where they also had thought he was very bright, but they couldn't deal with him, so they pawned him off, and George said, Oh, I can deal with this guy. That's funny; I presume that's what George said. I can help him, and of course he did, I mean intellectually, but he didn't help him personally and actually, I, I heard from Fowler a few years ago that ~~John~~ had died, but he hung around, I mean after he got his degree went back East and hung around the MIT area but, he never really got any kind of recognition or a job _____, because he just couldn't deal with it.

Tribbia: Yes.

Baer: So that's all I know. But he was part of our little country. We had these three of and _____ in the back of an old building and I think it was 5727 University Boulevard there. It wasn't a Boulevard then ..... just University Street, and just across from, you know, the big campus buildings, and so you were asking about people…

Tribbia: Right.

Baer: —in Chicago at the time, So I

Tribbia: So was _____.

Baer: I know that Bill Gray was working with George, with what's his name ____, and ultimately he went out to Ft. Collins. That's where I also went after that, and so I remember him as being a fellow student, but I mean, if I saw a list of names of students at that time, you'd know I'd remember them all, but it just doesn't come to my memory, and that this was George's little crowd that he really liked, and he, I mean we'd have a wonderful time.

Chen: Ferd, besides your group, there are so many.

Baer: Oh _____ _____ was there.

Chen: Yeah _____ _____.

Tribbia: —was in that group also?

Baer: Yeah, oh yeah, _____ graduated about a year before me, and he was there at the same time, he worked with _____, and they were downstairs on the second floor, but _____ _____ I _____. ..... _____ introduced me to hot peppers. He had a party one time you know, and this timid sort of Indian guy you know, walks over, and he has this bowl of peppers, and has this green pepper and he says try these they're really good, so I says, okay sure, and I bit into this thing, but I didn't taste anything for the next few days.

Tribbia: [garbled]

Baer: And I don't know whether Ruby, she must have showed up there in Chicago too, because _____ and Ruby got together, and so she must have come in at some point, I remember the contact between them but, I don't remember I don't think she was in the meteorology program.

Chen: She was in physics.

Baer: In physics, okay.

Tribbia: What about Chester Newton?

Baer: Oh yes, of course Chester was there, right. He was the residence and _____. Sure, and he gave courses and all. I didn't work with him, but I knew him well, and he is still here, I take it.

Tribbia: Yes, occasionally.

Baer: Yes.

Tribbia: So, you now have this group with George _____ as the intellectual head, and a group of graduate students.

Baer: Right, right.

Tribbia: And working on this project of numerical prediction using…

Baer: Yeh, well I…

Tribbia: _____ method.

Baer: Exactly, that's the project that I was kind of attached to, and Birchfield I think was doing some _____ or hurricanes maybe, and _____ was doing hurricane stuff at the time. And _____ was doing some theoretical work on multiple parameters, we can call it parameterization, but you know, you do an expansion of parameters, and he wanted do an expansion in multiple parameters, he was working on that problem. But George had me work on, started me working on modeling. So we started with the _____ model, and interestingly enough, I had remembered from a mathematical physics course that I had taken. There were these called _____ _____, we had studied them, and I realized that they were very nice things on the sphere, and so, I talked to George and I said why are using, if we're going to do the expansion why don't we use _____. He didn't discourage it at all, as a matter of fact George is the kind of guy know if something came up he was extremely studious then thorough, and so he got into this himself know, he did his thing, and I played around with it in the learning process it was really ideal of him, he was way ahead of me anyway, in terms of how he could do these things because he had so much strength. So anyway in that regard then, so we started working on the application of the _____ _____ for modeling purposes.

Tribbia: Uh-huh.

Baer: Rather than the _____ because you know we could go to the pole now, and _____ all these channels know, and so and the _____ worked on these channel models too.

Tribbia: So were you aware of Silverman's activities at that point.

Baer: That came up, we discovered that later on.

Tribbia: Okay.

Baer: Right, because I mean it didn't take very long to realize that we suddenly got interaction coefficients ....

How in the hell did you do that in those days? You know, I mean nowadays you could program this, and it's no problem at all if you want to calculate the interaction coefficients. You probably just do it, but in those days it was really complicated. We just started on the big computers. You know what we called "super computers" in those days, and so I think we came across Silverman in a sense that he had a reference to a physicist named _____ , who had published a paper called "The Triple _____" back in 1898 or something in the know " World Society Journal" and in that process he had solved the problem of integrating _____ _____, which is all we had to do. We had a derivative there, but you could do the, you know, the expansion for that, and that gave us series of _____, and so we had a formula, and I think Silverman used that too. If I'm not mistaken, I can't be sure, but I think Silverman was definitely one of the first to publish, although _____, you know he did the liner problems, so, he used the _____ for that.

Tribbia: Right.

Baer: And so then we went into programming. I did this programming with these interaction coefficients, and man, I tell you that was a mess. You know, you couldn't just write the product, because you could have these double factorials, the numerator and the denominator, and the computers didn't have the capacity to deal with them, so you would get over flow, under flow know you couldn't, you had to do something so we, I had all kinds of devious devices for being able to make these products and divisions so that the computer could come out with a number within the range of its capability…I mean those computers were not, you know, transistorized in those days, they were vacuum tube things, and actually the word configuration was simply in the monitor. Like a TV monitor, and I think it had 2,048 points if I recall. That was the number of elements you could get into the machine, I mean there was that many words, and the number of words, the binary bits, each monitor had a binary bit. … . .. so you had maybe 20-25 monitors, and that was the range of the number of bits that you had, so it was really constrained, and as a matter of fact there was a, right at the beginning when we started, there wasn't even a programming language at all, and then IBM came out with a programming language, a fairly simple like transfer, and add and subtract you know _____ you know, those kinds of things, which was really a very simple language, and one operation at a time, but you still had to know exactly where numerically you were when you went to get some element and bring it to the operations, wherever they did the operation. You'd have to go out and say number, I don't know if it's, it may have been a two dimensional number…

Tribbia: Uh-huh.

Baer: A, B, bring element to A,B put places into the operating component, and then bring in elements from some other place, multiply, store, and then transfer, and you may transfer back if you had a loop now.

Tribbia: Yes…

Baer: And then I think in '59 they finally came out with _____, that was at the light.

Chen: So in the past it was the machine language.

Baer: Yeah, it was machine language, but you see this, what I am describing to you now was already symbolic language.

Chen: Right.

Baet: But before that, you had, I mean it was done in numbers. You had to, you know there was sort of a code for the transfer operation, and, and this was really the first machine, I think it was the IBM 701, or something, or maybe they already had the symbolic language for that one. I can't remember. I mean there was an IBM 650 which was kind of a clunky machine. You put in some kind of a paper tape to get information in, and then they later on started the cards.

Chen: So Ferd ,when you look back, I mean the research in the spectral method, you started in the '60's?

Baer: No, no before '55.

Chen: '55.

Baer: '56 yeah.

Chen: Oh, '56.

Baer: Yeah, yeah.

Chen: And then _____ about 70 _____ _____ spectral method again.

Baer: Oh, well, in fact, yeah.

Chen: _____ maybe 10 or 15 years, and actually not too many tried that because of the problem you just mentioned.

Baer: Well, it's hard to say, I mean, in those days we didn't build programs and then clean them up, and put them on the shelf, and make them available for other people, so no, if somebody else wanted to do this they started from scratch again.

Chen: Right.

Baer: So that may have been a problem, I don't know. I mean it wasn't a standard procedure. As a matter of fact, I can remember that even the basic , functions that you had in machines, where you could call up operations, were subject to errors, in other words._____ divided _____ .... or even calculating the tangent, if you had the numerator and the denominator inappropriately specified, the machine would blow up, it wouldn't tell you that you can't do that or wouldn't give it a _____ so you can get a number out of it. So I remember once we tried to make a calculation and we kept getting something blowing up in the middle of you know, some field. I don't know what we were calculating, it could have been _____ or something for all I know, but it involved I think a tangent function, something like that, I'm not sure anymore, but anyway the numbers you were putting in the tangent, it just couldn't calculate it, and it was just blowing up, know, ...,but we just finally discovered it, and we found a way around it, I mean within 5 or 10 years of that activity, no one ever thought about the fact that the tangent function didn't always give you a good value because it was pre-programmed so that know it would take into account all potentialities, and if you happen to put in the wrong value, it would tell you, or it would stop or it would do something that would take care of the problem. So even the simplest functions in those days …… were problems. So we spent a lot of time, I mean when I think about it now I did this model and I ran a number of cases but, you know the model was so simple that nowadays you could do all these calculations in a matter of a month or so. You know it took me years to do that.

Chen: Yeah.

Baer: Because I didn't have the equipment, and I didn't have the experience and all that kind …, and all these other little things that entered in. We used to go up to, we didn't have a big computer on campus so George had made arrangements at the General Motors Technical Center in Detroit, and I used to go up there and run the damn machine, IBM 704. It filled the room much bigger than this, and I'd sit at the console and key in, you know, the instructions and my numbers and let this thing run, and the way you could tell if it was running okay was because there was a sound attached to it, and if it was running normally, the sound would be something you're familiar with, and you would hear it clunking along, and then suddenly it would change because the switches were set that something,…, but it if kept

running for too long, and it didn't change, you knew you were in a dead loop. . . .

Baer: You know, things like that you know so you could, you kinda realize what was going on in your program by your ears, looking at the panel there to see what numbers are flashing around, and of course nothing came up graphically of course. You used to have these big sheets and it was _____, you also had _____, we didn't, I don't think,at the first have decimal, so we had to convert from _____ to decimal manually. ....

Tribbia: So as a group, you're working in George's group, and is _____ the only group the only group within, within the department, and perhaps within the University that using computers at this time is inappropriate.

Baer: I actually think that there was a start, a really rudimentary start in computer science in those days.

Chen: Okay.

Baer: And there were some people around who were interested in these computers and then they were building them, and there was kind of a basic computer there at Chicago, and I forgot the name of it, but it was _____ _____ . It came after the _____. I think the _____ was the first one that was _____, right?

Chen: Right.

Baer: And then they had built something in Chicago, but I mean for us it was a matter of curiosity because it really wasn't a machine that was serviceable to solve our problem, but it was experimental, and it was interesting, and so we didn't really use that, we used what was available [in] their machines that we could get our problems solved on.

Chen: And, and there were no comps.... Were there any computing courses or how did you?...

Baer: No, no, no.

Chin: How did your group kind of learn to compute?

Baer: I thought I told you, it was just by word of mouth and experience, you couldn't do.... I don't think there is anything written down at all. I don't remember anything. I mean I learned FORTRAN, oh there must have been a manual or something, but I learned if from I can't remember that, but I mean, you can't just pick it up, you have to know what the instructions are and all. So there was clearly a manual now, but what format that was or

whether it was actually published at the time I don't know, but you know if, and I think it was done through IBM probably. I mean they were the big computer people then, and I mean. It wasn't, it wasn't an IBM group I think that built FORTRAN, but they worked in conjunction with them, so they you know they put the stuff out, but I don't ever remember ever going courses in programing, I don't remember even any consultations of any significants. We just learned how to do it.

Chen: Well Ferd, beside , , the computation part, _____ is so useful in physics.

Baer: Yeah…

Chen: Do you have any recollection of this? Do you have direction with physics?

Baer: No.. no…We did this all ourselves.

Chen: People in Chicago…

Baer: The physics people in Chicago were off somewhere else, I mean, we weren't anywhere physically near them, to tell you the truth, I, my only contact with physics and , it's pretty exotic, I didn't tell you this but when I was , before, when I was still in the physics program, know, thinking about astronomy, I also had a assistantship, I worked in _____ lab, and I was counting mullion's They put these plates know, plates with some _____ on them or whatever, put them in accelerator, you know they had an accelerator there, and then they would trap the mullion's and capture them, and they would make tracks in this film, it was really like a photo film, and so we as students sat in front of these microscope's, put these plates down there and counted these mullion tracks, and of course that information was of some use for the people set up the experiment. I don't know what I was doing, but I was doing it. But I distinctly remember this very nice small older gentleman walking into our laboratory periodically and just looking over our shoulders to see what we were doing, and _____ _____ ..,,,,, and we were really under the tutelage of a couple of his students

Chen: Ah huh…

Baer: I can't remember what their names were. They actually got to be pretty well known physicists, but that was so long ago. Rosenfeld of something was one of them, and the other guy I didn't remember. Who's the guy in the computer shoppe, he had a name similar to a guy I know fairly well in the computer shoppe I just don't re….. his name eludes me for the moment.

Chen: At NCAR?

Baer: Yeah at NCAR, there you go. He sits right downstairs at the elevator.

Tribbia: _____

Baer: _____. So this guy's name may have been _____.

Tribbia: Okay.

Baer: So it was something like that.

Tribbia: Right.

Baer: Anyway I that, that's really vague in my mind. I think it was in the early 50's. I do remember though seeing _____ walking in and out of there.

Tribbia: Okay, so .. you've set out on a course, you, you and George _____ has agreed that _____ _____ a better or a different choice, something to look at.

Baer: It's something to explore. I mean it's a scientific challenge, know and a… I think that turned George on, I certainly found it to be fun to do.

Tribbia: Yeah.

Baer: Yeah, So we built this model and you know George wrote a few papers on principals of _____, and then we did the experiments and then we know a little bit about interactions coefficients, I think that is the way we communicated information is through publication, Not by writing, not by sharing programs, you know…. But I can't answer the question why it didn't pick up, you know during the 60's. I was certainly not the person to go and _____ this stuff. If I had a different personality I probably would have done it. You know now a days you come up with something and your all over the world advertising it, but, that wasn't George's style that's for sure. He didn't train us that way, and at ….as..as. you probably would see , of all the people that worked with him at that time, almost none of us published anything, I mean it wasn't his thing, I mean he might have published something if he did it separately on his own.

Chen: Yeah.

Baer: But he didn't …I mean it was just learning environment. I mean he so you know it was really lovely, you just go in there and do whatever you want to do and you get exited by it, and you walk down to his office and you discuss it and get plenty of time to talk to you about it. Usually it ended up he was free _____ but he would tell you all the stuff and he was a marvelous teacher, but it was so clear that when you left it was muddy.
…..

Tribbia: .....

Baer: You know you must have had that experience that somebody knows something so clearly ..... you see it and say Jesus how clear this is, and then when you go away you say "what's that all about"?
Anyway, that was kind of the style, so there wasn't any pressure to get out into the community and communicate. Although we did go to meetings and stuff, and I do remember running one of the first NWP conferences that we, they started them in the mid 50's and we had one in Chicago. George asked me to organize it, which I did, and that was kind of fun, you know because of Charlie and Phillips and _____, and _____ and all those guys came. We had about 30, 40 people came.

Chen: .....

Baer: Big meeting. You got up there and gave your talk and they give you an hour .....You know I mean but you out of chalk board. You didn't have all of this projection stuff or maybe a lantern slide for something you know. I don't think 35 mm slides being used yet. So it was heavy big glass plates. Well that was about it, you know you just wrote everything out of it, and people interrupted you all the time you know, you just chalked about the thing.

Chen: _____.

Baer: I remember _____, once I gave a talk and he asked me , this is very interesting what are you going to do with all this .... You know that was selling all _____ _____stutters. ....

Chen: So you think that they.... You have either you or Joe _____ behavior like _____ probably _____ ...

Baer: Oh I bet _____ with a different personality know we could have advertised this, and pushed it harder, I mean like with the people that _____ like _____ who I think at that time were running the show at the, I don't know if was ___WP at that time anyway it was the unit the joined unit they were using models for you know, making forecasts.

Tribbia: Right.

Baer: In Washington, and Phil Thompson I think was there and they were , you know just pioneering with this modeling stuff, and the Navy and the Air Force and the Weather Service they were working together. Then they, I think wasn't it to the end of 50's or early 60's they broke apart, then each of them set up there own units. I don't remember the time again, I didn't pay too much attention at the time.

Tribbia: Well, one of the attractions of the spectral technique that came to be known and that the turn of that decade, right at the 60's was this capability of avoiding this pernicious nonlinear computational instability _____. Which is what people were wrestling with at that time.

Baer: _____, yeah, and that's true it was a it was much simpler George had demonstrated you know the energy conservation if you truncated at any point. With the _____ model only for quadratic parameters, and we actually start looking at _____. There was a student, that was at Michigan again, that was later on. We looked at the _____ equations, and they were pretty close to conservative but you couldn't prove it, and I think there _____, but , that was one of the arguments, but the point is we didn't go off to _____ and pedal this as THE device know. And actually, historically the system prediction got started with fine differences, and it was very well implanted, and trying to break into that, know it was really quite difficult

Tribbia: Yeah.

Baer: And as I say we weren't _____ you know, pushing that, we were just making demonstrations and showing what these things were, as a matter of fact my thesis was a demonstration that you could do, a prediction with a _____ model in a spectral domain, and I don't know that anyone had gotten quite that, that far with it, we did at that time.

Tribbia: In terms of …

Baer: For making a real prediction.

Tribbia: Okay.

Baer: know over a significant period of time in a stable calculation using the _____.

Chen: Ferd at the time that was in 1966.

Baer: Well I , I published this thing in 69.

Chen: Yeah, _____, but after that, the Canadians they pick up.

Baer: Yeah, the Canadians were the ones to picked it up, they liked it. Yeah, and they did , did some nice work there know. I mean it's kind of interesting once I got done with that, I kinda saw the _____ as more of a tool to understand some of the processes that were going on in the atmosphere, I was more interested in that, than you know making more forecasts, you know in other words , I like some of my students later, _____ is an

example, he worked on it 2 level _____ clinic model, you know, but we applied it _____, you know so here's a way of getting to see what you might find in the _____ climate, by using the spectral models, and application for something that hadn't been tried before. As a matter of fact, again that was a really a pioneering effort. Nobody had ever done that. You took climate from some 35,000 year ago for the boundary and _____ conditions, and I never could get him to publish it, and if you published he would have been the first guy who had done that, I mean popular thing now a days. ……It did came popular quite a bit long time ago, know but well I mean you leave it to people they do what they do. It was an interesting study, but that's an example of how know how I was interested in using that method, know to solve some problems.

Tribbia: So, in 61, publication comes out of extended numerical integration.

Baer: hu…

Tribbia: Okay, and that really demonstrates the kind of ethicacy of the technique and agility of the _____

Baer: And it really was up to date, because that's all we were doing at that time was a _____ model, know.

Tribbia: Yeah, Yeah.

Baer: I mean, they were starting to think about the primitive equations, I mean ____ was had done some work on that, so but , those, I think know in retrospect I can see the problem, I mean they have the methodology which is finding differences, and they studied all this characteristics and all way before the computer science people ever got around to it, and so they knew a lot about stability with regard to computation and things like that, , and so they wanted to move forward, and if they had to have stopped know, and learn about the spectral method, and apply to all the stuff that we, that all the time we invested in it, that would really slow them down, I mean _____ was in that _____ and so was Norm, and so I think that I can understand why they, they didn't do it because they were busy doing things, pushed the boundaries further with the technology that they already had explored.

Chen: Ferd if you look back the history, the Canadian uses spectral method for operation of the forecast, and then the Australian picked up in the early 70's.

Baer: Right.

Chen: So he can see that actually he was not a _____ scientist to focus on the spectral.

Baer: Well know I, I can't tell you this for sure, but I suspect that they were really starting from scratch you know, in other words, they didn't have big research efforts going, which already had been invested in modeling, so they started from nothing, know so _____ could start with the spectral equations as well as the _____ difference equations, and he was probably looking at everything know, I mean he had an open field there, and the Australians probably were in even a little later in getting started in this area. I mean, there was just nothing going on anywhere, but in the states. know in the early 60's.

Chen: It must have been interesting, _____

Baer: I mean from that perspective, sure, we already had demonstrated the spectral method, ... it was probably better than finding the differences with his problem, so if these guys are gonna start from scratch, why not go with it. know they had the mathematical skills to do it, and I think the American's had the mathematical skills too, just that it was matter of having said something almost in stone, a methodology that was working and they were into it you know.

Chen: So eventually we've been back _____ again.

Baer: Yeah… Well I mean, you know that the, the community is now 10 times larger, at least _____ _____ , and so you have people doing everything now. You know, you know have lot of people working then they can explore whatever the aspect of the discipline they want, and everything is _____ like a _____ moving its tentacles out.

Tribbia: So in 61 you've got this result ah its … how, how does one graduate from the University of Chicago? How does one…

Baer: It's not easy ,,,,, ,,,

Tribbia: Laughing.

Baer: Is it that what you were working around.

Chen: I, I……That was a leading question…

Baer: … Well I mean as I have told you many times before, we had this very, very, comfortable environment. George had his little corner on the 3rd floor of the building, we all worked there, he had money for assistantships. I never had to think about writing proposals, I didn't know anything about that. He took care of everything, and indeed we used to go home, I used to

go home for dinner and come back and work in the evening, and at midnight or so George would take us off to a pizza place and we'd have a pizza, and we'd be talking about what we were doing during the day, and it was really a, I mean when you think about that kind of an ideal environment, and a George was extremely dedicated I mean if a scientists scientist. He was a nice experience and I, I you know, so there wasn't really any excitement on our part to graduate, you know, because he never talked about it either. You know you just kept going, and a, the only other thing that I discovered was that this guy _____ _____ got onto this kick a little bit about graduating , and so it made me think about it, but what really came to my mind was I had other friends in the University you know, and they were all graduating and going off to work, and I really never thought very much about it, but when _____ started to make this noise it came to my mind that sooner or later this was going to end. .... Not that George would want to so, and so subjectively maybe or subliminally he was trying to avoid this inevitable thing. I suspect if you'd ask him he would tell you that this is one of the nicest periods of his career too, because he really enjoyed it, and I think we made some progress, we learned some things that was, it was sort of a 19th century, kind of learning process where people just at the University just sat down and studied. It's just different now, I mean the world is just different.

Chen: So Ferd, after that you moved to Ft. Collins.

Baer: Yeah, well that was interesting you know, then I, I finally said I got up and I said to George, I think it's time you know, and he mumbled and jolted me and said _____ and I wrote a draft, and of course he, he one of his things is language, I mean if you have ever read any of papers oh really is a linguist, and so he checked every word. ..... that I wrote.

END OF TAPE 1, SIDE 1

Interview of Ferdinand Baer

TAPE 1, SIDE 2

Tribbia: And Ferd, you were discussing a George _____ being a stickler about writing and language within the context of your thesis.

Baer: Right, so he was very meticulous and ultimately on numerous rewrites and many different additions to what should be done, it wasn't, you know the, the fundamental aspect of the thesis I think was the you know to perform this experiment, but there were a lot of other things that were in there, tests for stability, and stuff like that you know. That rounded it out and made it a little more sophisticated and polished as a _____ theoretical kind of work, that George would like, so, I mean finally he accepted it and a I, I think the grumbling was not so much on the science as it was the fact that things were changing. .... He wasn't quite prepared for that, neither were we. But at the same time, and this is in response to the question that Mike asked .. that I went out to Ft. Collins . There was the question on what I was gonna do with my career afterwards, and George recommended that I go and work with Mike _____ at Princeton, and that was an available thing to do or, actually no, he was more interested in sending me off to work with _____ , who was also at Princeton, but not and _____ wasn't at Princeton yet at that time, he was still in Washington. So I I had some correspondence with _____ , but I had no interest in working with _____, and this may be one of those things ...,…where that this paper comes in. At that time _____ I saw as a super egoist, and I just really couldn't stand being around him. I mean I admired him for his skill, and his knowledge, and his curiosity, I mean he was a marvelous scientist, and ultimately I did get to like him, but at that time he just appeared to me to be this super ego know, he had to have the last word, he knew everything, and I told George I wouldn't think of working him, and then at the same time strangely enough Herb _____ was starting a department in Colorado State, and he needed a _____ in residence, and he asked me. ….., know it wasn't like nowadays you know I really, you get a hundred applications and you have to fill them out in triplicate in a special way, and everything has to be formalized. You can't just hire someone off the street. Well that wasn't a case then, well you know Herb said would you like this job, and he was collecting a few people to work with him at Ft. Collins. So I went out there and had a look at it, and of course Colorado is an impressive place and there was a interesting, they were, they didn't have a building or anything they were in the engineering building. And across the street was the the Vet Hospital, and you know there were cows and things running around the field …… in the neighborhood of this building. ..... It was quite a difference from Chicago. ….. So anyway then I just decided to take that job. I mean I, I, you know having worked with George for 8 – 10 years and seeing what the academic world could be like, how could you resist. It was clearly my direction. …

Tribbia: But _____ out of the west, you'd been in Arizona for a year, so.

Baer: Yeah.

Tribbia: So being out in the country wasn't (both talking at once)…

Baer: Oh, no, no, no I didn't have that. I didn't have trouble with that. I mean didn't have to be in the big city, Yeah I didn't grow up in a big city, although it was a city, and Tucson was really quite nice too. I really liked it. The climate was spectacular, but the irony of that was that they don't have winters essentially I mean it gets cold, actually I think one day there was actually a half an inch of snow that winter, but you know the temperature would be in the 60's in the wintertime. It was beautiful climate, however sometime during that year I really had nostalgia for winter. It was bazar, know I mean living in this wonderful environment I, I realized that I think that a… I liked having a change of climate. So I didn't have any trouble coming back to Chicago. I also had a nostalgia for Tucson when I back to Chicago for awhile, but that all went away, but it was interesting, we had an o..l..d station wagon in those days, it was something called the Nash, (sniff) and we had this old Nash when we had a bunch of kids transport them around, and when we left Chicago was in, it was in pretty good shape, I mean it was clean I think before we left. We never washed the car once in Tucson, and we came back to Chicago and it was still the cleanest car on the road.

Tribbia: ……

Baer: We came back in the middle of winter after, _____. ….. Chicago was a dirty city in those days……..

Tribbia: So now you had this opportunity. Your building a department at Ft. Collins.

Baer: ..hu…

Tribbia: with Herb _____ as the….

Baer: Yeh, It hadn't been formalized yet.

Chen: Right.

Baer: But we did within a year or so, when I got out of there. We were kind of in Civil Engineering at first.

Chen: And what was that like?

Baer: And we started the department….. Oh that was kind of fun, I enjoyed that, I mean Herby, … you have to know Herby. ..... He was a very dynamic guy know always running off to Washington every two weeks know, he was very interested in what was going on in the weather service, and if he hadn't been, hadn't said have such an abrasive personality know with people, he probably would have become some honcho, big honcho in the weather service but, know they just avoided him like the plague, even though you know intellectually he was a giant, but personally he just had trouble with people I mean you know he just, he was overbearing and demanding and you know he just didn't have a smooth style to him, and so it didn't work for him, but he did fine, he created the department like, I mean, you know. In his legacy it's a good department now. Has good people working for him.

Chen: But Ferd at the time, of your brand new assistant _____ _____ demanding to do the work like we are doing today?

Baer: …I'd say that it wasn't as obvious that the pressure was there. In other words in those days , there was _____ of scientists who could take professorial positions, rather than the way it is now where know there is a, I mean its hard to get a job.

Tribbia: Right.

Baer: When I said that I probably meant , what I meant to say was that they needed people, you know.

Tribbia: This was right after Spootnick and a…

Baer: Probably yeah, in 61 – 62 yes, so know there was this saying that they were picking people up off the street, giving them Professorships you know. Then they cluttered up the ranks know is what they called _____ work for many years. So you know getting a job wasn't that difficult, getting promoted wasn't as difficult as it is now. So I got promoted within a few years, and I don't know if I did anything exceptional, but you know the average professor would do, but now a days you know they watch you much more closely. I didn't have that many publications so.

Tribbia: So who, who else was on the faculty the first faculty at Colorado State

Baer: At CSU? Ummm their was a Climatologist, a Christ, what the hell was his name ….. I'm trying to remember, remember, oh … it was this guy from Austria. Elmer _____ , … a _____ physicist…

Tribbia: Grant.

Baer: Yeah, yeh…Grant, yeah Lou Grant, Lord I'm having trouble with names now. ....

Tribbia: Sure.

Baer: Trying to remember.

Tribbia: Sure.

Baer: Bill _____ came, he wasn't quite finished, but he came and continued to work, and continued to work, and I think he got his degree a couple of years later, but he you know he started then.

Tribbia: Right.

Baer: Umm, who else did we have? It was a very small group. , I don't know if Tom _____ came at that time , but I think he came a little later, and another guy who worked in the same area who is now retired. I, I, I really would need to look him up.

Tribbia: Tom McKee?

Baer: No Tom McKee was a not there, he was actually a student there, and he wasn't the first student there. He wasn't the first student. Jim _____ was our fist student. Well, he was in the first student class. He was our first graduate. I remember talking to him, he was already sh…made indications that he would be a terrific administrator. I told him to go to Washington, and he did it, and he became a good administrator, so he liked it. So I, I if I, if I pursued this a little further I think I would remember, but their weren't very many other people there.

Tribbia: So.

Baer: I mean it was really a small group.

Tribbia: , at this time your research is still caring forward some bits of of, your thesis research.

Baer: Yeah, I, I kind of wanted to continue to explore in this area, but I did branch out little bit which is kind of interesting I umm… I got interested in the analysis problem a little bit, and I started to look into how you could take data, and, and massage it know and create it, maybe it was a question looking at the initial conditions and all, but it was a very statistical kind of a procedure, I don't know. I can't even remember where I got cued into doing this, but a, I worked on it for a couple of years, but it never really

amounted to very much and so I never published on it, but , this fellow, the Japanese fellow was there who visited he went to UCLA, and he's still there. He's retired. Do you no who I'm think of?

Chen: Yes I know. He made the…

Baer: _____ yes. _____ he a picked up on this from something I did there, and he used it…

Chen: _____ _____ _____

Baer: Who was that?

Chen: _____ _____ _____ prediction of the of the spectral model.

Baer: Was that _____? Yeah, he worked with me. Yeah I a.. invited him, yeah I remember that, and he became an important guy in Japan, yeah, yeah.

Chen: _____.

Baer: Yeh, Yeh I remember seeing him in Tokyo once when he was the head of the weather service or something, I don't know.

Chen: _____ _____ so

Baer: So anyway and he picked up on that, and used it for something, but I mean it was just a piece of what I was doing and I probably still have notes stacked this high, so, from those days I never threw it away, but I would never be able to recover what I was doing at the time.

Tribbia: But…

Baer: But then I, I also played around the spectral method in terms of using it for other things, and, and by the mid 60's I started to get curious about the low order system that was really very interesting. I did some work on that and then ultimately I published that toward the end of that decade. I have a few papers on that.

Chen: Then Ferd before you _____ Mexican, _____. _____ _____ You went to India, _____ _____.

Baer: Yeah I did.

Chen: Because I visited there many times, so

Baer: Have you?

Chen: Oh yes, yes. So that's why I would like you to say something. Why you went there?

Baer: Oh, well this was in 66 and I guess the Indian, I mean Herbert know traveled around and I think he had been to India, and so, they had, somebody had contacted him asking him if they could send an expert on numerical methods in numerical weather prediction to India, and , it was through the _____ of the WMO you know _____ all around, an expert. A scientific expert or something like that, and so then the WMO would send this person to India, and they did this for other country's too in development. And so Herbert turned if over to me and he asked me if I wanted to go and I thought about it and decided I would go. So I did that in the winter of 66. I went to _____ , and they have this institute of tropical meteorology there, and I'm sure that you haven't seen there, you'd of never gone to there old building. They probably have some new facilities there. But anyway umm and, and I then I gave series of lectures, and a told them about numerical weather predictions. Dually impressed by this expert, and I tried to , I don't know they probably had no computational facilities, or hardly anything, and I tried to point out to them how to know to do this on the computer and all, but it was very difficult. But I had some, I mean it was a really interesting experience with some very interesting people. As a matter of fact , _____ was there at the time.

Tribbia: huh.

Baer: And I remember visiting with him and talking to him. He was not the director though, I some guy by the name of _____ or something if I'm correct was the director, but I did meet _____ which was _____ saw his daughter and she must have been pre-teen ..., at the time, and you know we never made any comment we just went to visit him at his house one time and had dinner and there were a few kids around, so but she remembers it vividly.

Tribbia: Well.

Baer: And a so I, and then I traveled around India a little bit, then … you know visited up in Delly, so then you now there headquarters were, and went to Calcutta and, actually went to _____, I don't know if ever _____saw the stone cuttings around the Temples at _____ with all of the official pornography of India. That was quite an impressive place. , but I did have some interesting experiences about India which I wrote up, because I was suppose to write a report, and I don't think I made myself terribly popular in the process because I kind of castigated them for the social practices which inhibited their making progress. know I was a good western kid coming out and showing them how you really move ahead, and India was and I

don't know may still be I, it's probably changing but was incredibly stratified vertically. I Mean you could easily move on of horizontal level, but if you tried to move upwards you know, its impossible, especially for the natives now, I was a special visitor so they treated me very nicely, but they didn't allow me to help them to move through the ranks know. I mean it was as bad as you know as making a phone call and trying to talk to somebody in a different level. That was just almost unheard of, and know here you come from the states and you pick up the phone and you can talk to practically everybody but the president, and you know it's kind of a interesting experience. So I wrote about that and I said well I didn't think they were gonna make a lot of progress unless they could break this down so that they could communicate and use there people efficiently in, oh I don't know that document I think is still in my office .....somewhere. I was very proud of myself being forward looking, but it was politically really inappropriate, and I think that it got back to the Indian's they didn't like it very much, but nobody ever said that to me explicitly, but I have a feeling that is the case.

Chen: Chain of command.

Baer: Chain of command, right.

Tribbia: , at CSU, you got a brand new department more or less, and no students. So how…

Baer: Well, we gradually got some students.

Tribbia: How did you…

Baer I don't remember how they advertised for them, but gradually they started to drift in.

Tribbia: Okay.

Baer: As a matter of fact I got a reputation several reputations .....,of being a difficult teacher because I come out of Chicago where things were really pretty, pretty tough.

Tribbia: Yeah.

Baer: And I though well I thought, well I thought I could do the same, so I sat down for a year and wrote out these lectures for dynamics course, where I did everything under the sun, including radiation all in one semester, one quarter maybe. ..... I mean that was a lot of stuff and those kids really had to struggle then. I got a reputation for that at CSU, but I mean not infrequently I'd meet graduates from CSU, and they remind me of this.

Tribbia: .. ..

Baer: They don't mind it now, but I think they didn't like it at the time. …. I probably carried that over to Michigan too, that kind of reputation, I don't know. You guys would know that better because your both from Michigan.

Chen: I'm not afraid of you.

Baer: Hm.

Tribbia: So, as an assistant Professor who were your first graduate students. Your only graduate students at that time.

Baer: Ummmm. I had a fellow by the name of Rich King, I think he was the first one. He did the thesis, he was also working on the low order systems, but he added another, another mode, which made it completely nonlinear and you had to do it numerically and you had these kind of triangles, and stuff. There was a guy that is up at Albany or at least went to Albany for awhile, and he actually worked on this too. These, these triads they were called, I don't know did you ever run into that kind of stuff? Anyway he worked on, and it was really quite interesting, and he wrote a thesis , and then he took a job with some company I guess it was down in Alabama, Huntsville I think, and so I said why don't you come back and I will pay you a summer to clean up your thesis you know, he never came back, and that was the end of it. He never finished it.

Tribbia: Wow.

Baer: I never knew what happened to that guy, and I really, I think he was my first student.

Tribbia: Okay.

Baer: Yeah, and then Fred _____ came in, he was one of the earlier students. Then he did this as I said earlier, he did this dissertation on _____ climate model, using a _____ two level _____ model, and there was a fellow from the Netherlands, Joe Simons, who could have had a PhD before he came as far as I'm concerned. ....He was really a brilliant guy.

Tribbia: .. ….

Baer: As far as I'm concerned, but he was really a brilliant guy. But he did a really nice study, and we did some _____ instability studies with him, and he got a PhD and went to Canada, and he worked for the …

Baer: Some water program outside of Toronto I think is was. Somewhere at the end of Lake Erie any, anyway he got to be quite well known, but unfortunately he got cancer and he died at an early age so, but they really liked him, and they put a monograph together know with all his publications and, so who else, anyone else came on in that period. …

Tribbia: , it looks like the other PhD student you have during that period is Bill Burrows,

Baer: Oh yes, and he moved to, with me, to Michigan. I think he got his degree at CSU.

Tribbia: Right.

Baer: Yeah.

Tribbia: You also had some Master students at that time.

Baer: Not hardly.

Tribbia: Mike _____

Baer: Oh, I beg your pardon, Yes that …..Oh you know how that happened. Was, the reason I forgot about Mike was because …I took a sabbatical at Princeton in 68, and worked at the GFDL.

Tribbia: huh.

Baer: And in order to, I had to get somebody to fill in for me, so I invited _____ he came in, and when I came back he stayed, and_____ and I got a grant with the Air Force, and I don't remember what we were doing, I think it was some regional modeling of some sort, I, I, can't remember the details anymore, but anyway we hired Mike on this project, and so he worked with us, and he was really a bright student. He got a Masters Degree, and then he went off, he came down and took a job here in Boulder or something, but I think it was with a probably NOAH, well it wasn't NOAH in those days The Weather Service I think had some things here. I don't think it was NCAR.

Tribbia: Yes.

Baer: He ultimately went back. I guess he got PHD, and I was gone by that time.

Tribbia: Right. What about Alan _____ I remember?

Baer: Yeah, but I don't remember much at Alan _____ I don't remember what I had him doing. He actually, I don't thing he got a Masters degree, did he?

Tribbia: I don't know. I, I, _____

Baer: I, I had a tendency to go for PhD student's know because I liked the idea of independent work.

Tribbia: Right.

Baer: Although, later on in Maryland, we won't talk about it, I did have some MS students you know.

Tribbia: Yeah.

Baer: Things changed a little bit.

Tribbia: So we'll talk a bit about later ah, about Bill Burrows. One of the interesting things that thought about Mike _____ work is that it was some applications of _____ my recollection.

Baer: Oh right, we did do _____, oh that stuff's so far back in my mind, I ……. I just can't recall it.

Tribbia: But, this was an analysis?

Baer: Right it was an analysis my problem we were working on really.

Tribbia: And …

Baer: I did some different kinds of modeling in those days, know, but things that weren't really in the forefront in my mind in terms of the kinds of things I am interested in. I mean I was interested in them but they a little more tangential, and when I in summary now looking back know they kinda of are on the edges, and I just don't remember the details of them ... I mean we'll talk about some of the other stuff too that happened in that regard later on.

Tribbia: Right.

Baer: …

Tribbia: But now I want to get back tooo , GFDL your visit to GFDL. And…

Baer: Kind of nice, I don't think I really did very much there. I can't remember .. what I did there. It was just a new experience. But I remember that the, I

remember the environment was really quite nice, I mean that this is where doing anything, they really didn't care. But Joe, had a tendency to want to be involved in what people did, and , and you know in some sense maybe he would like, would like to direct something, not, not detail but, know, but in what I was doing, but he never came out and said that, and so I was there. I remember Richard Somerville was there, and he was similar to me in the sense that he was just doing whatever he wanted to, and he didn't make much contact know with Joe. Then I, I never really got the work in close harmony with anybody there, I mean I saw them everyday and we talked about things, but the only distinctive thing I remembered was that I tried to convince that the spectral method was really good, and if anything, if nothing else, why don't you do a composition of your data fields, and see what they look like in the spectral environment, and then you can get a sense of how well they are behaving, know, because each of the spectral modes would have some kind of a periodic or, _____ periodic character, and you could at least analyze that, and he didn't, he didn't have any patience with the spectral method what so ever, so he never did anything like that, so I tried to take some of the data I think and play around with it a little bit. But as I recall, it was a wonderful experience, I really loved it. But, I don't have a recollection that I really accomplished a hell of a lot scientifically except for the contacts, you know and the interactions with the people there, you know, talking to them. , I think socially the most interesting guy I met was I, I, was Bob Morris, he is really a charming fellow. But I mean the only the other people I could remember having parties, and at that time I was married to a young lady who, was of Yugoslavian decent , and she liked to have parties, and her brother was in the area, _____ we all, that's where we learned to drink Shlevovitz. ..... But I can remember having _____ and _____ over for parties, and I can remember 3 o'clock in the morning we're sit-in around the floor chattering and drinking away. Well, it really was a nice time. The winter was very nice, we do a lot of ice skating and, I, I, you know I think about my Princeton experiences more a social experience than an intellectual one, but Princeton is a lovely town, and I had just moved into the new building so.

Tribbia: Did they, go ahead…

Chen: You mentioned you didn't do to much at Princeton, but after that you were later on and you were about year or two later you moved to Michigan.

Baer: Yeah.

Chen: And you published a couple of very important papers.

Baer: Well I was working on that stuff for a number of years, and I just sort of put it together. I was having _____ at CSU.

Chen: No, no I know, but what I'm saying, it's a it's also a time for you to hatch the ideas.

Baer: Yeah, probably yeah. I, I think that probably did happen at Princeton, in other words it was not necessarily right at my conscious level, know, but things were brewing. I mean I was involved in research and I was know, thinking know about all the issues and all around me and people were doing really interesting work, know, and I picked up on it. They had some _____ all the time. It was really quite a nice experience in that way, but as I say I couldn't put my finger on any one thing, but what would principally what happen after that was Herby left. He went to Germany, and Elmer _____ became Chair, and Elmer and I, we just never hit it off, and I might, I can't for sure tell why he was know, he was of, kind of a scientist who published like a maniac, but he was always on the surface know, skimming off the cream know, and so I described him as a guy who had literary diarrhea, and he accused me of literary constipation. ..... It was really cool, but we were always at war with each other, and her was very scatological at, I think he was a bit of an anti _____ on top of it, but I, know it was nothing _____that I, it was just in the kind of jokes he told, and , so that was really the time when I was suppose to get, be ready for promotion to full professor, and he just wouldn't move on it, know, and I was really pissed, and so I started to look around, and I did some traveling. I actually went to Maryland and gave a lecture at that time. Some time, and you know I actually forgotten about that even the next time I went to Maryland, ..., but it was interesting that I had done that I went some place I think I went to, Ohio State was thinking about opening up a program, and I think I visited there, and finally I ended up in Michigan, and , of course I knew _____, I knew _____ a little bit, and so then we got in some serious negotiations because _____ had left. He went to _____, nd so they needed a guy with similar credentials, well I wasn't quite up to _____ standards, but I had some experience in that _____. But I went there, and at that time I was putting together some really interesting stuff, I think, and so when I gave the talk there everybody was really interested. Sam _____ was there, he liked it. And so they decided to hire me, and so I felt really good to get out of Elmer's _____, and I got a promotion on top of it. So, ... So that's really how that worked. I left CSU.

Tribbia: Do you think that just the thought of trying to convince people at GFDL that decomposing the data or their model output terms of _____, led you to looking at spectra and things like that.

Baer: Yes… yes…I can't remember at what stage I started to study know, these _____ and horizontal _____ and now you got the vertical stuff.

Tribbia: Right.

Baer: And I can't remember at what stage that was, but it might have been at that… I mean, you have to look at my _____ to see when these publications started show up.

Chen: 71 ….

Baer: Okay, so its very possible, because that was 69 , 68-69, and I probably was starting to think about that. The energy distributions and stuff, things that you have gotten into, yes, I think that is probably right.

Chen: Well Ferd, I, I went to Mexican with Joe and , and other guys at that time…

Baer: I remember you, you came from Florida, and were at John's Hopkins, or something like that?

Chen: Yes, yes.

Baer: You were actually at MIT also, right?

Chen: Yes, we were, we had about 5 or 6 graduate students that went to Michigan at that time, and Joe and I _____ _____ that _____.

Baer: Yeah remember it all vividly.

Chen: Yeh..It, it was a good group.

Baer: I think that by comparison know, when I was talking about George and all, from my career and I take that a simple kind of a period know, I had some really good students. All of whom not only communicated well with me but with each other, and it was just an exiting time know, but I don't think I hung on that long …..

Tribbia: I wanted to ask before we go on to Michigan, while you were up at Colorado State , something was happening down in Boulder so that must have been some interest.

Baer: Oh, I was in the Boulder all the time. I never lost my contact there. I mean I was kind of an external member. As a matter of fact I got to Ft. Collins in 1961, and within a two weeks I went down to NCAR and saw _____, and he tried to hire me away. ..... I remember that ..... I said well you know I just came here I can't do that, but they were in the old gymnasium here and they had their offices up around the track upstairs, and there was Phil and _____, and just a few I guess Roberts must have been there right? But I mean there was just a hand full of people know. It was just at the beginning then.

Tribbia: Yeah.

Baer: And I used to come down there all the time. I come down in the summer and play ping-pong with _____ _____. I mean I was the only one _____ was the ping-pong expert so everybody tried to beat him but didn't. …… Well we stayed in _____ Hall in summer time know, there were summer visitors always there. I was at NCAR all of the time. They really enjoyed it.

Tribbia: One of why the reasons I wanted to….

Baer: And of course I hoped to get _____ down there. know he went to New York to _____.

Tribbia: Right.

Baer: And then we kind of worked on him to out to NCAR.

Tribbia: I, I, I wanted to understand how questions that come up in some of the work, that actually its published by the time you get to Michigan, but its work that you did at Colorado State, on questions like predictability and climate situations. Were those influenced by your visits to NCAR? How did you come to be come to be working in those areas?

Baer: That's a good questions Joe. I really haven't thought about how they entered my mind, but you know in those days, I mean whatever I was doing there were always meetings going on, I would go to a few meetings a year.

Tribbia: Right.

Baer: And in those days you really paid attention, because the meetings went like, thousands of people around, and everybody gets 5 minutes to talk, so you instead of getting interested you just get board because you can't absorb all this stuff, but in those days know you have limited number of scientists around and speakers, so you listen to what they were talking about, and you put it into context to what you were doing and all, and I think ah you know you were stimulated, and the ideas that came up were provoked by the interactions that you had at these meetings know. I mean there was a different, I mean I used to love to go to those meetings, and now I just you know just go to the meetings is more like taking a vacation or something, but it's not so much going to the meeting because you know what the people are doing now and your really not learning a hell of a lot when you go to these meetings. There is just too much stuff and people would grinding out details and know it's just not provocative. I've gone out just saying that in conjunction with how different it was.

Tribbia: Yeah.

Baer: Well I think it, it's from environment that probably that some of these ideas came up. But, ah you know and I haven't really thought it true in the sense that how did I get on to one topic, or get onto another topic, and its just these things sort of evolved. I start exploring, and you know if you have students you say well let's look at this and the things evolved. I mean, you ended up doing something, I mean it certainly wasn't something I recommend. know.

Chen: Right .

Baer: It was probably more of Stanley's thing, right?

Tribbia: Okay, two other kind of publications that stand out when I look at this, this late 60's early 70's, era are the summary of spectral models in the proceedings of the _____ seminars, and also this alternate scale representation so, _____ seminars kind of, at this juncture are now one of the, one focal points for spectral modeling _____…

Baer: Yes, they were wonderful yeah. As a matter of fact a _____ gave me a little summary of that last summer. …… Where we had this drinking party and had, I mean that was the first time as I recall that any one publicly actually _____, _____ methods, and spectral methods, in terms of what their potential was in the future you know. Of course I, I as I say wasn't that committed that the spectral methods in terms of anything except for my own work, that it had to be taken at the community, I had to take it over, but I think now those kind of situations did put some pressure on the environment to try to evaluate whether there was a scheme that was better, and it was more appropriate, I think more timely by the 70's, because know the models were really becoming more personalized in terms of there, representation for the prediction community and the people who were making the prediction committee were now using models more to give forecasts than developing models. Which I think in the mid 60's it was still very much developmental. know they weren't, that the forecasters were using maybe some of the output from the model which they might have not be able to get from the data in terms of looking at the patterns and stuff, but they made there forecast know they were still ____ forecasts, but, know this was still kind of a little aide on the side. You know now a days, nobody even, there isn't even synoptician around to make a forecast, it comes out of the computer and nobody even looks at it, it just goes out on the air waves. know, that's how it's changed. Well in any case we were getting more to the point where the models were becoming more important and know the discussion was going on Well, know maybe the models were doing just as well as the forecasters, I doubt if they had yet said yet that they were better,

but it was a time to reassess and if you could use the new methodology, which gave you better response you should consider it. I don't know if Tony Gordon went off to GFDL, and he worked with _____ and he was doing spectral models.

Tribbia: Right.

Baer: ....I don't know who fist got into spectral models at NMC.

Chen: Was it Joe _____ or something?

Baer: Yeah, right, okay that was probably in the late 70's then.

Chen: Yeah, but Ferd _____ at that time has such debate because of the Canadian has operational models.

Baer: Yeah, they were building. Right.

Chen: And then the Australian was the building spectral models.

Baer: Right.

Chen: And another words, it gave the community of the United States have a chance to see and _____.

Baer: Right, exactly.

Chen: But why is so difficult for them to accept it, because those two groups were so successful?

Baer: Well I, I mean know if you have a going concern, you have a lot invested in it,. know you don't just turn over and say well we'll just do something different. I mean it's psychological if nothing else and maybe even from a financial point of view. know, it's, it's, like saying for 20 years we've been on the rotten track, I mean it's not easy and they just, just these people were running it were not of the nature to do that. So it had to leak in through the back door really, and it did, because it was a change, like _____, and _____, while they were running the show know, they weren't gonna shift over. I mean I knew these guys. And but then they retired and new people came in and _____ came in at that time, but actually that's getting a little later, but know then they started to explore other techniques, and they used the device of saying well, we'll have some pioneering work done here, but we certainly won't implement this as the tool you know for making forecasts until you prove that it's better than the other while the other continued to roll. know, so at some point in this process they found that the

developments using the spectral model gave them systematically better results, and then they acknowledged it.

Tribbia: One of the important developments during this period is something that _____ spoke about it at your retirement symposium, anyway the development of the transform method.

Baer: Yes, we should have talked about that actually in the process, but I'm glad you brought that up, because, and this helps to answer the question that you were asking that computationally the method we used, which was the interaction coefficient method, was very expensive. In other words you have to have this humungus table, and know with 5° of freedom, and until the transform method came the those people wouldn't accept the spectral method anyway, because they couldn't afford it. So I, maybe that's really the answer to why it didn't take off, and, but that came not until the early 70's, so in the 60's they could have thought about it, but they didn't, and I guess that, that is really the answer rather that anything else, and the irony of this is that George and I inadvertently explored the transform method too, but not really consciously and not with any intent of gaining computation advantage, we didn't think about it. and it was in the two dimensional _____ series model in the channel, where we just know, we worked on grid to do the _____, and then we transformed it into a piece of cake know, because the interaction coefficients are all unity. ….. know I mean, so I don't take any credit for the transform method, know for developing it, because I didn't in terms of it's real application, but the idea obviously was already there but you could do this. We just did it because it was convenient program wise, but it wasn't as if we trying to do something new know, which is what _____ _____ and what's his name…

Tribbia: _____

Baera: _____ did yeah. No that definitely was the break through, and I think that opened up the door, and it certainly helped the Canadian's and the Australians also.

Chen: On the other hand Ferd, before you moved to Michigan you really didn't do any diagnostic analysis ____.

Baer: Probably not. Yeah, yeah, as I say I was playing around with some kind of a analysis tools, but it was really a theoretical thing, and I , I never brought to _____. I wasted a lot of time in Ft. Collins , I mean I was training as a teacher, and you know working with students and also relaxing a little bit from the intense experience I had in Chicago. …… know where I had never done anything privately, I was just working all the time. So I started to horse around a little bit at Ft. Collins, I mean I didn't, run down on know, my scientific activities, but I wasn't working as intensely, and then it sort

of built up again toward the end of that period, and I did in Michigan, I think I spent a lot of time working.

Chen: Yeah, because when you published _____ _____ scale presentation, that requires many, many people, because at the time it was after the discovery of _____.

Baer: huh, right.

Chen: In a way you introduced a new method to deal with the so called geotropic turbulence.

Baet: Yeah, well I was kind of interested in, I mean this question of sub root scale processes always fascinated me. I mean, and to this day I don't have any answer for it, but I've thought about it all the time know, throughout my career about how you deal with it, and what's going on down there, and , and I've always been uncomfortable with the idea of _____ and nonlinear process because know it, it fundamentally the _____ suggested that you can make some sort of a linear approximation, and you can't make a linear approximation of a nonlinear process, and besides which it know, you don't know what's happening on linear at least so know, it's just a very difficult question, know, and Joe and I talked about this many times about how you actually identify and define these processes, so I think that's why I studied the statistical characteristics of the data to see know what kind of distributions you have there, but the statistics didn't help you very much because it's kind of an average in the nonlinear process is a time of evolution, and further more as Joe found out, these things _____, and then you are in trouble. know because they go in different directions when they can.

Chen: But Ferd, if that's the case why at the time it's about the same the same time you published another paper so before to extend to three dimension.

Baer: Well, well.

Chen: Available potential energy.

Baer: Yes.

Chen: And ah….

Baer: Well , I think that was the starting, my starting effort with regard to whether you could do three dimensional spectral model. In other words can you use something in the vertical to correspond to the horizontal structure functions that we use. know, it's all a question of know you have the differential equation, _____ linearly, and you probably can describe some kind of a

_____ set that can represent what you have in the particular field, and if you can do that, then maybe you can define model in terms of the coefficients in those models. I mean I thought, I think at the beginning of process when I start looking at the vertical stuff I was pretty naive about it know, and know because the vertical domain is so much different from the horizontal, I mean in terms of scaling, and in term of the intensity of the forces, I mean you know you got gravity going there, you don't anything like that in the horizontal, and so you know I just started playing around to see whether or not I could find any of those kind of structure functions. I worked pretty hard, as a matter of fact when _____ came, to Maryland I put her on into looking at vertical structure, functions know, and I was in getting EOFs there, but they were one dimensional or less, and to me EOFs are simply numerical modes know, to describe structures, and so you know that pervaded a long period of my thinking you know to try to understand on how to do that stuff and I think you kind of have to go back and look at the data to see how it distributes, and even in the horizontal know for using the _____ know. They don't necessarily give the best representation of how the energy is distributed and know in a model environment. So as you go back and you actually look at the distributions you might get a better sense of how that's distributed, and give you some insight into what's going on interactive processes. It's always _____ interaction that fascinates me there. Whether you found the right structures, and the right modes then you could just isolate a few modes which interacted and know, would cause for the transfer of the energy. I don't think it's true. I mean so far I haven't found _____. ……. But anyway I think that was the process that I got into and that's how that paper came about, but I mean, all , all this time the spectral method was always there in the background because, those were the nicest expansions, and the nicest structures that because they have to scrape properties on the sphere, which was the geometry we were working in.

Chen: Because actually _____ , at the time the new direction for diagnostic analysis.

Baer: I suppose I don't know I though _____ was doing that kind of stuff too wasn't he?

Chen: Yes, he did, and was not very successful. ….., and so , when I came, he suggested that I have a look at that kind of problem.

Baer: huh.

Chen: Joe.

Tribbia: So, in this context of looking at data this was kind of early days of _____ and _____, and those kind of things?

Baer: Yes, Yes, yes.

Tribbia: So, and, and, it was, it was somewhat easier to actually get a hold of meteorological analyses at that time .

Baer: A little better, yeah a mean better than the 60's, sure it wasn't anything. Right, and they were beginning to get organized, right. So I, I tried to get hold of this data, but know it was still not easy.

Tribbia: Right.

Baer: I mean like today. know you just get on the web and there is data source there and you just download it ____.

Tribbia: But, also at this time we'll get back now to Bill Burrows work, because he's trying to put together a couple of things and going on.

Baer: know I, I when you mentioned Bill Burrows, I mean he and I were good pal's, but I don't remember what the hell he did. ..... to tell you the truth. ..... I mean do you remember what.

Chen: He did the _____

END OF TAPE 1, SIDE 2

Interview of Ferdinand Baer

TAPE 2, SIDE 1

Tribbia: Mike Chen was just mentioning some details about Bill Burrow's thesis.

Chin: It was the spectral analysis of kinetic energy equation.

Baer: huh.

Chin: And , Ferd, do you think that it's because the _____, so some of your students get into the energetic analysis. _____ and _____.

Baer: huh.

Chin: _____, and _____.

Baer: Well, I mean there is obviously some spin off, , I was starting to look, you know, these , what you get out of data in terms of maybe seeing how the energy was being transferred from waves to a different scale, and maybe looking for some maybe some characteristic structures, which were a little more sophisticated than the simple functions that we were using, and so you know, they picked up on some aspect of that, and looked into it, and I would guess that, that is what happened with Bill. Jordan was a little different in the sense that he kind of had his mind set on doing something, and he was definitely a data man, and so he , you know, he just worked at it, and you know, I kind of gave him some clues, and guides. Jordan was the kind of guy that you really had to keep on track you know, he would find that an avenue down there and explore you know you would have to pull him back and get him on the main track. So, I mean he did fine, but you know, he just had to be directed a little more, but his project was really more his than mine, so, if it was a reflection of anything that I was interested in, you might see it there, but you would have to look for it.

Tribbia: Now, Bill Burrows came with you from Ft. _____ to…

Baer: Right. He had been a student at CSU.

Tribbia: , and , I also came with you, although I had only been a student for a very short time.

Baer: Right.

Chen: Yeah.

Tribbia: I, I know that when you were at Michigan you taught energetic analysis…

Baer: huh.

Tribbia: As part of, , part in _____ of the dynamics courses there. , that was carrying on kind of the tradition of Michigan. I know _____ had left.

Baer: huh.

Tribbia: _____ had done quite a bit of energetic analysis.

Baer: Yes of course, that was his thing.

Tribbia: Right.

Baer: Yeah, I never thought of it from that perspective you know that there was a tradition there or anything. I think I was just interested at that time, and from our discussion here, it sounds to me like I was interested because of what I was looking for in terms, I mean, energy clearly is a vehicle for identifying what's happening in the system, and if I could extract from that some structures in which had the primary energies of the system, and how they interacted with each other, you know, I would get some in site, but I think ultimately I was still looking for this ideal expansion system, which encompassed everything. As close as I could get to the nonlinear part without actually being nonlinear, and then put it into the nonlinear frame work. You know, incorporate just about everything you put…

Chen: Actually, it was because of that. Because you got involved in energetics. So I, , I have a _____, which I didn't do my PhD visitation, which you _____.

Baer: Yeah.

Chen: _____ because of that.

Baer: Yeah, sure, yeah

Chen: Now there was another side track when you were in Michigan, , I remember when I _____, and you asked me whether or not I was interested in working with you, or _____, and you kept one of the students…

Baer: Doug _____ did that.

Chen: Yeah, that's right.

Baer: And he worked on the Great Lakes, yeah. He was interested in that.

Chen: Yeah, he was.

Baer: I can't tell you what provoked me into doing that. I mean that was really a side light I think, although you know we're into it now as a part of the global problem, but it's still _____ now.

Tribbia: So, I'll refresh your memory a little bit, , you had a grant with _____, and that might have been a carry over of…

Baer: Oh right, it probably was…

Tribbia: Of this grant that…

Baer: Right, okay.

Tribbia: That Mike ____ worked on.

Baer: Yeah, I think so. Because they were interested in the regional computation problem, but I can't remember what specific contributions we made there. Whether we were simply trying to develop a model that would, you know, predict on that scale, which he couldn't do in those days with a global model, you know it was not possible to get those small scales in there, and also you know, it incorporated some physics now, where you know my tradition was working with the _____ or the, even when we did the _____ problem like with, you know, , for the _____ model, that , the physics was really quite simple, you know. It's like what we talked about now, as far as kind of forcing…

Tribbia: My , my recollection also is that one of the aspects of this search proposal was to contemplate moving _____ modeling into the limited area domains.

Baer: Yeah, we probably thought that might be a possibility, but you know with the boundary conditions and all it was a mess. Oh I understand that people are actually doing it.

Tribbia: Yes, right.

Baer: But, I mean I don't know what they do for the boundary conditions, you know I mean, those functions really need special boundary conditions…

Tribbia: Yeah, right.

Baer: They don't behave very nicely if you just chop them off in the middle of something. So, I, but I don't think that, it was more of a computational thing than it was of a theoretical process, and , I don't know did he use _____…

Tribbia: Yeah, no, no, no.

Baer: I didn't think so. It was a slight indifference problem.

Chen: _____. I mean as far as my _____ student and I, _____, Michigan was the best time I ever had.

Baer: Yeah, well…

Chen: It was also very interesting to observe that I _____, but I was mixed with _____ student.

Baer: Yeah, so was Norm, Norm _____, he was not my student, and he was certainly a part of that group.

Chen: And , what, what would be your experience to see that _____ mixture of _____ students together there.

Baer: Oh I was very impressed. I mean you know, coming from Colorado where we had built up a reasonable student body. It was very diverse, you know, I mean we had, we had everything there. And of course Michigan did to, but dynamics you know with _____, Ed, myself and, and , I don't know, other people were doing things not so far away, like Stanley was in the ocean's, but he was doing theoretical kind of stuff, you know, we had an extremely strong emphasis on dynamics, and we had a lot of professorial talent there, and we collected a bunch of good students you know, and we couldn't have done that at CSU because the student body was too diverse. So I had a few students here and there, they were good students, I was always pretty fussy about students, and you know, but they were kind of one at a time, maybe Fred and Joe worked at the same time, you know, I didn't have very many students there. I would say if you looked at my, the only way that I could really measure is to look at my publications, that the 70s was by far the most productive period that I had, and that was when I was at Michigan, and , I never would have left there anyway, except that it just seemed like an opportunity to do something else in Maryland, and basically because of the , the only limitation that Michigan had, and it wasn't really severe, was it was very isolated, and you know, you know people from around the country, and from around the world came to the states, and they visited, you know, you have to go out of your way Anarbor, and , Anarbor was an isolated community. As a matter fact, that is part of its beauty, (laugh), and I loved it, and you know, I certainly never applied for a job. I was called, and asked to come down to give a seminar, which I did, and they liked it, and it worked out. So I went to Maryland, and I don't regret doing it, but I think, , it would have been exciting to stay at Michigan because the school was so supportive, and at least we had a _____ of students who were really good. Now I don't know if we could have reproduced that again. You see,

George never reproduced that period we had in Chicago, I mean, he had a few students after that, good ones, but there were individual students that he had, he didn't have that group, and you know, all you guys left around the same time. You know, within a year or two, and so, I don't know what would have happened there. It might have just, and Stanley certainly didn't have a lot of students, and so I don't know what would have happened. _____ was gone, and Ed was gone, he went to Washington, and so maybe it was a smart thing to do, I don't know, but I think it, , it, when I left, it was kind of a switch in my career in the sense that I started doing administrative stuff, and I was not has heavily involved in my research anymore. The people were doing it for me, and that's really not much my style. I like to keep my hands in, so gradually I, you know, I started doing less I think, and you can probably see that in my publications to.

Chen: Because when you were in Michigan, you did _____, as far as I'm concerned was very significant. _____ that , I mean you introduced the alternating _____…

Baer: huh.

Chen: _____ that you side tracked to deal with _____,

Baer: huh.

Chen: Some _____ publications with that. Like in numeric prediction and _____, _____.

Baer: huh, yeah.

Chen: When I was a student, I don't mean I was in shock, I just felt it was so strange why one could do that.

Baer: Laugh.

Chen: And then, after I left, well actually before I left, you started to talk about that, the _____ initialization.

Baer: Yeah, right.

Chen: So that is another very important thing in your…

Baer: I can't tell you how we got onto that, but it was a hot topic already. I mean, that was one of those areas which just was starting to grow, and I was curious about it, and I remember you and I certainly talked a lot about that. I, I distinctly remember that when we finally came to the, our representation of that, it was a very compact thing, and Chester Newton had it reviewed,

and he said could you expand this, (laugh), and I said I don't think, I think we said what we wanted to say, so they published it, but they wanted more.

Tribbia: One of the, my recollection, is that , one of the areas that you had been discussing on your sabbatical to Sweden, was initialization with different students there like _____

Baer: Yeah, I think we did, yeah, but I thought she was working on the balance equation when I was there as I recall.

Tribbia: Yeah.

Baer: We talked about a lot of things. Well there was some good students, it was really fun, , , _____, I think he must have come in there right at the end of my visit, but there were a couple of other students, Stephan _____, and there was another fella who was really bright, and I really wanted to get him out, but he was with the Swedish Air Force, and he took some job up North in Sweden. The Swedes are funny, I mean, you know, they, they're very, they look after their family and stuff like that. I mean you know, it's more important than their professional stuff, but this guy was very smart, Leonard Dunning was his name, but those two guys I worked with a lot in terms of what they were doing, and giving them guidance, I don't remember the details of their particular dissertations, but they both, I think graduated a year or so after I left, and we had a lot of interactions with them, but , and then there were a few other people that I interacted with so intensively, . _____ wasn't there that year. I think he was on sabbatical. He was in Canada, so I didn't work with him. Of course _____ was there, and he was _____, but he was already heavily invested in politics, you know, I think he is into all of these international programs so I didn't see that much of him. I mean I saw him more socially than I did professionally, and then , , _____ was there starting her career, and the guy who publishes, who was the editor of ____.

Tribbia: Harold.

Baer: Harold ____ was there, and they were mostly involved in teaching actually, you know, and at that time, I really wasn't overly impressed with the work that they were doing, but I think things improved for them, and it was a small program, so the biggest part of it was the chemistry, which I really didn't have much to do with.

Tribbia: Right.

Baer: There was also a physicist. He was a Hungarian or something. I don't recall his name either. He's retired now. He was a nice chap I remember, and we played recorders together actually, ... It was a really nice _____. I

enjoyed that. The Swedes are very nice, and, and the consequence was I used to go back every year, after there, a couple years I guess, they had some kind of retirement for _____, that may have been the last time I was there. That was a nice tribute.

Tribbia: So, you spent a year in Sweden, and you come back to Michigan, and something is in the air. First of all, we should mention that _____…

Baer: Came back.

Tribbia: Had come back.

Baer: Which was really nice.

Tribbia: Really nice.

Baer: Yeah, I was, boy I was so happy because then we had three guys there. That was probably the strongest group in the country at the moment, ..., but it didn't last very long.

Tribbia: Yeah.

Baer: But then _____ left again, so it was , it was , so I couldn't, so they couldn't attract me in Michigan because of _____, and then I had left, you know, so. So I was back to, Bill Gray called me a one horse dynamic meteorologist because, ..., I'll have to tell you this story, it goes way back to Ft. Collins, but , one of the things that I did in Ft. Collins, I had contact with NSF. In those days, they had these summer programs for college teachers, and , they wanted to train people in self disciplines, which they did not have much experience at, and meteorology was one of those, and so I wrote a proposal to NSF for this program to give support to a summer training period for students, and they came in for approximately six to eight weeks or something. There were teachers that came from different colleges, and of course we were inundated with applications because Colorado in the summer is the place to be, and then I was able to hire really prestigious people. I remember Phil Thompson use to come up, and he would give lectures for a couple of weeks, and sometimes he would stay over, and he would come over to the house with his six pack, and we talked until the morning until he finished his six pack, and then he went off. Anyway, it was really a nice, but one of the guys that I hired one summer, or actually, this one _____ came out a few times too, and this was , , a climatologist from Rudgers _____, and he was one of the early time climatologists. He was kind of actually even a forerunner _____, and , a charming pain, really nice, and quite , bright, and he came, and he came over to the house. We invited him for dinner, and the kids were hanging around, and he was just a nice guy, and so they started talking about horses for some reason, I have no

idea, and ____ says well maybe I can buy you a horse. So he and I conspired to buy together a little horse for the kids. We had a half an acre behind our house, which was just a field, you know, but we didn't _____, we weren't going to put up a lot of money, and we couldn't find anything but a lame nag, and so we bought this thing. It was kind of cute, and the kids would ride it around, I don't even think they had a saddle on the back, and we actually put _____ on this thing, and I have that photograph. I'm going to have to put that into digital form. Anyway, so, I think once I actually rode that horse out to the, we were out on the edge of Ft. Collins, and then there was the big dam there where the Atmospheric Sciences Building was, and then there was the Horsetooth Reservoir on top, and so, I didn't have to go through the city of anything. I just went out, a mile or so, with this horse, and after that, Bill Gray dubbed me the one horse meteorologist, a dynamic meteorologist. ....., so that's how that came about. Anyway so, back to Michigan. I was left being the one horse dynamic meteorologist. (Laugh) (cough).

Tribbia: And, so, , the graduate students at that time, _____ you already mentioned, I was one of them…

Baer: Jordan, and .

Tribbia: Doug _____…

Baer: Right.

Chen: Bill _____.

Tribbia: Bill _____.

Baer: Erik ____ was there too. He was _____, and you know he was doing something really fascinating, and never, well I don't think it was appropriate to proceed at that time, it was hard to do, but he was doing higher order interactions by doing expansion _____.

Tribbia: Right.

Baer: I mean that was fascinating, and Ed kind of got into that, I mean, because he was more of a statistician, and this was kind of looking at statistics, you know, on how you do closure for higher order systems and all, right, you know, that was really fascinating, I like that.

Chen: I'm still curious, because after you and Joe started to build the _____, _____…

Baer: Yeah, yeah.

Chen: And that was in 1977, , _____ and I, we were walking in _____, and there was a conference in Germany, that was 1977.

Baer: Yeah, I remember that, yeah right.

Chen: And , both…

Baer: _____. That was really ironic, because _____ and I, you know, pretty much started our careers doing the _____ method. Then we, we didn't end up, but I mean we then, at some point, we also started working on the, you know, _____ initialization, and we took it a little further than he, his was a little more practical scheme, and it was much more popular. Ours was more…, but again we didn't design this thing necessarily for practical purpose, it was just to understand how, you know, the models were constructed, and it was kind of put all together by ____, you know, with this _____ onto the different _____.

Tribbia: Manifolds.

Baer: Manifolds, right, yeah.

Chen: _____ the operation _____, and _____ significant impact, and .

Baer: Oh that, that took off like a firestorm. As a matter of fact, you know, it doesn't happen very often, and that too many people, that they would get into something in the beginning, and the thing just takes off. I mean how many thousands of papers were written _____, I mean Brad _____ got into it too.

Tribbia: Brad ____ is now one of students at Michigan.

Baer: Right _____.

Tribbia: Who followed you to Maryland.

Baer: Right, right, yeah.

Chen: And Joe and you got into that, and , Joe came here, but you guys continued on, and , and at that time Joe, you _____. I recall a better ____ at least eight to nine people walked in _____.

Tribbia: , that's probably…

Baer: Here at NCAR?

Tribbia: That's probably a bit exaggerated.

Chen: When I looked ____, it was about…

Tribbia: I would say probably six, is a…

Baer: Oh six, yeah six.

Tribbia: As I think about it. Ron ____, Dave Williamson, Roger Dailey, _____, myself…, and then…

Baer: But you know the interesting part of this is, and you probably remember this too, I saw this coming.

Tribbia: Yeah.

Baer: You remember, I said we got to publish this fast?

Tribbia: Right.

Baer: I never felt that way about a paper before, but I saw it coming, that this was a band wagon, but the funny part of it was that after we did this, I saw that all of the developments were in the applications, and then I lost interest. I just, I couldn't see myself, you know, working on details of applications. We did a couple of studies after that, to see, you know, what the significance of some things were, but basically I thought we had pretty much done it. I mean, you did advance it a bit though I think with the, you know, you did this paper which pursued the, to a higher level of expansion right?

Tribbia: Right.

Baer: Yeah, and I think that was a nice theoretical contribution, but the applications you know, everybody got into it, and then they put the physics in it, and it all got really complicated, and .

Tribbia: But two of the places that …

Baer: You know the guy who like this the best was ____. He really loved what we had done there.

Tribbia: Well, two places that picked up on it was NMC once again, the Canadians had been the first because of _____.

Baer: Yeah, right.

Tribbia: NMC picked up on it, and in fact wanted Brad ____ to work there before he was even done with ____…

Baer: Oh is that right?

Tribbia: Right, and when he was working for Joe ____ at the time right? Implementing it…

Baer: Yeah.

Tribbia: While he was doing his thesis.

Baer: Right, right.

Tribbia: And , the European Center, which is where _____.

Baer: Right, right.

Tribbia: And so, those were the places that were…

Baer: Yeah, I mean it was appropriate you know for people to pick-up on this and use it because it helped in their forecasting. Even, was it, it had a practical application, it was just that my interest in it was much more theoretical in terms of, you know, what the implications were of , you know, how the _____ conditions had an impact on the forecast.

Chen: The Japanese usually _____, and , even _____ was , affected.

Baer: huh, Sure.

Chen: _____.

Baer: Well I say this thing just mushroomed everywhere.

Chen: So they also adopted, and used it.

Baer: huh, sure.

Chen: _____, NMC, _____ change the way they operate.

Baer: Well I mean then along came the days of _____ guys, so now that's kind of been incorporated into data simulation, which is more sophisticated, you know, but that's because they have so much more data.

Tribbia: Right.

Baer: They can do that, and they have the computation capability. I mean we couldn't have done data simulation in those days the way they do it now.

Tribbia: Well, I mean, there is a lot of ground work that needed to be done before we got to _____. Some of it actually goes back to George _____ because one of his graduate students winds up at…

Baer: Oh, what's his name, , yeah, he worked with the air, he was an air weather service guy.

Tribbia: Tom Flattery.

Baer: Tom Flattery, right.

Chen: Tom Flattery.

Baer: That's right, yeah.

Tribbia: And…

Baer: And he used the _____.

Tribbia: That's right.

Baer: Right.

Chen: So actually he was the first one to apply _____, but …

Tribbia: _____, right.

Baer: huh.

Chen: Yeah, initialization.

Baer: Right, that's right.

Tribbia: And I, I think also that's some of the influence of that work, , led Dave Williamson and Bob Dickinson to find normal _____ of the grid point model…

Baer: Yeah, your right, right, that's right.

Tribbia: And the _____ in terms of normal _____…

Baer: Right.

Tribbia: And this is really kind of how the, the momentum was built, so.

Baer: So it was, from that perspective, was consistent with the way I was thinking about trying to find _____.

Tribbia: Right, right.

Baer: Because that's actually what you're.

Chen: So Ferd, at the time when you , and Joe Wolf, did the normal _____ initialization or the approach, you never expect that it would be, that you would provide such big impact to _____…

Baer: Oh no, I mean I just, I didn't have any idea about that, but as I say because when we put this thing together, I mean it's a very clean study, so, you know, there wasn't any if, ands or buts, you know, hypothesizing, we just put this thing together, and at that time, I realized that there was a big interest in this thing because other people were doing things, not exactly the way were, but they were thinking about it, and so , that was why I felt that we had to publish it right away, which was a smart move. Although nobody else was doing exactly what we had done anyway, so.

Chen: _____, you know Joe applied the _____, and got into the tropical region because normal _____ initialization, when you guys created, you focus was mainly in _____.

Baer: _____ the region. No because it was a theoretical study, so we just, what we had available, you know was the simplified version.

Chen: Yeah, but , when Joe pushed into the tropics, I, I, I because I was affected by , , _____ to do the tropical _____ research…

Baer: Sure.

Chen: And so I saw _____ that could be a really interesting _____, but _____ after you got it published, Ferd, both of you just didn't push any further.

Baer: Remember I told you why I didn't go any further. I don't know why Joe didn't go any further. I mean he probably had other things that interested him too. I mean this wasn't your primary _____ research at that time anyway, I mean we just have to do this together, and Joe was actually, his dissertation wasn't done on the subject, so.

Tribbia: So, let's get back to Ferd now, I want to mention that, I think we've not made note within the interview of one of the other, you mentioned

administration as being one of your duties at Maryland, but in fact you were the chairman of the department at that point in time, right?

Baer: Well, technically they didn't have a department, they had this program, and …

Tribbia: You were the head of the program.

Baer: And I was the head of the program, and I came in and I took over because Landsberg had retired, and so that went for a couple years, and then we decided that we would make a department because, well, it was complicated. Number one, I think we felt the department, I mean program didn't mean anything in the outside world for recruiting purposes, if you were in a department, the students were going to go with a department, I mean, that's a standard thing, and that was one thing, and the other was that we were being managed out of the old Institute there, which actually I agreed to when I came, and it turned out to be not practical because they, their requirements were too severe. So anyway, in 1979 we became a department, so I was the chair of the department, and I just had to do, aside from official duties that you do as an administrator at a university, you also have to see to the needs and the requests and stuff involved with people that work for you in the department, and that is sort of time consuming if you, you know, wanted to be fair to them, you probably have some experience at that now, and so it took some of my time, you know, so I didn't have much time to do my own research, but I had some students working, I think I did at that time, _____ my student, I mean the number of students that I had really went down at that time, after _____ came in with me, and I don't know if I had anybody right away. Then _____ showed up a couple of years later, and she worked with me for a few years, and she helped me. I did a lot of that normal _____, or what, I should call normal _____, _____ analysis, I thought of in this _____. Looking at different vertical distributions of variables, and seeing how I could structure those, and I think that was a prelude to finding vertical structure function as you know, that were appropriate to the atmosphere based on what we actually saw in the data.

Tribbia: Now .

Chen: I have a _____ question. Ferd when you left Michigan, it was about 48, 49…

Baer: Right.

Chen: And so it was on the peek of your professional career scientifically.

Baer: Yeah, probably.

Chen: And , if you don't, you didn't go to Maryland, you stayed in Michigan…

Baer: huh.

Chen: For another five years, and , you went there 71, and I believe it was 78.

Baer: Right, the end of 77.

Chen: And , we mentioned you did _____ significant things.

Baer: huh.

Chen: Now if you stayed there for another five years…

Baer: Yeah.

Chen: I think you would have created some of the things, which may be also provide very big impact.

Baer: Well that's possible, I can't tell you, I mean there is no way I can tell you that, you know. I just decided to make the switch because I, I, not because I didn't want to do research, but because I thought that it was an interesting environment to go into. The, half the population of meteorologists in the country were in Washington, you know, and I felt that, that was could be provocative because Michigan is pretty isolated, and also ____ and _____, and so I was pretty much by myself there again, like I had been in Ft. Collins.

Tribbia: There was also something happening in the DC area.

Baer: Well there was NMC.

Tribbia: Well no, NASA.

Baer: NASA too, right, we had NASA, NASA had a big operation there, and Dave _____ was there building that. Although, you know, I didn't know much about NASA at Michigan, although interestingly enough, upper atmosphere guys, they were all NASA people.

Tribbia: Right.

Baer: But we didn't have much contact with NASA, and I never, never applied for a NASA proposal law in Michigan, even though I did have some when I was in Maryland.

Tribbia: So Greg B____ is a legacy student from Michigan.

Baer: huh.

Tribbia: He finishes at Maryland.

Baer: Right.

Tribbia: And he is now at NMC, and so. The next PhD student you had is Maria _____.

Baer: Oh yeah, right, and she did a limited area _____ model, and that was an interesting experiment. She was a difficult lady to work with, but she was smart you know, but she had a lot of problems, but , I'm trying to recall, it was kind of, again trying to find out what was going on in the nonlinear processes for the smaller scaled procedures that we were looking for, and , so we started with again with a _____ model, and , I think it was one of the earlier limited area models, you know, I had this problem that because of the fact that you have to impose the boundary conditions, that no, the only thing that was available to you was information on the larger scales, so I always had this question how could you have a limited area model, and have things on a small scale actually developing in there, when from my observation anyway, the consequence of things developing were usually what was affected into the region, and you couldn't _____ this stuff in. So the only possibility was that it was evolving internally, you know, through physical process, but we weren't able to you know, _____ with all of the convection and all that kind of stuff, and of course the topography probably played some roll, but we were doing it over regions that were not so intensive topographically, you do it over the mountains or something else, but if you do it over the midwest you just have the rolling hills. So, I was really curious about that, and I think I was in some kind of insidious way trying to demonstrate that this wasn't something that you could do, ..., and so I got _____ into it, you know, to at least show what the implications were when you came in with course boundary information into a finer resolved domain, what the implications were, what happened in there, whether anything changed on the smaller scale, and I don't even remember what the results were, but I know that, that was over _____. What I was looking for, I'm not sure that she had that much to contribute in terms of, you know, curiosity, but I think that she understood the problem, and she worked on it. I think that she could have done better if she had not had, I mean she had a lot of personal problems, and I don't know where they came from. If she had been more comfortable with herself, she could have done a better job. She was a smart lady, and she had a good mind. _____ was there at the time too by the way, but she didn't hang around, she took off and went onto _____.

Chen: Ferd, at the time actually, NMC was also developing the _____ model of…

Baer: _____?

Chen: Yeah, they made _____ model. It was about that time.

Baer: Was it?

Chen: Yeah. I mean _____ operation, and , _____, so…

Baer: Was she already there, wasn't she over at NASA at that time?

Chen: She was at NASA, but she was also transferred to…

Baer: Oh yeah, sure.

Chen: And they used that as a bench mark.

Baer: huh, yeah.

Chen: And .

Baer: Well, I don't think, this was an interesting study that Maria did, but I don't think that it made any impact. I mean, people were starting to do those models, and they were hell bent that they were going to do them, and actually some of them were successful, so I don't have any answers on how we managed to do that, but it must be the physics internally that developed what's going on rather than the boundary conditions.

Chen: Yeah ____ was at that time you didn't push any further, and …

Baer: No it wasn't, yeah, this wasn't one of my primary things you know in terms of my thinking that that was going to be my career to work on the limited area models. It was just one of those things that I was curious about, and put her on to doing it.

Tribbia: So, some of the people that I see you collaborated with that haven't been mentioned here, one of them is _____, you didn't, again some of…

Baer: Yeah, well the Air Force kind of stuff, you know, I'm trying to remember what in the heck we did, we didn't get too far with that, I mean, I don't know if I ever published any, I wrote a few reports on that, but it's funny, my feeling about publication has always been that if it isn't ____ don't bother with it, I mean, you can do research, and you don't have to publish everything you do, and I find myself hard pressed to spend time writing something up if I don't really feel like I've learned something substantial. I

don't know, that's probably not the right attitude in this day and age, where if you don't publish you don't get funded you know. Luckily I, I didn't run into that until the end of my career when it wasn't relevant anymore, so I was lucky I was able to do what I wanted to do. I mean and the stuff was really nice in the old days. They funded you because they gave you a chance to explore your ideas, and you didn't have to come out with a million publications in order to get re-funded, but it all changed when big science took over you know. I don't know whether that's caused by the big computer advances. I don't know the answer to that.

Tribbia: , some other people, one other person that we ought to mention is, , _____ Yohonsen.

Baer: Yeah, he was one, he was not there I don't think.

Tribbia: He visited you at Maryland.

Baer: No, no, no, I was thinking about my visit to Stockholm.

Tribbia: Oh, he was not…

Baer: I think he came later.

Tribbia: Yeah.

Baer: But, I probably ran into him during my visits sometimes in the summer, and we got along quite well, and then he came to the states, and I think he worked down at NMC for a while. He had some kind of a, I don't know, was it assistantship, or what…

Tribbia: _____

Baer: Yeah, and then I invited him to come and work with me for a year or so up in Maryland, and we put something together. It was kind of a climate oriented thing as I recall, but I do have to refresh me…

Tribbia: So, you were working on this problem with correcting systematic errors.

Baer: Yeah.

Tribbia: And this probably was influenced by his experience at what was being done at _____ at the time.

Baer: Sure, yeah.

Tribbia: And so, was it something that you and he worked on together?

Baer: Right, yeah, but it was, I, I, I, it some how or another had something to do with climate modeling. I mean I don't remember, it's just not coming into my head exactly what we did there. I have to, you know, look at the _____ or something. What's the title of that?

Tribbia: It's Climate ____ and Statistical Adjustment.

Baer: Oh, okay.

Tribbia: And so I think, , it was basically trying to, my recollection of the work is that it was trying to find the kind of linear correction terms that would…

Baer: Yeah, yeah.

Tribbia: I think to drift climate.

Baer: Yeah, I think I remember now, right, and that's not _____ away from the _____ concept.

Tribbia: Right.

Baer: (Laugh). It shows it's head everywhere.

Tribbia: So, you were, another paper that came out at this time was a conference paper that actually leads to , your next PhD students work, which is you gave a paper at the end of a _____ conference in 88 on Optimal _____.

Baer: Right.

Tribbia: And, , this goes back to some of the work on vertical scaling.

Baer: Yeah, well, I mean, but this is ties the picture together when I say let me put three dimensional _____, okay, so then I started to study what the vertical structure _____ should be, and then I had horizontal structures, I just decided _____. I couldn't find anything. I mean _____ is okay to because it is very, very complex. So I decided to use, for scaling of the _____, and then we looked at these characters _____, and _____ really nice contributions there, and , so I tried to put that together. Some of the three dimensional scaling _____, and , I mean this is really a three dimensional model environment.

Chen: I got a question for you.

Baer: huh.

Chen: Because, I mean, we go back to the comment you make earlier. The _____ really physical _____ _____.

Baer: I think there are probably. I mean you have the external mode, internal modes, and all.

Chen: Yeah, okay, but the, the, the…

Baer: But how do you get a structure from them?

Chen: Yes, and , you saw the limitation, but after you moved to Maryland, and , you continue to work in that area for quite a few years and produced quite a few interesting studies.

Baer: Yeah, well I, you know, _____ working on these vertical structures looking at them from the data point of view, you know using EOFs as a tool, and it kind of gave some insights into how the different variables, the different variables have different structures. How they _____ in observations to see what would put them into some kind of frame work for, you know, getting these structures out. You know, it, it, it varies. I must admit that it was kind of a diffuse view. It wasn't very precise, but I, you know it's hard to do it in the _____.

Chen: You also…

Baer: Then _____ came in, and he worked on this problem, and he actually did a really nice job, and , he got shot down by our friend Dick _____, which I thought was a little unfortunate. He and Dick actually and Michael Fox had worked on this problem, and I was looking at more from the model spectrum point of view, and they were doing it from a different perspective, I think it was actually from a grid point perspective. Dick, I think, felt that he had already solved that problem, but I got upset because, you know, _____ didn't do anything wrong, and he did it, did something different. He even _____ in the same domain study, and also he was a young guy trying to discourage _____, and it really pissed me off.

Chen: So…

Baer: But he did get, he did get it published.

Chen: Yeah, my question is , do you see _____ to some extent _____, but then the vertical structure, you never stopped, you just continued on?

Baer: Well it was difficult. I mean, when you say continued on, I mean putting them together, it was three dimensional kind of structure, I mean you know ultimately, I was looking to find a systematic three dimensional provocation

scheme so that the scaling in the vertical was somewhat equivalent than the scaling of the horizontal. Horizontal scaling is a piece of cake by comparison, and to the vertical, because you just stop at some scale, and if you look at the energy distributions, which we did, you see it decays very rapidly, and so, at least from that point of view, it is appropriate to truncate, but from the point of view that when you truncate, you are also throwing away the sub-grid scale processes. You now, maybe truncation is inappropriate anywhere, but we don't have a choice, but I was trying to fit the vertical in with the horizontal so that I could say to someone well look, if you want to stop at , you know, however many planetary waves, then you should only take so and so many vertical modes into account because otherwise you're going to over resolve _____ of one domain at the expense of the other, and because nonlinear interactions, you're going to have _____ coupling, which is going to screw up your response. I mean, that was kind of my idea, and I don't know, I mean, whether that's really true or not, but it's not _____. You know, so I was trying to find this systematic thing, but it's not very easy, because you know, the vertical things happened in funny ways. You know, you would have highly concentrated clouds sometimes, which means that you need more resolution locally to resolve the clouds, even though from a _____ perspective, that scale would be too slow to correspond with the horizontal scale. So, I mean it's not an easy problem. Not a clean problem, and I don't think we cleaned it up, but I think we made some contribution to it you know. There were a number of papers that were involved with that.

Chen: Ferd because, when you start the _____ method, _____ initialization _____ deal with horizontal problem.

Baer: Sure.

Chen: And it was really clean, very applicable to the operation forecast…

Baer: _____ initialization wasn't horizontal was it? I mean we didn't deal with just the horizontal equations did we?

Tribbia: No.

Baer: They were general equations that we used, but it's still, you know, it's a different problem because it's not a truncation question.

Chen: Yeah, but the vertical _____ would be so easy for you to deal with the , , structure _____ the dynamics so easily like the horizontal problem.

Baer: No, that's true, right well, . In terms of looking at the vertical modes, that's certainly true, the vertical problem.

Chen: So because of that, you _____ time and a bit more effort trying to deal with _____ the vertical structure.

Baer: Well, it was, , it was an unsolved problem, and it still is an unsolved problem, and , I was trying to make a contribution to it. I couldn't see much to do with the horizontal. As I say, you could use other structured functions in the horizontal. I don't think that we make as big of difference, and principally as I mentioned because, even using simple functions like with other polynomials, you could see the energy decay very clearly, so you know that ____ and smaller scales, and principle don't play a predominant role. Now, when you say predominant role, you have to start talking about the time scale, and for a forecast problem that's true. When you start talking about climate, little ____ in the small scales will have time to propagate to all scales, and we did a lot of tests to demonstrate that…

END OF TAPE 2, SIDE 1

Interview of Ferdinand Baer

TAPE 2, SIDE 2

Tribbia: This is Ferd Baer's interview, Tape 2 side 2. We were just finishing up a discussion of some work on vertical truncation, three dimensional _____, , scaling three dimensions. So I think that it might be time to , move onto another topic, , . One area in which you worked recently has been some collaborative work on physical _____, radiation, and examining it's impact in climate models. How did that work come about?

Baer: Well, , that was kind of a collegial with Bob Ellingston in our department who had been involved in drafting up the arm program for DOE, and , Bob was then put into a proposal to that program for some support, and he asked me if I would collaborate with him, and I said okay, and I tried to think of what would be appropriate there, and one of the things that he had been involved with was to develop these kind of , models for radiation input into the system, and I thought well, that is probably a significant feature of _____ models, and maybe we could do some experimentation to see what the impacts were, and so I joined him on that. I stayed in that project with him for a number of years. I don't know that it became my primary effort, but , that was the environment in which I had a number of masters students. You know, kids who were doing experiments for us, and , , it was reasonably successful. Although I don't think the community was ever very much interested, the _____ anyway, what I was doing, because they weren't into the modeling aspect. I had this feeling that , there is a lot of touchy feely things happening in the vertical models of , radiative transfer, but the bottom line was that as you move the energy around, the radiant energy around, that clearly the model itself, the prediction model, it has an impact on the temperature tendency, and so , you know the heating rate that you get out of these models changed the temperature, and they could change the temperature as much as the _____ of temperature, and so it was important to do this correctly. Well for one thing of course, the models didn't have, when we first started playing with them, didn't even have clouds in them. So, you know, it was pretty crude. (laugh). Never the less, so I went about gathering different , these were just algorithms, you know people wrote, and there were probably at least a half a dozen that I got a hold of. People gave them to me that I could use, and so I arranged, I mean, and they are kind of plug compatible in the GCMs so that you know you pull one model out, and you plug another one in, and , it's really just the vertical column thing, so , you know, you have to match the variables in the model _____, and you get those from the prediction model. I use CCM 2 and CCM 3 at that time, but what I discovered was that I would just run for, I, I, I'd usually ran for about 6 months with these models, and , I'd give it a couple of months to spin up, and then I would do a season. Usually I did the winter season, and then I'd look at the statistics in the winter _____ that we got as a consequence, you

know, like temperature field, wind field, you know, and stuff like. At different levels to see what happened, and surprisingly what we discovered was that changing these _____ changed the response of the model, you know, so the climate was gradually changing. _____ took years and years, you know you'd get a different climate, but you know I don't know in theory that this is particularly unique because you could probably do that with any variable that goes in, change it a little bit, and , cause the climate to change, but I thought it was important for the community that was building these models to see what was going on, you know, and so, they had broadband models, and narrowband models, and then somebody actually has almost a continuous model. The problem with it is it's so damn costly when you have, you know, so many frequencies to work with. And so, anyway, that was basically what I was doing there, and I , reported it off and on to the _____ people, and some people seemed to find it interesting, but gradually, I think that after a few rounds of proposals they didn't want to fund us anymore, and you know, in terms of my contribution, I found it difficult to get involved in other aspects of it because I was, I'm not into building radiating models, and so I didn't know what else I could contribute there, you know, so I didn't really quarrel with the fact that they didn't want to fund it. I mean that was what I could contribute, and if it was useful to that community fine, so, I have some more detailed things that I did looking at, you know, how it affects this and that and the other thing. I would have to go back to my notes to remember all of the stuff that we did, but , I think I had one more study that should have been published, but it was a students dissertation, not dissertation, it was a Masters thesis, and he never, you know, wrote it up enough _____ publication, and I wasn't going to do that. So, that never got out into the _____ market, but I don't think anyone is suffering from lack of publications in that domain, and whatever they learned from it, they learned from it. I sort of went through that cycle, but it was kind of parallel with other things I was doing if I recall that.

Tribbia: …

Baer: Then we got into the…

Tribbia: This goes into , the , period of the 90s, we're starting to get into the 90s, and , I wanted to mention one other, at this time you were still chairmen of the department.

Baer: No, no, no. By the 90s I was not anymore.

Tribbia: Okay, right, but you were on the _____ Board of Trustees at that time.

Baer: Yeah for a few years.

Tribbia: Right. So what was that experience?

Baer: Well, it was kind of fun, ... , now we're getting into something a lot more political so, ..., maybe these kind of forms are appropriate. (all laughing). I mean, you know, I always had the concept, I was involved with NCAR from the start, and , I was a representative to, you know, the _____ from Maryland as soon as I got to Maryland in 77 on to the late 80s. So, you know, I had a lot of involvement with UCAR and NCAR. NCAR through research and UCAR, you know, just through my position, and , I always felt that you know, being from a university that UCAR really was a corporation for universities, and was a representative for the universities in the appropriate research domain that we were involved with, and that UCAR was looking after the interests of the universities to expand their capacity. I mean you guys are familiar with the fact that over the years there has been a lot of conflict between universities and UCAR because one is dealing with resources from the other, and people complain about this and that, but , the bottom line is that NCAR has the laboratory for UCAR, has a lot of facilities and resources that they research a lot more convenient for the university people, and so there isn't much point in having a big conflict there. The idea is to work together to try to, you know, make the best of the situation. And so, this kind of stuff always shows up when you get down to ____, you know there were _____ to be made, and it always show these issues you know where UCAR sees itself as some kind of an independent thing rather than as a representative of the universities, and starts to look like its doing things, which are not particularly in the interest of the universities, but in its own interest because you know, institutions tend to get that way, and sometimes maybe they weren't as important as NCAR, because NCAR should have been their primary activity because it's that funnel between the universities and research that UCAR was providing that NCAR sits there, you know. So I got into some _____ off of that, at, at the board, you know, trying to present this particular position that I'm, might have been a little more assertive than other people, but it was a good experience, and I think that , you know, indirectly I may have helped to keep things working the way they are suppose to work, but I must admit that you know, I've been out of there for over 10 years now, so I don't have a very good sense anymore of what's going on. I mean, you know, you just read about what the involvements are, but I, I think UCAR has done a good job for the community overall. It's been in existence, well, well over 40 years now, and , I think it has brought our profession to much higher level of awareness on the societies perspective, and the consequence of which is that we have had feedback _____ to, you know, to expand our knowledge in the field, and that's really the purpose, and I don't know any other disciplines quite as successful in doing that, , as when we say meteorology now is much more broad. It's the atmosphere _____ I would say.

Chen: Ferd, I would like to backtrack your work in Maryland. You were the chairman there for quite a few years.

Baer: huh.

Chen: And actually when _____ arrived there, you mentioned earlier that it was only a _____.

Baer: huh.

Chen: I, I had the same experience in I _____ _____ that the , when I was a fireman _____ _____ _____ into a major _____.

Baer: Sure.

Chen: , but , besides that your scientific contribution, I feel that you head the department to evolve into the , the nationally reputable program. It's also _____.

Baer: Well, I appreciate that evaluation. When you're in the thick of the battle, you don't quite see your victories....., but at this point, I mean like today, I think that the reputation in Maryland has grown substantially, , I will take credit for starting that. I can't say that I brought it to the level that it's at now, but when I went there, there was nothing. The guys told me Landsberg is running the show, and Landsberg came out of _____ , and apparently he was an okay administrator, but he wanted to do his own thing. He had retired you know from being an administrator, and so, he really wasn't looking after the program. I mean, even as _____ of an operation of seeing that the people in program get paid decently. He didn't, I mean you know, he just didn't pay attention, you know, but he must have figured it out. He was well known and respected, and so you know, he gave the pace a good name. So I came in, and there was just a handful, and I would say reasonably young people there, , _____ was there, Thompson, and Jesus anybody else. Rachel _____ was just beginning her career. ____ had just been hired. We also hired a guy ____ I think his name was, and he was just coming in, and I, that's pretty much it. Oh, what's his name, _____ right.

Tribbia: _____.

Baer: And I would say that _____ probably at that time was the most steady, you know, solid scientist, the rest of them I don't know. I mean, what's his name, Bob Ellington was beginning his, just beginning his career, and at that time he wasn't doing very much, but he, you know, he's developed quite well now. Dave R_____ had problems and he finally left, and so things. Well anyway, the bottom line is that it was a very small program, and of course nobody knew anything about it. We had hardly any students, and so, I said about making, trying to establish relationship with NASA, which worked very well, we started getting interactive seminars, and then

we actually had a program, a study program where we studied different aspects of modeling project, and analysis project and things like that, and we just sort of dug out all of the publications and we reviewed them, and we did this over each item over a period of weeks. I still, I think I still have these volumes on my desk of these publications that we went through. We assigned these things to different people who were specialists, and actually NASA paid to bring in people from the outside too to help, and , it set up a very nice relationship with the _____ between us and the university, and a lot of these things happened at the university actually. So that was one very nice thing, and then, you know, we made some connections with NMC, and , you know, had interactive seminars. We didn't quite have the same connection as we did to _____, they were a little further away, but I think a lot of their people use to attend these meetings that we had. This went on for a few years, and I think things picked up, and then _____ came along, who wanted to lead _____, and he had this program, and he had support from this, and , and NSF, and he decided after some speculation, he looked at the University of Washington and some other places, and he decided that he wanted to come to Maryland. So we made the arrangements for him to come in there, and that was not easy to do because the administration was very sluggish in those days about hiring new people, and you know, _____ made a good case, you know, he brought people from the agencies in to speak on his behalf, and, so the administration bought into it, and so he came in, but , I don't think we realized his personality at that time, ... I mean he was a good manager, he had a good project, and he had good contacts, and I think he really helped to bring recognition to Maryland because he had a lot of outside connections. Unfortunately he was the kind of guy who really works for himself, and so I'm not sure that he didn't give us a bad name, the department a bad name outside, while beefing up his own activity, you know, I mean he kind of bad mouthed us. He was not a, what you call them, player, , you know, you have to be a party member.

Chen: Party member?

Baer: You have to be part of your group, and supportive of it, because your part of it, and he didn't realize that.

Chen: _____

Baer: Play in that, right, ____. So this went on for some years and ultimately he left, but I mean, the byproduct, I think was some sort of a help to the department, but it was also kind of very fracturing, another words there were people who really couldn't do, and you know, we had a lot of _____, and this went on for some time, and it didn't help, that didn't help the department internally, although I think we had some help on the outside, you know, just generally. The department was growing, , and we brought in a number of people who retired from, from NOAH, who were, you know,

they were, they had been doing good work, and they just wanted to keep working a little bit, and they came in, and, you know, research scientists, and they weren't given any special consideration if they brought in some research money then they could work, otherwise they didn't, you know. , that also was a mixed bag. I mean, my view was we had absolutely no money from the university. We needed money to build to program, and if people could come in and bring money with them, then you know, and they had the capacity to do something, help with training students, it was okay with me, but _____ when he came, he had this idea, you know, this was a retirement club, and he kind of bad mouthed that too outside, you know, and so, you know people don't, you know they don't, you know when they hear something they don't necessarily say, , I think I'll check that out. They hear it, and it sounds reasonable, okay so _____ was saying that Maryland is a retirement community, you know, people would say okay, Maryland is a retirement community until the next guy, you know, and so, I mean, I don't think it was _____. So whenever anybody reported that to me, I said you know, that's not the way it is so who cares what they think, but you know, over the years I've changed my mind. At that time I wasn't really much of an administrator. I was just learning how to do this kind of stuff, and I still had this idealistic view of ____, you know, and the outside world didn't really matter, but it does, and so ultimately , , I then I, I, you know, I decided that I had been doing this long enough, and it wasn't really, my career goal wasn't ultimately to be an administrator, so I finally agreed with the Dean that I would step down, but I waited until we had a line, and that was when _____. So then we were able to hire somebody new, and that was a real pain, because we had some good candidates online, but _____ kind of shot all of these people down. I think he would have like to take over there himself, and just make it into ____, but , it was just too broad and academic program, and he couldn't succeed that way, and it didn't work, but , he did shoot down a couple of people who would have been quite good. Fortunately, I mean, so we had I think three go rounds before we finally got another chair. In the meantime, the Dean had put in a guy from physics to act, and also to find out what was going on in meteorology because he didn't know, and this was a new Dean who was much more proactive than the old guy I worked with, and , he discovered that the university didn't give us any resources, so we couldn't really do what the university wanted us to do. You know, our records were a little sloppy, and it just, you know, it was just a fairly casual operation because we didn't have money to do _____, so he decided to put some money _____, which was good. He hired a business manager for the department, who was really quite good, and helped to clean up _____, which I didn't look after terribly well, you know, okay, but the way the university would have like it, but anyway, so we hired Bob _____ as a second candidate. We had a fellow who was actually from NCAR, and he went to Penn State…

Tribbia: John Wyngaard.

Baer: John Wyngaard, who really wanted the job, but he got shot down by _____, not internally, but you know, _____ just sort of made himself _____, and he decided that, that was not something he wanted to do, so, which was unfortunately. Hudson came in, and we all complained about _____ to him, and he said, well I don't know the guy, and I don't know what he does, so I mean, give me a year or so to look it over. So he is really quite good at making people comfortable, and bringing the kind of ora replaced back into some kind of where people were working together rather than back biting, you know, which _____ was setting up, and so, he did keep an eye on things, and ultimately _____ decided that he wasn't going to get anywhere in the department, so he asked the Dean if he could start his own unit, and the Dean said well he would put him in with another group where he would have more _____, and _____ agreed to that, and then he finally decided not to, and then he said that he would start a private company on the outside, _____ his professorship, and the university said I think that it's time for you to leave, and so he started up his own operation. So, he's still going strong, and , but anyway, and after that, the, the, the department kind of _____, but that was early 90s, the funding situations were pretty bad, and so we really couldn't do much in terms of hiring people _____, and then Bob Hudson retired, and _____ came in, and she has a good reputation, and she was pretty industrious, and she made the place look a little better, and , I think maybe we actually did hire one or two, I don't know actually in her tenure whether we did much hiring, but just recently, I retired, and they _____ the, the university would give us two lines for my line, and Ellingston took the job as a chair _____, and so there was a line there. Oh, and then we had this cooperative institute with NASA called _____, and Tony…

Tribbia: B_____.

Baer: B_____ came in, and he is quite a good manager, and he brought in a bunch of good people within, and , he was able to hire a young fellow named Lee, who was up in Canada. He is kind of a radiation guy, and , he got a professorship _____, and now we hired a new dynamics guy, , Dan _____, he came from MIT, and we got _____, professorial appointment. So we actually got three new people. So things are really moving along now. So, I think , we're in good shape, and , I don't feel bad about retiring. I think at least two of those guys looked at me like I would have hired them if I could have. So… Oh, we had another young fella, who was working, he is kind of a climate guy, but he is more into the oceans. He is an Indian fellow, and , , I'm under the spotlight here with this machine, so his name is not coming, but , I'll think of it in a minute, but anyway. So, the department is really moving along I think it's in good shape now, and of course Russ Dickerson took over when _____ stepped down.

Tribbia: All right, , somewhere in the early 90s there was a new program within DOE.

Baer: _____. Do you know him?

Tribbia: No I don't know him?

Baer: Okay, anyway he's the other guy.

Tribbia: , there was a new program in the Department of Energy called the _____.

Baer: Right.

Tribbia: Which stood for Computer Hardware, Advanced Mathematics…

Baer: Yeah something like that.

Chen: General computation.

Tribbia: And , , somehow you had gotten wind of this funding opportunity, and you decided that this was an area that you wanted to get back involved in, in computing to some sense.

Baer: Well.

Tribbia: How did this come about?

Baer Yeah, well this is an interesting issue because throughout my career, we already talked about the fact that we've got the _____ stuff that we cannot identify, and I've always felt that the _____ of _____ processes, now I'm not talking about the physical side, I'm talking about the _____, you know like momentum transfer from the _____, wasn't handled correctly by _____ because you cannot _____ it, and I had often wondered if you couldn't have, you know, a lot of little models running on the sub-grid environment calculating these things in space and time, and then feeding them back to a larger model so that you would actually have the time and space variability of the sub-grid scale processes rather than having to _____ it, and , but of course you know, it was sort of a pipe dream, and I never really pursued it in any depth because the computing capability for that was obviously not available, and he would conceptually try to do that with the kind of computers we had until the last 10 years, it was really difficult to envision, but by the time this program started, it seemed to me like maybe something like that could be done, and so, that's what I had in mind, and also, I, I was thinking in terms of parallel processes, by then I think they were starting to show up, where you could actually set these models into

individual components over a larger computer, and so you could have a regular model, and of course, this is all the climate domain, you don't really need this for seven day forecasting, but you could have all of this stuff working on the _____, feeding in, you know, you could conceptualize it that way. That's the image I had of the, you know, maybe it's a little like sitting _____. ..... _____, but anyway, so I, I guess I must have started talking to you in terms of trying to write this up as a proposal, and because the computers were not in my domain, but NCAR had such computers, and of course we probably, at that time, I wasn't sure, but I presumed that we would get time on the DOE machines to do that. So we kind of cooked up a proposal basically to do that, if I'm not mistaking. I mean, you have had some ideas of what you wanted to do in terms of ensemble forecasting, you know…

Tribbia: Right.

Baer: You know, doing all of the ensembles concurrently, and in terms of those processors, and we added a few other little things involved that we wanted to get into, and , so we got the funding, and so we had to hire _____, and we found Mark Taylor, and , I tried to explain what we were trying to do to Mark, and he came up with _____ element model....., and that's where we are today. We're working with _____ elements, and so we had never really pursued this initial intent of multi modeling of sub-grid statistics, but we are doing, you know, higher resolution calculations embedded in large scale processes, which is what the _____ model does, and so we did that for seven years, and then, , they re-announced this program under the _____ CCPPP, and , we were refunded to do that, and so we are doing that now, and so that's where we're at in that program, and it looks pretty promising I would say, something for the future, a model which can do seamlessly calculate, you know, different scales concurrently for the climate problems, pretty worth while, I mean, others have to embed other high resolution models into lower resolution model, or actually Michael Fox _____, which is comparable kind of thing, so, we have opportunity for interacting our investigation with him. So anyway, this is proceeding pretty well, and I mean this is an ongoing activity, so.

Tribbia: One of the other aspects of that _____ work, , resulted in a couple of publications with you and _____.

Baer: Yeah, yeah.

Tribbia: And, that's a different…

Baer: Well, it's not the same problem, but the idea still is , is there are several things going on here: One can you design a better climate model, which involves multiple scaling, and the other thing of course is that climate

modeling inherently has to be done in kind of an ensemble. It's not, I mean there are model variability, and you don't know what that is, and so you better find out what that is because when you come out with a prediction, how good is that prediction? I mean is it accurate, or if you run two realizations of the same thing with a slight _____ you get completely different results so that the model variability is so large that the results are useless, you know. So, then, in order to do that, it becomes a prohibitive thing with regard to our computing capacities. So I go interested in seeing if we couldn't speed things up a bit, you know, because we could do more realizations, we could do more complex models, and so, I, I, I looked at this possibility of trying to increase the time step, I'm told to talk to Joe about that the other day. I've always looked for ways for trying to run models with an increased time step, and the little trick here, and it was really, I thought it was fairly clever, was that if you take the prediction at any time, and you project it on to some modes, here comes the modes again, and , the modes have characteristic scales, then you could truncate those if you don't lose too much on the short scale then, and at the same time you can increase the time step because it got the stability criteria goes up, because you don't have those short scales. Now, as it turned out, you can do this with a projection on any modes, and at one point I thought what the hell, let's skip the computational modes invariably from a big model, the GCM, you know, that's a super mess, and I have never achieved to do that, but fortunately NCAR, in their model, they have everything projected onto _____ modes. It has something to do with their initialization scheme or something. So I said well what the hell, use the _____ modes. They have characteristic, , , _____, so I could calculate the time step where I truncated from _____ modes, and so I did that, and , so I just sort of truncated at some point where I could increase the time step and maintain stability, and I ran it up to a factor of three, and I ran some experiments, you know, comparing the integrations where you don't do the truncation, and where you do, and , I was able to successfully show that if you did this, you get essentially the same integration, climate integration, but you speed up the integration by a factor of three. Well three isn't that much, but I think one could, if you get into this problem, improve that, but this is just for a demonstration, and the demonstration was that I did enough realization, and showed what the model variability was so that when I did this for the two comparing, comparing the truncated version with the full version, that from a model variability point of view, both of them gave you the same resulting equivalent, you get a better result from one or the other, and so that demonstration, I think, suggested that there are vehicles where by you could increase the time step, get the same result, and of course then you could do much more in the way of integration, so I mean that's something I'm not working on directly at the moment, but I'm still very interested, and I think it has some real possibilities, but you know you have to get some help to do that. I can't _____ myself.

Chen: We go back to a little bit previously, you mentioned Mark _____ the _____ approach, and , you worked with a _____ in the past.

Baer: huh.

Chen: _____ of course.

Baer: Well this is also _____ in a way. I know, I mean, _____ element in the sense that you start by gridding the domain, but once you have the domain gridded, then within each grid, you actually use a transform method so that you are in the _____ environment. So it is a big …

Chen: Okay, it doesn't matter, but the important thing is that the _____ element, when you applied to Polar region, it, it's _____ method, but on the other hand the _____ method you can deal with the _____ direction _____ element approach.

Baer: , the scaling, I mean you have to look at it, , you can't do the same kind of scale, , analysis with the _____ element method that you do with the _____ method.

Chen: Yeah.

Baer: Well, I guess you can, because you could take your field, I mean, you have a field that you can project it onto a _____ expansion if you want to do that, but this is a different ball game that we are talking about. I mean this is a climate model that we're trying to get the best possible prediction, and we are also trying to , accommodate to regions, which require higher resolution like topography, and also for particular issues, I mean, if you want to see what a regional climate will be at a particular time. During integration you could use this to do that, and also there are events that occur sometimes, which require higher resolution to resolve them, and if you can find those, you can create the grid to take that into account with this model.

Chen: Yeah Ferd, I understand what you are talking about. My question is , what will be your view of the future to deal with for the _____ or forecast _____ model, because you _____ model, and you see the development _____ and now…

Baer: I, at this moment, I think that , we've done about what we can do with the _____ model. I mean I don't have anything against it. If you could go to any resolution you like, and you had the computational capability, I suppose the _____ model would be okay. On the other hand, when you start to include such high resolution stuff, you are also generating a lot of noise. You are still back into the sub-grid scale process. So it may be that there is, is, from an efficiency and accuracy point of view, a limit to how high

resolution you want to use for _____ modeling. I mean, I'm just conjecturing off the top of my head. I just have a feeling that, that may be a problem, and you would have to investigate that. Now, as an example, the European Center is perfectly happy to go to T1000, I don't know, you know, I mean they are willing to put their bucks into high resolution _____ modeling, you know, and , it may work, it may not. I think though the procedure that we're following, which is a little more pioneering, may be more successful in terms of giving you reasonable climate prediction, but the _____ is the physics, you know, I mean you're not going to get the right climate unless you know the physics, and also the sub-grid scale processes are still there haunting you. So we're trying to decide a model, which will I think help to optimize the output, but it cannot be really good until a lot of other things get cleaned up, so. That's where we're at Mike, that's my view for the future is that there is a lot of work to be done, and I'm not even sure that in the end, this is the procedure for which we are going to get the best climate predictions. I don't know that for sure.

Chen: Okay, just another thing, because I also teach at the University, so Ferd _____ your whole life, although you were involved in a lot of things, but the teaching _____ one of the major function you _____…

Baer: Sure.

Chen: What's your philosophy _____, because I mean when I was a student, I had experienced a very, very, _____ a very different approach, and I think that it's very stimulating to the students, on who had a good background, and who _____ _____, education, _____ majority, then there's a problem.

Baer: Well, I got a word for it, it's called, it's from the Swedish and it says _____, and it means too bad..... What you want to do is educate people who want to be educated, and who have the capacity to absorb the education so that they can do something with it, and the rest of them there is a sociological problem, and maybe there are other people who like to teach them, and I think they should. I don't have any problem with teaching people at all levels. I mean anybody who is willing to come to a school should be taught. I don't have the patience to use my time, you know, to invest there, and not to invest it in students who really are competent. The most important thing for me is students who want to learn. If they don't want to learn, why are they there, you know, I mean, it just, I don't want to be involved with them. Now I know that's not going to solve the educational problem that the universities have, but fortunately I'm retired.

Chen: _____.

Baer: I can be even more fussy in my retirement.

Chen: I want to go back to the question ____, , _____ personally, because many people teach so many years, they always like to _____, but they would like _____.

Baer: Oh, I've never had the patient's for that pretty much. I did start to do a little bit of that a few years ago. Somebody asked me to write a _____ book, you know on numerical weather prediction. So I did. It's a hard thing to do. You have to do a lot of research, I mean a different kind of research. You have to go through the literature, and find out everything that people have done, and really clean things up. It's like learning all over again. You know, taking the courses, and, , you know, I thought it to be difficult, but it was rewarding. I enjoyed doing it, and I think I learned something in the process, and so I'm not against doing it, but I, you know, I, I'm not really motivated very strongly towards, you know, creating something that's already out there. I mean, I, I much prefer finding out something new, than putting things together like that, but I, I do admit and acknowledge that it's something that shoulder be done, and it's important that it be done because, you know, there are generations coming along who need this stuff, you know, and if you have the skill to present it in the classroom, maybe you could put it down on paper or in the computer now, so that the people can learn from you, you know, without having contact with you directly.

Tribbia: I want to go into, , a similar rein of two things that we didn't talk about, . Two publications that we haven't talked about were these, what I would consider in some sense review articles. One appeared in Herb _____ book.

Baer: Yeah, that's another one, I had forgotten about that, on the hurricanes, yeah.

Tribbia: And the other one was in a volume of Advances in Computational Science.

Baer: Yeah, well that's what I was referring to…

Tribbia: And that one was a, the last one was a review, review purely in numerical weather prediction.

Baer: Right.

Tribbia: The first one was a review of…

Baer: Hurricane logging.

Tribbia: Numerical hurricane prediction.

Baer: At that time.

Tribbia: At that time.

Baer: That was back, what, in the 60s still.

Tribbia: 79 I have it.

Baer: Really?

Tribbia: Yep.

Baer: _____?

Tribbia: Yes.

Baer: Son of a gun. Why did Herby and I do that? Very interesting. We must have traveled back and forth. I don't know, he was in Boulder. Yeah, I guess we did.

Tribbia: So, , , what was your experience in doing those? Was it…

Baer: Well, it was the same kind of thing I was telling Mike. It was difficult because I had to do all of this review material.

Tribbia: Right.

Baer: Although I'm not experienced doing this kind of thing. I have mentioned that, I'll tell you in a minute, but you have to go back and get all of the literature to see what people have done. I mean, it's not really fair or comprehensive if you don't if you just write out your own review. I mean that's not really what a review is. So, it takes a lot of effort to do that, and , you have to discipline yourself to do it, but as I say, it's kind of rewarding because when you're done you feel like that's really an accomplishment. You know you presented something, and you have the experience while having done that. I learned the reviewing process, when did I start that, did I start that in Ft. Collins? I did reviewing for the Air Force, for the Air Weather Service in the days of the cold war, , when they wanted to know what the Russians were up to, and so we, and so they hired me as a consultant, gave me appropriate security and clearance ..... They really thought secrecy clearance was very important in those days, although I could never make a connection between what people were doing, and meteorology. I remember reading articles by Michael Fox _____....I mean, it was such an International enterprise that , but anyway that was their problem not mine, but you know they'd send me all of this stuff, and the would ask me to evaluate it, and to put it into context, but it was all in connection basically with modeling, weather prediction and things like that. So, I learned a little bit about how to do reviewing. I had some experience, that helped a lot. Just doing it cold is really quite difficult. It is not easy,

so, some people really enjoy doing that. As I say, I think I, I think I'd rather do something new.

Chen: So Ferd, in your perspective, it's a, it's better to leave a creative mind to do research, instead of writing textbook?

Baer: , you know, I mean, you know me pretty well. I don't, you know, I have, I have kind of concepts and attitudes that apply to me, but I'm not really big on telling other people what they should be doing. I mean my experience wherever it's come from, and you know, all the stuff we talked about earlier. I, I don't feel comfortable saying to somebody else you got to do something because I think it's right. I, you know, I have a lot of experiences where people have tried to do that with me, and I don't think I _____ that, and I just don't think that works because everybody is different. Trying to get into somebody's head and trying to figure out how they work is not my kettle of fish I tell you, and frankly, I don't believe it's doable, but some people think that they can do it, I mean, so, I mean in answer to your question, I think people should do what they want to do, because if they do what they want to do they're going to do it well. If they're doing what they think they have to do they're going to do it, you know, for one reason or another, but you know, I doubt if they put everything they have into it. Jordan is the one example of that, you know, where I realize that some students go for a PhD because they're curious and motivated, and some people go for a PhD because they can't help themselves because somebody told them that they had to do it, and Jordan is one of those, and he is very successful, and I think in his career, but his motivation wasn't good, and , I think it caused him a lot of problems, and he is a good example, I mean, because you guys know him. He is a charming fellow. I really like him, and we get along very well, and we see each other socially, you know, but I, you know, and I've had occasionally other students that like that. I've had a student, , Bert _____, who was clearly competent enough to get a PhD, he was really bright and sharp, and he didn't want to do it. He wanted to be a service guy. So he was very skillful, and he is doing that, and he is very happy, and the people that use him, love him. You probably know him, you know. So he's an example, you know, I didn't sit on Bert _____ head and say you must do this, you know, I can't do that kind of thing. So I can't answer your question and say, yeah some creative guy shouldn't write a textbook. Why shouldn't he if he wants to. George _____ was writing one. Did he ever finish it?

Tribbia: I don't know.

Baer: I don't know, he had been doing it for 25 years and it never came out as far as I can tell.

Tribbia: .

Baer: He's a, he's a perfectionist though, and it would make it difficult.

Tribbia: Are there areas that you think that we haven't talked about that you would like to talk about?

Baer: No nothing comes to mind directly. Philosophy maybe.

Tribbia: Okay.

Baer: But I mean I don't have anything specific. I, I, I love to sit around and talk about, you know, what could happen in terms of how ideas evolve and all, but it's not the kind of thing you do in front of a microphone because it's so evasive, you know, and you might say something, and then get into a conversation, and your whole perspective might change, you know, how the conversation goes, so I don't know that, that would help this particular event unless it were a demonstration of how people communicate.

END OF TAPE 2, SIDE 2

Interview of Ferdinand Baer

TAPE 3, SIDE 1

Tribbia: This is Ferd Baer's interview. We are on tape 3, side 1, and , Mike Chen had just mentioned Ferd's relationship with International Service.

Chen: Well Ferd, I look at the _____ of your students, and you have many International students. Maybe 50%, and you also, , get involved in a lot of International activities, and , also International students in the past. I was particularly interested in why you, , , involved in International activities, just like you went to India. It's very, at that time, was a very unusual to do, and , all these years, you are, you admit a lot of International students. Why your interest in doing that?

Baer: Well, I wouldn't say that, that was done intentionally. Another words, you know, it, I chose the students as they came and were available, and if it turned out if the Internation students showed more competence than National students, I would select them if I had the opportunity, but aside from that, , I'm kind of an International sort of person. I'm more interested in a broad perspective. I'm not terribly provincial, and clearly I wasn't even, I'm kind of an International person myself in the sense I wasn't born in this country, and so I, I'm an American Citizen, I have no problem with that, but, I, I, I think that people from different cultures are interesting. I find different kinds of behaviors to be attractive, and challenging, and home ingenuity for me is not terribly exciting, and, I mean even in terms of my studies, you know, I say that I'm interested in studying nonlinear processes. Well, nonlinear processes are not repetitive, so they're involved with different kinds of things you know, and so that's attractive to me, and I've always enjoyed going to meetings, you know, out of the country. To regions that are different, and things that I haven't seen before, and meeting people, you know, have different perspectives. Because I kind of have different perspectives on things. I'm not sure my view of things are necessary. The conventional American perspective, sometimes, and in some things they are. In a similar vein though, I wanted to comment that you know aside from my professional life, and my career, , I didn't dedicate all of my time, you know, to doing professional things in meteorology, I seemed to enjoy exploring other avenues in life, in particular I enjoy music, and I still to this day play an instrument with people, and make contact with people that are not involved in my profession at all, and , you know, I think it's been helped in keeping me refreshed, and a little more broad in my perspective than you know burying myself 24 hours a day in my discipline, although as I said, there have been times when I have certainly invested myself heavily, so, and then you know, in a sense you know, having that perspective reflect on your career. I may not have been as productive as I might have been. I don't have any problem with that at all, but maybe what

I produced was more meaningful because of the fact that I didn't invest myself 100%, and you know, I mean when I was doing it was 100%, but over the time it wasn't all 100%. So anyway, I thought that might be of some interest.

Tribbia: Mike do you have any other questions?

Chen: Yes another thing. Ferd, you , in your professional life, I don't see that you were involved, , many people they like to be involved with , the, , editing, or like editor of a journal, or either the _____ , , _____, but you know, cuz , your, your professional life spanned for almost 40 years in meteorology, although you are very active, but you don't really spend a lot of time getting involved _____.

Baer: Yeah, I enjoyed the _____ experience. I was on the bask for a while, and I've been on committees off and on, and I suppose if you ask people I was on committees with, I was communicative and contributory. In other words, if I had something that occurred to me, I wouldn't have any resistance in saying it, but I honestly didn't search out for those things. I mean if people asked me, I probably responded and said I would do it. I think I was the chair of the search committee for the fellows in the AMS one time, and I did it. I mean, I, I, as a matter of fact around the University I've done a lot of committee work, and I feel like I've done my share of committee work, and contributed to the community, but it kind of goes hand in hand with what I was saying before. If I were a person who felt committed that I really knew how things should be, and that I wanted to convince other people that it should be that way, then I would have been much more involved in committee work, or been involved in a lot of planning stuff in the , in our discipline, but, you know, I'm more letting things go the way people want them to be. I mean, I don't necessarily agree with people who insist that they have to be a certain way, you know, but I don't have the energy or the enthusiasm to fight, you know, people who are doing things which I think are stupid, you know, I figure they'll show up sooner or later anyway, and committees have grown enormously in the last 15 or 20 years, and I kind of faced myself, when I stopped being chair, I kind of realized that administration was not necessarily my fort. I could do it, and I tried to do the best I could, but you know, to pursue that, you know, it just, it didn't ring a bell for me so, and, and with regard to reviewing journals, I mean, I would have done it if somebody asked me. I don't think anybody asked me for a long time during my career when people sent me things to review, I was very slow in reviewing them. I'm sure I got a reputation from that. I'm much better now actually, but I _____, and also I have this little quirk that , if things are really not right, I feel compelled to speak up, and I'm not sure that's a good posture to take. As a reviewer you have to have some flexibility, and be able to you know, except things that you might not think ought to be excepted. I mean, it goes hand in hand with

this idea we were talking about with regard to say teaching, you know, you want to teach a bunch of dunces because dunces have to be taught, you know, I just don't have the patience for it. Do I have to review things where people are just spinning their wheels, and you know, I just don't feel like doing it. I mean if somebody else will do it, fine, I'm not trying to deny anybody career advancement. As a matter of fact, it's better off that I don't do it, because I might inhibit somebody who has an opportunity to do something, you know, I don't want to do that, so, I, I mean maybe that's the answer to your question. I'm not quite sure if…

Tribbia: Any last words Ferd. I'm done asking questions?

Baer: Well, okay, well, I don't have anything else to say except to thank you guys for the interview. It's really been fun. I haven't had an occasion to delve into my past in such depth in God knows how many years, so thank you.

Tribbia: Well, thank you.

Chen: Thank you Joe, thank you Ferd.

END OF INTERVIEW