Remembering *Verner Edward Suomi: The Father of Satellite Meteorology. An oral history* moderated by Dr. Robert J. Fox, recorded at Monona Terrace Community and Convention Center, One John Nolan Drive, Madison, Wisconsin 53703, 2 November 2009, 2:00pm-4:00pm

Panel:
Dr. Robert J. Fox (moderator)
Dr. Thomas O. Haig
Dr. Donald R. Johnson
Dr. William L. Smith
Dr. Lawrence A. Sromovsky
Dr. Charles R. Stearns
Dr. Thomas H. Vonder Haar

FOX:
Good afternoon. We're gathered this afternoon September the second 2009 at the Monona Terrace Convention Center in Madison Wisconsin to conduct an oral history entitled *Remembering Verner Edward Suomi: The Father of Satellite Meteorology*.
I'd like to go through and introduce the distinguished panelists now and we'll proceed from there.

First of all starting at my right, your left, is Dr. Larry Sromovsky. Larry actually was inspired to become a Suomi cohort based on a physics colloquium he attended early on when he was a physics major here at the university and Verner Suomi from then on seduced, I guess is the word I'll use, him into working for SSEC, the Space Science and Engineering Center, on instrumentation development and data analysis and modeling primarily covering vertical soundings of the atmosphere and then the planets, a whole range of planets and planetary probes. Larry was a co-I with Verner on the Venus Net Flux Radiometer and a little later we'll get into some of the details of that project.

Immediately to his left, second on my right, is Professor Donald Johnson. Professor Johnson is a professor in the Department of Meteorology and he served as the chair of the Department of Meteorology for a long while. He was a Suomi colleague, served as associate director of the Space Science and Engineering Center and also as director of the Cooperative Institute of Meteorological Satellite Studies which was founded by Professor Suomi. He's a fellow of the American Meteorological Society and a past president of the AMS and a little later on we'll get into some details of his interaction with Professor Suomi.

Immediately on my right is Dr. Thomas Haig, retired colonel, USAF. Tom was, first met Suomi when he was active in directing the development and activation of the world's first operational satellite system which later become known as the Defense Meteorological Satellite Program. And it was during this time that Professor Suomi consulted with the Air Force and interacted with Tom. When Tom retired in 1968 he joined General Electric for a couple of years and then in a Verner Suomi trip to General Electric in 1970 he convinced Tom

Chapter 2 marker 2:59

to move to SSEC to assume the executive director position where he was the executive director until 1980 working closely with Dr. Suomi.

I'm next, I'm Bob Fox. Followed a trail very similar to Tom Haig except not quite as illustrious. I, too, was in the Air Force, ran into Tom Haig there, worked with him, as well as Verner Suomi. And when Tom retired from the executive directorship at SSEC in 1979-80, Professor Suomi reached out and tapped me and asked me to come fill those shoes which I tried to do from 1980 through 2000 as the executive director.

Immediately on my left is Professor Charles Stearns. Professor Stearns worked, well, was a student with the Department of Meteorology while Professor Suomi was a professor there and got his degree here. Then he went and worked with Verner Suomi on the Vanguard and Explorer satellites. Later on he joined the faculty of the Department of Meteorology and worked as a colleague of Professor Suomi's. His, he diverges a little from some of the rest of us in that most of his association was with ground based meteorological instrumentation, although he did work on the Vanguard and Explorer series. And he is the creator of the Automatic Weather Data Station Project beginning in 1980 that populated Antarctica.

Immediately to his left is Professor Thomas Vonder Haar. Dr. Vonder Haar was a student of Suomi's from his, from the summer of 1963. Worked for Verner Suomi as his major professor. And Tom was one of the original members at the creation of the Space Science and Engineering Center when Professor Suomi formed that along with Dean Robert Bock of the Graduate School and Professor Charlie Anderson of the department. Tom worked with Verner in many ways but perhaps his first and biggest thesis publication was the global multiseasonal measurements of the earth's radiation budget using data from instruments of Suomi's instigation and joint development and cooperation.

And last but not least on the end over there is Professor Dr. Bill Smith. Bill Smith is again a Suomi student. Suomi was

Chapter 3 marker - 5:59

Bill's primary Ph.D. thesis advisor. And after he got his degree he went off and worked for the US Weather Bureau in the Meteorological Satellite Laboratory. He worked with Nimbus and aircraft atmospheric sounding instruments. Ostensibly even then they had a plan that Bill would return here and work on vertical sounding of the atmosphere which he eventually did in 1977. He brought seven federal employees to Madison to work with Professor Suomi on both the development of the McIDAS [transcriber's note: Man computer Interactive Display Access System] for display of meteorological data and to do atmospheric sounding work. Bill was the first director of the Cooperative Institute for Meteorological Satellite Studies. And today he is a distinguished professor of

atmospheric and planetary sciences at Hampton University in Virginia. And still working on new and innovative satellite remote sensing techniques.

Alright. That was my shot at introducing you all. Is there any fact that anybody would like to add that I missed totally?

SROMOVSKY
The current date is the November eleventh, I think ….

FOX
I don't, what did I say? I said September. It's November the second 2009. Alright. Thank you Larry for getting me up to date. When you're old time flies you know.

[laughter in background]

Alright. We were going to start this off sort of informally and give everybody a chance to warm up maybe with their favorite Suomi Suomism or Suomi Story. So you all have at it and tell your favorite Suomi story and then we'll get into some of the technical details here. Who wants to go first?

SMITH
Well I

FOX
Bill?

SMITH
One personal story I have. Actually, Professor Suomi was not my major advisor, I mean not my major professor. He was my primary Ph.D. thesis advisor, because of the area that Professor Lyle Horn was actually my major professor. But Suomi was very instrumental in a lot of the work that I've done in my professional career. The story I remember most is actually on the Sunday the day before my Ph.D. defense. I had given Professor Suomi my thesis many weeks earlier, but never heard anything from him. So I thought I'd better call him and make sure he knew about my defense being the next day. And when I talked to him it seemed like he didn't realize that I had my defense the next day. But he never let on that that was the case, instead he said Bill he says come on out to the house.

Chapter 4 marker 9:00

Give me three hours and come on out to the house and we'll talk about your thesis. Which I did. And it was a very memorable experience. He had obviously read my thesis well because we had a very good discussion of it at his home, And then near the end of our discussion Paula his wife invited me to stay for dinner which I graciously accepted to do that. And I got to know Suomi's wife for the very first time then. And I remember thinking during the dinner that old adage that behind every great man there's a great woman because Paula was certainly that. Well, the story doesn't end there. The next day

my oral defense took place and it went pretty well except for one question that Professor Suomi asked me. And he hadn't asked me that the day before when I was out to his house. And he asked the question, he says why can you see further with infrared remote sensing looking down from a satellite than looking up from the ground? And I didn't really know the answer to that. But Professor Suomi went on to explain that infrared remote sensing is like looking through a series of glass panes. Each atmospheric level being a different glass pane. And he says the panes get dirtier going from the top down due to a phenomena called the pressure broadening of absorption lines. This is kind of technical. But he says when you're looking up from the ground, you're looking through the dirtiest panes first so you can't see very far. Whereas when you're looking down from a satellite you're looking through the cleanest ones first and therefore you can see further. And I remember thinking how dramatic that was at the time. But I did appreciate how that simple question and the answer to that would impact my professional career from then until this very day. So that's my story.

SOMEONE
That's good. That's a good story

FOX
Thank you, Bill. Anybody else?

SROMOVSKY
Well, I can. I have a story that's sort of sort of second hand so maybe I shouldn't even talk about since I wasn't actually there, but

FOX
We gossip. Go ahead Larry.

SROMOVSKY
I'll try it anyway. This occurred during the Pioneer Venus program. This program resulted in probes entering into the atmosphere of Venus. That happened in 1978. And during a meeting to discuss the Pioneer Venus probe targeting Suomi was very anxious to get one of the probes as far towards the pole of Venus as possible. The problem was the science team was very reluctant to do that because communications becomes difficult when you do that, so there's a risk that you lose the Doppler radar tracking and also the data transmissions. But Suomi nevertheless insisted on making a risky decision.

Chapter 5 marker 11:59

During a break in the meeting he had Sanjay Limaye who with, at him, at the meeting with him, go down to the machine room and get a, put as much money as he had into the machines and get all these packages of almonds. I don't know, I have never seen a machine that has almonds in it, but apparently that happened out there. Anyway Suomi then labeled each package of almonds "bravery pills" and then when he got back to the meeting he handed them out to all the people on the science panel and saying, saying swallow your bravery pills and pick the high latitude target.

[laughter in background]

And he used that swallow your bravery pills concept many times since then.

FOX:
Anybody else?

HAIG
Well I'll tell you one. When I first came to Madison to join SSEC I moved into a home out in Monona that needed some repair work. And one of the repair jobs involved a lot of plumbing. And Suomi, I told him about it and he said well I got a pipe wrench might help you. So he came out and he brought a pipe wrench that was about that long [transcriber's note: holds hands apart, a little wider than his shoulders], that was the biggest pipe wrench I've ever seen and it was exactly what we needed because the pipe we had to undo was a huge thing and it had rusted shut of course and everything. And so we struggled with that all afternoon. Got it open and did all the plumbing. I won't go into that anymore. But then we were exhausted of course and sat down to have a little something over a bottle and talk.

And we got talking about our earlier life when we were younger, like kids and this sort of thing. And he, Vern told me about his early life on a farm up in Minnesota and how his big brother Frank had cared for him. He was, Frank was two three years older, I guess. And as Suomi described him he was much bigger, stronger, and smarter. And Suomi idolized him. And he went on quite a long time and then said that as he grew older and it came time to go to college his brother decided that Vern was the one that should go to college and that Frank would stay back and work the farm and supply the money that kept Vern in college. And that's how it worked out. And Vern went on and of course had a very distinguished college career. And then just about the time

Chapter 6 marker 14:59

he graduated, Frank died. And Vern said my one deepest regret of my life is that I could never repay Frank. And so I think he felt very strongly about this. I think it was really one of the formative moments in Vern's life and that for the rest of his life I think he actually worked extra hard to try to justify his brother Frank's sacrifice in sending Vern to college. That always stuck with me. It kind of characterizes the man.

VONDER HAAR
I've got a personal one, too. Bill mentioned his wife, Vern's wife Paula. And some time in the late 60's we were on a trip together and he would relax after a busy day and liked to talk about personal things and I had a few young children and Vern's children at that time were certainly teenagers or maybe even a little beyond. And he started giving me some advice as a parent about children, but then he expanded that to include young scientists and students and a few others. And he said well you know it’s a little bit like a man with a bow and arrow. He said with the children or these young scientists you have to point

that arrow in a certain direction, pull back, give it as much force as you can and then you have to let it go. And what happens after that is really out of your control. And that's some good advice for all those groups of people that I've tried to follow over the years.

STEARNS:
Well, I've got one that's a bit different. We were invited out to Champ Tanner's [transcriber's note: University of Wisconsin-Madison professor, Department of Soil Science] house for pizzas. And in the process one oven was not working. So we get the screwdriver and the other things and the pliers and start taking the damn oven apart to see what was wrong with it. And a little while later here came the guy who sold the ovens to Champ Tanner and he pushed the little button and away it went, but we had the damn thing all apart and had to put it back together. [laughs]

[laugher in background]

SOMEONE
That's good.

FOX:
Let me follow up on the two Toms here with a story. When I, I was down at Scott Air Force Base when Don Johnson called me and asked me to come up for an interview for the executive director position. So I drove up on the appointed day and discovered that Verner Suomi was in University Hospital on the eve of his coronary bypass surgery. And for my interview I was given directions to the University Hospital on University Avenue. And I went over and sat in the hospital room with

Chapter 7 marker - 17:59

him and his cute little hospital nightie, tilted up on his bed. And had my interview for this position as executive director in the hospital room the night before his bypass surgery. I always, that's always to me been a measure of his dedication to the job and getting things done. It's also awesome to contemplate going to your job interview in a hospital with someone who's about to have coronary bypass surgery. Following up on that though, Bill's comment about behind every successful man is a great woman. He went on to have a couple more heart surgeries after that and at every heart surgery Paula would start baking about a week beforehand and by the time the day of surgery came she would call me up and ask me if I could send somebody to the house because the freezer was totally full of cookies. And could we come and haul away fifteen, twenty pounds of cookies so she had more room to bake more.

[laughter in background]

And she baked and baked and baked all the time he was in the hospital. And it was really a time of mixed emotions because we ate absolutely great while he was in the hospital recovering from surgery. [laughs] Don?

JOHNSON
Well I'll follow up on Tom here. To some extent. Suomi had a unique value of life and it showed that from his relationship to his brother and getting a chance to go off to college. He became a teacher in high school and always had this unique capability of explaining science to the man on the street. Then he went off to the University of Chicago in about '43. Stayed then until '48 and he actually headed their laboratory. ..And was involved in the development of several unique instrumentations to measure water vapor. Actually sonic anonometer, turbulence, even prior to this work on radiation. But then you go on to how he actually got in to, and of course he'd had some of these discussions on radiation, on field measurements, cornfields and things like that. But there was a story told by a person from, scientist from Ohio who was here working, had been in a Washington office with Harry Wexler who was chief scientist of the Weather Bureau at that time. And Harry Wexler told this man to go back and see if Suomi had any ideas for a satellite experiment. Next morning Suomi's on a plane for Washington to propose this Explorer 7.

[laughter in background]

That's not the only time this happened because he was always prepared to take advantage when certain events happened, here, there, or everywhere. Another one that happened. We'd already

Chapter 8 marker 20:59

been well on the development of McIDAS and satellite, and these people here in particular. And there was a series of tornadoes in Kansas that, you know, wiped out a town or two. And a congressman from Kansas called up NASA and wanted to know what they're doing because they'd made all these promises about weather. And what did they do, they turned around and called Suomi. Can you help us in explaining to Congress what we're doing. So they actually, three of them came out here and we had congressional hearing here in the Space Science and Engineering Center. That lead to the exportation of McIDAS's system that showed imagery, meteorological information to the Kansas City Severe Storms Lab, to Oklahoma, to Washington and all over the world eventually. So I don't know how many was sent as far as these estimates. Somebody said sixty earlier in the day. Tom, here, would know far more about that than me.

HAIG
There was upwards of sixty of these McIDAS units and various models. As technology progressed you could make them neater, smaller, and more efficient. And the boys up on the fourth floor were just so eager to try a new model every time. So we built a lot of those things and almost gave them away, gave them away at cost to just about every government agency throughout the world. And it revolutionized meteorological analysis and presentation worldwide.

JOHNSON

Yeah, in that sense, they went to China. They actually had a system that observed the hurricanes, typhoons, I should say, in the Bay of Bengal to warn Bangladesh and places like that of oncoming storms and essentially Suomi was very proud of the fact that before that happened two, three hundred thousand people could lose their life and now the loss of life was down to five thousand and things like that, so

FOX
Alrighty. I think I'm going to first call on Chuck Stearns here. I think it's sort of fitting this oral history is being taken in conjunction with the fiftieth anniversary celebration of satellites and meteorology. And it was fifty years ago this year, as I understand it, that Explorer 7 carried Suomi's bolometer into space and returned it. And since you were an integral member of that team along with Verner with the Explorer 7 and because we have an artifact under our chair and I don't want to step on it, so I'm going to start with it so I can get it out of the way.

STEARNS
Alright

FOX
I'll turn it over to you and let you tell us a little about the Explorer 7.

STEARNS
Well, Suomi wrote a proposal to the National Science Foundation,

Chapter 9 marker - 23:59

which I never saw, proposing to do something on the Vanguard rocket which was financed by the NSF [transcriber's note: National Science Foundation] for this first, one of the first uses of rockets to carry something into space. And so, we were designing this system for that particular rocket. And at any rate, we put the thing together and in the process of doing that we had a lot of stuff to learn. One of the first things was that we had to use transistors instead of vacuum tubes because there's not much power. And we had the power in the little package that was going to go on the satellite was really from batteries. Little, I guess they were mercury batteries, I don't know [laughs] which ones was in them. But at any rate, a pile of batteries that was going to run for a month or two. That's all. And they had a sphere that was about this big around [holds hands out to indicate a sphere, a little wider than his shoulders] and inside of that was this little situation with a tube in there. [holds hand out to indicate a cylinder shape] And on the outside of the tube there were, well, transistors used to make an updata words.

And the data atword had about ten to the twenty, ten, a thousand and twenty eight

FOX
Ten twenty four, yeah.

STEARNS

Twenty four places for it. And the sensors, well, this was similar to it [the model of the bolometer is on the table] but we had little round balls that happened to be painted black and white. Well, some of them were black and some of them were white. And [laughs] at any rate, there was just old stove paint cause I found this, I was trying to find out what should I use for a paint and I didn't. I figured that stove paint would be the stuff that would last the longest. So that's what I bought. [laughs] I don't even know where I bought it now. At any rate, and the second thing was that the system was going to have to withstand severe vibrations. Now I took a look into this Vanguard satellite and I could see these different wires hanging down in that satellite and I decided right then and there this isn't going anyplace. And so I packed up and

Chapter 10 marker - 26:59

got in my car and went home. I didn't even want to watch the launch, watch the launch at all, cause, well, at any rate. And the third thing that we had to do was have a short term memory for the data. And the short term memory for the data happened to be a little tape recorder. And you could wind it up on a spring driven reel and then let'er go to play it back. And it worked. And, I don't know, it was maybe it had a yard of tape or whatever it was. It was a metal tape. And that was our short term data and it was for , oh, a little more than the data that's taken in a half of an orbit of the satellite. And any rate, the data had to be transmitted to land based stations and there weren't very many land based stations to collect data from satellites at that time. Like now, they're all over the place. Back then they had to set 'em up. And another thing that would appear to you if you did a little calculation, what in the world are we going to store this data on? The data storage systems were some magnetic tape, you know. Well, it turns out, if it lasted too long we'd fill up all the world's tape for computers, something like that. And then the last thing that we had as a problem that we didn't know what to do anything about was that we didn't know what was going to happen to something you put into space. How will the surfaces be changed, cause if we put something up there

SOMEONE
Yeah

STEARNS
that depends on the surface and it changes with time it's going to give us a different number. And we had no idea what that was going to be. At any rate, we had to overcome these things plus we were, as a group, were doing something we had never done before. And I had the job of designing a little gadget that had some gears in it and it would move five thousandth of an inch every pulse, which is about once every second and it would chomp along and put the stuff on the data and wind it up on this spool so then we could pull the pin and have it play back to go down to the ground. And you, Tom [indicated Vonder Haar] collected that data I remember

VONDER HAAR
And Fred House, I remember

STEARNS
[laughs]

VONDER HAAR
We did

STEARNS
Yeah. And that, but that, all of this had to be modified from the Vanguard system to the Explorer 7 system

Chapter 11 marker - 29:59

which was entirely different. Now the Explorer system, the Explorer 7 system had the advantage that it had some solar panels on it and this thing could run our station for years, at least a couple years, something of that order and make it really worthwhile. But, we had to make a different type of sensor. Now this one [holds model of bolometer] is decayed. Didn't go up or not. It was this little ball here [points to gold ball] that was either painted black or white, but it was in this case this was put gold on there. And so we have a measure of the temperature in there with a thermister and that temperature then is measured by the thousand and, what was it?

FOX
Twenty four, yeah.

STEARNS
Twenty four [laughs], I can't do my mathematics. A thousand and twenty four counter in there. And at any rate, I don't think it's really a very good sensor, frankly. This surface here [points to metal bridge between the two balls] was a beautiful front surface mirror. It looks terrible now but when we put it up, when we put them in space this was a beautiful mirror, perfect mirror and I got that for nothing from someplace [laughs] I don't know where it was now [laughs] but at any rate, I probably made promises to them, but I did have a little problem with this from my vantage point of view because of course the Army then as soon as I sent these things down to be installed, they rattled them a little bit and of course, they came apart.

SOMEONE
Yeah.

STEARNS
and I had failed to properly clean the mirrors and stuff before I glued them down with some epoxy glues, so I, they said they were going to split a chunk of concrete in there and call it the University of Wisconsin experiment if I didn't get on the ball. And I did. I did get on the ball and take care of it. But my final item there was the purchase of these transistors for what Suomi wanted. And he gave me the job. Suomi was in the engineering building with Parent doing the stuff with the thermistors, or thermocouples. And any rate, and he didn't like to get over to the Meteorology Department because he'd

find that he had to do something over there and he got me to teach his classes so he wouldn't have to come there I think. So I had to take care of his two classes, well, one for each semester.

Chapter 12 marker - 33:01

And then Bryson found out about it and didn't like it. He was the chair at the time. But I was fully qualified as far as I was concerned [laughs] to teach those classes. But, I'm a graduate student now, and I'm not paid very much. [laughter in background] But any rate, [laughs] I had to work twelve hours a day just the same. But any rate, on buying these transistors, I just called up good old, what was it? Texas Instruments and said I needed whatever it was, forty or fifty of these things. That's something like thirty five dollars a piece and so they said sure don't worry about it. And about three or four days later we got our transistors. And Suomi had what he needed to get going. But a few days later the bill came in to the purchasing department and following the bill to the purchasing department came the purchasing order to the purchasing in the University of Wisconsin and this is about the biggest no-no you can go do. [laughter in background] Nobody is ever to order anything without letting the university go out on a bid for it. And if they'd have gone out on a bid who knows how many years it would have been before we got those transistors. [laughter in background] And we had to have them tomorrow sort of thing and so [laughs] the purchasing got to chew me out very nicely for it and I accepted that. And Suomi didn't even know anything about it. [laughs] So I thought that was a pretty good trick cause I got it done. I got the things bought. And at any rate, as I said the Vanguard system went in the ocean and then we had to design a little, a newer system for trying to measure the radiation and the various, and the longwave and the shortwave and so forth and we came up with this thing [indicated bolometer model on table] which probably wasn't too good but it was, I don't know how Tom processed this but the magic here was done by Tom.

VONDER HAAR
And Fred House, I have to say it again was

STEARNS
And Fred House.

VONDER HAAR
taught me a lot. Suomi came up with the idea, if I could interject, to make these very simple sensors work. He claimed he could do it with a piece of bubble gum, remember that? But,

STEARNS
Wow
VONDER HAAR
The idea was that when the satellite went through the Earth's, into and out of the Earth's shadow, crossed the terminator, you got a big signal from the sun or you lost the signal.

STEARNS
Yeah.

VONDER HAAR
And with the aid of that concept we were able to do

Chapter 13 marker - 36:19

what was the first in-flight calibration of the radiometers.

STEARNS
Yeah.

VONDER HAAR
And that was the key and I think Suomi before he left us did talk on some oral history tapes about that concept a little bit.

STEARNS
Yeah, well, I know that was going to be, I knew that was going to be an important thing.

VONDER HAAR
That was big.

STEARNS
But it was about that time, before it went into orbit that I quit and started working with Lettau, [transcriber's note: Heinz Lettau, professor, University of Wisconsin, Department of Meteorology]

VONDER HAAR
Yep.

STEARNS
which was more up my field, my interests.

FOX
I guess I would remind you, Chuck, that good is time dependent. And what may not look so good now was probably absolutely great back in those days.

STEARNS
Oh, oh, we had no choice, absolutely no choice.

FOX
And since Tom made a thesis out of it, I guess he thought it was probably better than good.

VONDER HAAR
Yeah, I thought it was great. [laughter in background] In fact we're celebrating in this fiftieth, program on the fiftieth anniversary of the legacy of that, of those sensors, Chuck. You were, you might say, you were the early experiment engineer or something.

STEARNS
Yeah [laughs]

VONDER HAAR
Although Vern might say he was, but you got the work done and it was a grand success. And actually the Russians even received some of the data. They had a readout a station.

STEARNS
Well, Suomi said to them, or said he was going to keep all the data for himself.

[laughter in background]

VONDER HAAR
They were broadcast, you know, to stations, Russians were, had the ability and this was out of scientific cooperation

STEARNS
Yeah

VONDER HAAR
in the International Geophysical Year. And they actually published a paper

STEARNS
Oh, they did?

VONDER HAAR
from the data, yes.

FOX
I was a little surprised, Chuck, to hear you say that you taught Suomi's classes for two semesters because I thought he had a great love for teaching.

STEARNS
He did.

FOX
and love of his students
STEARNS
A great love for my teaching.

[laughter in background]

FOX
He had a greater love for science and research. I thought I would

STEARNS
Suomi was charging and as fast as he could to get stuff to work at that time.

FOX
Yeah

STEARNS
because we had to do all, everything for this Vanguard satellite. And we only had about a year and a half to do it. And it was hard to do it. You had to work all the time. And, but he was charging, he really was. He was trying to get it done.

FOX
I thought I'd follow up on the teaching thing with Tom, since Verner was your major professor and you had a lot of insight into him as a teacher and his students and his love of teaching. And in fact I even heard a rumor that he, while he was chief scientist of the Weather Service, that he quit and came back early because he wanted to be with his students. I always thought that was because he probably hated the administrative part of the job, but you can comment on that.

VONDER HAAR
Well, I will. You know Vern said things

Chapter 14 marker - 38:59

Said this many times, the purpose of a university is to educate students. He said it so often it was like a mantra. And I'm sure others have heard him say that, too. But at the same time he was certainly excited about following his new ideas and his new innovations and so he always, I think, always had to balance that. I would say he was a dedicated teacher, but he taught a lot outside the classroom and even the graduate classes that we attended at that time, people like Steve Cox, Bob Knollenberg, Bill was there. I don't know if Don [indicates Don Johnson] ever took a class but Vern's graduate classes were more like idea shops where he'd come in, you know, he'd tell us a month before that we're going to do this and then he'd go on a trip and get some new ideas and come in and it'd be a totally different agenda. We were working on projects like measuring the energy from the sun with a balloon launched from an aircraft carrier in the Atlantic and how we would do that. Putting an interhorn [transcriber's note: used for radar acoustic measurement of temperature profile] on a balloon to get the temperature profile with acoustic propagation
STEARNS
Oh, yeah.

VONDER HAAR

information, you know. Vern had a lot of ideas, but I would say he was a dedicated teacher and I think another example of that was his interest in the students and the faculty in other departments here at UW. He worked a lot with electrical engineering, not just the faculty, but the students. He worked with the Physics group, the Astronomy group.

FOX
Champ Tanner, in Soils

VONDER HAAR
In Soils. He came here originally worked with the Soils Department. So, he was a very collegiate, maybe an eclectic person. He didn't have boundaries. He saw no boundaries in education and things of that kind. Now about going to Washington, I was here when he left us for a year. I think he was on sabbatical to be the chief scientist at the US Weather Bureau and I think he came back to be with his students, but I, and maybe because of the bureaucracy out there wherever it was [laughter in background] on K street or wherever he had a little office. But at that time, he was beginning to get that concept of the spin scan cloud camera. And I talked to other people who were out in Washington at that time with him. This would have been '65 roughly. And they said, well, lets see, I was out there and Vern had me holding a globe and he'd stand back a certain distance from the globe and this guy had to spin the globe. So Vern was already getting the idea for the spin scan cloud camera which was one of his great new, you know, technologies after the Explorer and all that. So maybe he came back to pursue that idea and to be with his students. I don't know. What do you think Bill? [addresses question to Bill Simth]

SMITH
I'm not sure.

FOX
Any other comments on Suomi and his students and teaching?

HAIG
Well, he used to teach by posing.

Chapter 15 marker - 41:58

Gedanken experiments. Experiments where you had to think. I remember one of them. I wasn't his student, of course, but he tried this on me anyway. He said suppose you're in an elevator with a floor that is un-wetable, it's slick and the water won't wet. And there's a droplet of water on the floor of the elevator and the elevator suddenly falls in free fall. What happens to the droplet of water? [long pause] Well, you're supposed to think about this and say aaah, surface tension of the droplet will cause it to close up and become, it will probably go into an oscillation like this [hold cupped hands apart, moves them towards and apart from each other] and it immediately leap off the floor and [hovers one hand upward] it will float. And at this point Suomi would say alright now calculate how

fast it's leaving the floor. And at that point the student and I gave up because, and I said can you calculate that? No, but it's a good question. [laughter in background]

FOX
I think everyone in the world who ever knew him was a student of Suomi's because he posed thought experiments all the time to get reactions.

SOMEONE
Right.
[laughter in background]

FOX
As long as you're talking there Tom, you worked with Suomi while you were in the Air Force on development of the first operational meteorological satellite program.

HAIG
Yeah.

FOX
Could you give us a little insight on how you interacted with Suomi and what type of work he did and how it went?

HAIG
Well, the program was supposed to be a very short interim one year program to fill in for the national reconnaissance office. They had finally succeeded in getting a reconnaissance satellite to return some pictures and discovered that there were 85 or more, 86 percent clouds images, very little of the ground. So they decided holy smokes, we need a meteorological satellite up there to tell us where the clouds are so we can take the pictures where they aren't. And so they started my little program. We had just had a successful launch after nine months from start to first launch. It returned pictures, it was based on a little Vidacon camera up there just taking television pictures of the Earth and these were the first cloud images on an intentional basis. A couple of years before that NASA had launched a first TIROS [transcriber's note: Television InfraRed Observation Satellite, the first successful weather satellite, TIROS I launched in 1960] with a Vidacon [transcriber's note: video camera design developed at RCA in the 1950s] in it which proved that a Vidacon would work in space.

Chapter 16 marker - 44:59

What RCA did then was to propose a better satellite which would take a whole strip of pictures properly oriented and you could tell where the pictures were taken and that was my little program. Anyway, Suomi after Explorer 7 didn't have anything up there in orbit to put an instrument on so he asked Dave Johnson [transcriber's note: NOAA administrator], when are you going something up I can put an instrument on. Dave says, well, NASA is messing around with Nimbus and it will be several years before they get anything up, but Tom Haig has got a little program out there on the west coast, go out and

see him. So Dave called me and said I'm sending Vern Suomi out, he's a professor at the University of Wisconsin, listen to what he has to say and if you can accommodate him, great. So he came out. Vern says, all I want to do is to put two little sensors, all they are is inch, one inch in diameter aluminum foil, one painted white, one painted black on other sides of your satellite. As the satellite goes around [tumbles hand in front of himself] they will see space and then the Earth and we will take the difference in the measurements from the two little thermisters that are glued to the back of these little pieces of aluminum, record it on a recorder and dump it on the ground. All you have to do is to give me one command to tell my little recorder when to unwind and dump the data. So we said well, ok, we can accommodate that. And we worked for three or four hours, had it all designed, set it up, and it flew on our fifth satellite, our, actually our second successful launch. And the data that came down not only gave good albedo information, but the people in the global weather center also got a copy of the data. And they decided holy smokes, we can learn about nighttime cloud cover from this. Because the sensor was telling what the temperature was related to what they're seeing and the temperature will tell them where the clouds are. And they very quickly developed the software to do that. Well, I got a call a couple weeks after that saying keep a Suomi sensor on all your satellites from now on. They're data that, we don't care [laughs] about his Earth budget measurements, we want it for nighttime cloud cover information and so it became then a reconnaissance satellite sensor. Which is not what was intended at all

Chapter 17 marker - 47:58

but it become very important. And there was later on in one of our later models. [Fox places half arc, ring-shaped instrument on table] This is a great big beasty thing. Our satellites got bigger, heavier, not, this is, shows the diameter of the satellite, it was not a very big one, but these things around the sides now are all Suomi's sensors. The first one had two little flat plate sensors. This one obviously has a set of, I think there are eight or more sets. And they are now not flat plate, but conical which gives them more resolution and they're pointed in different directions so they were getting higher resolution, infrared cloud cover imaging at night from this thing. And so it was serving the reconnaissance satellite program extremely well. And it went on until they finally went to an entirely different kind of a satellite that had an infrared scanning device which gave whole images in infrared and you didn't need to have to do it this way anymore. But this was a very successful and very useful program to the national reconnaissance effort, which is not what Suomi intended at all but he did it.

STEARNS
You were using the, the, for on the first one Suomi was using the same satellite equipment that he put on the Explorer 7.

VONDER HAAR
Well, they were flat plates, Chuck.
STEARNS
I know they were flat plates.

VONDER HAAR
They were the same concept that he'd done earlier

SOMEONE
Yeah, the same one.

VONDER HAAR
All the way back to Explorer 7

HAIG
It may be been the same recorder.

STEARNS
I think it was.

HAIG
It was a little five ounce thing [holds hands apart forming a small rectangle shape] I guess Parent had a great deal

STEARNS
Yeah, it was about this big around.

HAIG
to do with building it. And it used the spring from a Big Ben alarm clock as its source and little rotary solenoid, and it would advance that little magnetic tape

STEARN
Right

HAIG
Or wire. Each time printed out an eight bit word and then dumped that by just pulling the little latch on it

STEARNS
That's right

HAIG
and it came down. And Tom can tell you all about how the difficulty of analyzing that data because it came down at a very highly variable rate. When you listen to it, it would go [makes descending noise], as that spring unwound, you know. And he had, [laughs] he had to calm that down to make it an even rate of data. It was digital word of course, but a computer can't take it at the uneven rate. He had to calm it down and make it all one rate. Then you could dump it into a computer and read it. Tell us about that Tom
VONDER HAAR
Well, I, yes, the, Chuck talked about even

Chapter 18 marker - 50:57

that magnitude of data in those days was taxing the systems. Fortunately the Air Force had a, this was a near polar orbiting satellite, so they had readout station in the polar regions, perhaps at Greenland or somewhere like that. And then, so they could capture the data better, but then on the ground we had to stretch it, reprocess it, check those little hack marks.

SOMEONE
Yeah,

VONDER HAAR
And I think it's a great example of Vern's idea to take an idea and to find an opportunity to fly it. And here you, he was supporting the Air Force program but at the same time we were getting great science data and a number of students here at the university analyzed the data. I can remember Bill Shen, that might have been Explorer 7. Mel Weinstein, Fred House of course, myself, and so here we were kind of piggy backing a science experiment on your mission which had its own special purposes in those days.

SOMEONE
Right.

VONDER HAAR
There was a lot of red tape. And one time during the Vietnam War I can remember we had the only classified contract at the University of Wisconsin and that made us all a little nervous because of what was going on at the time. But, you know, it had an unclassified component, too. That some students could work with the data, but processing the data was just the beginning. It was really a chore just getting the data to the ground it would sometimes take years literally to publish the results.

SOMEONE
Yeah, right

JOHNSON
I would like to

FOX
Speak

JOHNSON
interject something here. At looking back on how Suomi was able to be this creative, a person who could think outside the box, do things that ordinarily weren't done in meteorology. I want to go back even before the time of satellites, and cover something where I'm going to read in a insert on a paper having to do with measuring moisture in the, with electronic dew point indicator but that was used to measure water vapor in the stratosphere. And it said "Mr. Suomi received his BE degree in 1938 from Monona State

Teachers College. He served as a science teacher in various high schools during the next few years and in 1942 completed a professional course in meteorology at the University of Chicago. Because of the then extensive wartime meteorology training program, Mr. Suomi was retained as a staff member by the University of Chicago to participate in the expanded laboratory program. In 1948, the Laboratory of Experimental Meteorology was organized at the University conducting research in methods of probing the atmosphere. A large portion of this research was concerned with moisture measurement. Suomi

Chapter 19 marker 53:58

made as director in this laboratory." [transcriber's note: source is insert for article by Verner E. Suomi, Moisture measurement with an electronic dew point indicator. Instruments, v.21, 1948, p178-182. Correction to the sentence above, In 1943, the Laboratory of Experimental Meteorology was organized … Suomi was made director of this laboratory in 1946.]And then I go to an insert, or excerpt from a paper by Barrett and another individual on measurement of water vapor. "We particularly wish to call attention to the highly essential contributions of Verner E. Suomi, director of the laboratory from its inception in '43 until July '48, who initiated the program of research in dew point hygrometery and devoted a large portion of his time and efforts to personal participation in the work." [transcriber's note: source of article: Barrett, Eric W. and Herndon, Lee R. Jr. An improved dew point hygrometer. Journal of Meteorology, v.8, no.1, 1951, pp40-51.] Another thing he did there was the sonic anemometer to measure turbulence and temperature and you can go and you can find a paper here by Barrett and Suomi that's published in 1948 in the Journal of Meteorology. And this is the first time there were any measurements really made of atmospheric turbulence by sonic anemometers, at least as far as I know. If you go to the web and look up sonic anemometers, Wikipedia says that the first measurements made this way were in 1970, no record of Suomi's work in this particular area. And it's kind of interesting in the way he did sonic anemometers, he did water vapor measurements, he did radiation experiments. And he served as director of this laboratory at a very prestigious university, the University of Chicago which was the first and foremost university in meteorology at that time. Pardon to MIT maybe and UCLA, but I think Chicago was recognized as the top one at that time.

STEARNS
I want to add then, that this little, your satellite that you put up. Suomi was using my, well, it wasn't mine, but it was what I had saved as a model of this little gadget that would code the data onto a tape and tick along at five thousandth of an inch for every second or so. And that was my one that I was going to keep out so we could have one and he asked for it and I had to give it to him.

HAIG
Well, it was cute gadget. It really worked. By the time we got around to the next satellite, and of course, people wanted his sensors so badly, we modified the bigger tape recorder

STEARNS
Oh yeah.

HAIG
so that we didn't have to fly yours anymore.

STEARNS
Yeah,

HAIG
We put the data on the regular same one that

HAIG
held the pictures.

STEARNS
Yeah.

HAIG
And it made the satellite simpler. But, I liked your little gadget. That was cute.

STEARNS
Well, I'm not the one that designed it.

HAIG
That was, that was Bob Parent wasn't it?

STEARNS
No. Parent, I don't think Parent ever looked at it, even. No, part of the design came from a guy at

SOMEONE
At Iowa

STEARNS
At Iowa

VONDER HAAR.
Van Allen. I think he came from, I heard

STEARSN
Well, it was who was his student

VONDER HAAR
A student of Van Allen, then

HAIG
Aaah, it that right?

SOMEONE
Was it George Ludwig, perhaps?

STEARNS
No, I don't remember. I don't remember his name, I just know that he was

Chapter 20 marker - 56:58

teed off because the wrong name was used for that [laughter in background] player.

VONDER HAAR
Yeah, Suomi told, Suomi told. So, so Van Allen also had experiments on the explorer series, on Explorer 7. And there was a lot of sharing among the groups. Which reminds me of another Suomi story, real quick. He had several job offers when he graduated from the University of Chicago. And one was here at Wisconsin and another was at the University of Iowa. So I asked him, how did you decide? And he said oh, they were both good offers but I went to Iowa and I found out that most of the faculty there took their vacations in Wisconsin, so I came to Wisconsin. [laugher all around] That's why he came to Wisconsin.

STEARNS
Well, he knew, he knew Bryson, too.

VONDER HAAR
Oh, yeah, yeah, they were.

FOX
Well, in addition to being a great tinkerer and mechanical inventor, he was also a great person to talk science with anybody who came to his mind, and who he'd meet on the street. One of the things I admired most about Suomi was his ability to meet and size up a person in five or ten seconds and talk science to that person at that person's level. And I

don't know, Bill, you spent a lot of time with him in collaboration with scientists around the globe and around the world and getting them all cooperating. How did he do that?

SMITH
Well, I think Suomi's success in rallying the world science community behind his projects was really related to his personality, as well as his wisdom of course. But he had the gift of attracting people and getting them enthusiastic about his own ideas. His enthusiasm was truly infectious. And people would see how much fun he was having, and so they would have fun as well when just listening to the man. And as you mention he was, he was, had the gift of making even complex ideas very simple by using simple everyday analogies. In fact his, I remember his version of the KISS principle was Keep It Simple Suomi. [laughs] And it was his one liners like this which not only made his discussions with, with his colleagues and so on amusing, but they always conveyed a very important message. And Suomi, you know he was always quick, too, to congratulate his colleagues, or people who worked for him, his students, or even some of his competitors on their successes, even when they beat him to the punch

Chapter 21 marker - 59:58

Beat himself to the punch. One I remember which was Pierre Morrell, who beat him to the punch in getting the first water vapor channel on a geostationary satellite on the METEOSAT and he immediately congratulated Pierre for that, for that accomplishment. The other thing about Vern Suomi is that it was obvious when you talked to him and saw how he behaved with other people that he genuinely cared about the person regardless of his professional level. It didn't matter whether he was an administrator, a student or what have you. And I think one example of that was how he would entice people to quit smoking. [laughter in background] And he did this with the president of the World Meteorological Organization as well as a colleague of mine in those days at NESDIS. And he would do this by writing them a check and telling them they could cash that check after the first year of them not smoking. [laughter in background] And I think most of the time it worked. People stopped smoking. Nobody ever cashed the check, they would just frame it and put it on the wall as a demonstration of a person, a very important person, a great person who cared for them.

FOX
I've seen several of those framed checks. And likewise I've never known of one that got cashed. And talking about Suomi bringing things down to your level, I was in my office one day deeply involved in the administrative crisis of the day, and Suomi burst in and babbled at me about some great idea and I was only half paying attention and I said I'm sorry I didn't follow that, you're going to have to back up and start over. And he looked at me and he went to the blackboard and picked up the chalk and wrote F=MA [transcriber's note: Force equals Mass times acceleration, Newton's second law of motion] and he says there Bob, is that far enough back? [laughter round the table] Which was his measure of my scientific competence [more laughter]

SOMEONE
Alright

FOX
Alright.

JOHNSON
(says something?)

FOX
Pardon?

JOHNSON
He got your attention

FOX
Yeah, he did get my attention. He got 100 percent of it anyway. [laughs] In addition to all we've talked about planetary-wise and even on the ground, Verner was pretty much involved in the exploration of other planets and other planetary atmospheres. In addition to the Net Flux Radiometer, he did several other things, working primarily with you, Larry. Could you talk a bit about his work with other planets and planetary soundings and things like that?

SROMOVSKY
Sure. The, I guess the first one to talk about is the Pioneer Venus Net Flux Radiometer one because that's the one I first got involved with

Chapter 22 marker -1:02:57

at a fairly early stage of my working at Space Science. The original idea he had in response to this NASA opportunity. NASA was going to send a series of probes to the planet Venus and there was an opportunity to propose instrumentation for this mission. And Suomi wanted to basically take over the entire probe. He proposed an instrument to measure the net flux in the atmosphere. He proposed another instrument to do radar altimetry following up on what had been developed for the TWERLE mission. [transcriber's note: Tropical Wind, Energy conversion and Reference Level Experiment, mid 1970s] And he also wanted to propose the stable oscillator which would be used to track the motion of the probe during descent from which the winds in the atmosphere would be determined. And so there was a big effort to put together all these proposals. And there was probably another one to do the temperature structure, too, although I don't recall seeing that in the package I was looking at the other day. But anyway, the only of these multiple proposals that actually passed through the first level of review was the net flux radiometer proposal. Now, why would you want to measure net flux in the atmosphere? Well, it turns out that the net flux is the difference between upwelling and downwelling radiation fluxes and if you measure it at the top and the bottom of a layer, the difference gives you how much radiative energy is being emitted by the layer which

would cool it, or how much is being absorbed by the layer which would heat it. And heating and cooling drive atmospheric motions. So this is basically the power, the heat engine that powers atmospheric motion. So it's a pretty important measurement. And his approach to doing this was to try and make it as pure and clean as possible. Unlike the Venera probe [transcriber's note: Soviet Venus probe in 1969, first of the Venera series that returned data] that actually did measure radiation energy of the atmosphere of Venus earlier, but poorly, this instrument would have a perfectly flat spectral response. It would, it would respond the same at every wave length, so it could integrate the flux without any knowledge of the atmosphere itself. It would also have a perfect angular response. It would have the same response as a flat plate, a perfectly absorbing flat plate in that all angles would be treated like that and that ends up being like a cosine response, a cosine of the angle of incidence. And so that was the basic approach to make this perfect radiometer and of course reality intruded into this picture as we got further and further into the mission and we, we had to deal with the problems of Venus which the foremost of which was the high temperature at the surface of Venus which was about seven hundred and thirty five degree Kelvin which is a rather substantial temperature to deal with and ninety bars of atmospheric pressure and CO2 being the atmosphere. Sulfuric

Chapter 23 Marker - 1:05:59

acid clouds were another fine point that had to be dealt with and the two hundred Gs of deceleration as we entered the atmosphere. So in making a perfect instrument in that set environment was, to work in that environment was sort of difficult. And we had two approaches. One was to have a detector inside the probe pressure vessel which was protected from this environment looking through a window at a mirror that would be flipped up and down and look at the upward and downward hemispheres. And it turned out that was very difficult for us to achieve with our limited mathematical and machining ability to take that view and transform it into a perfect hemispherical view. The other option was to have an external sensor that was a flux plate, a plate that would absorb this flux and develop a temperature gradient that was for a proportion of that flux which would be measured by a thermopile. That is the way we ended up going, with the external sensor and we actually managed to get it to operate inside a pressure vessel at the Venus surface temperature, at that pressure, with CO2 and got it to mechanically flip and make measurements that were accurate and the angular response was remarkably close to the perfection we were after. And we had diamond windows to make sure it had transmitted all wavelengths, almost all wavelengths, efficiently. And so that, that's the way we ended up going. And there were a number of problems that kind of highlight the difficulties of both working in instrument program and also working with Suomi at times. He had, one of the, one of the stories that I could have related earlier, was one that is really quite remarkable in the physical demonstration. We had this flipping sensor with a coil of wire that would wind and unwind as the sensor flipped and it would carry the signals back into the probe. These were parallel strands that would slip and slide past each other easily, so it was easy to flex the coil. But in the life test we discovered wires broke during a life test, which was really quite a surprise. And after inspecting the details we discovered that these nice parallel wires were twisted together. That was not in the

design, so it was quite a surprise. And it turned out that one of the technicians had independently thought it will be stronger if these wires were twisted together, but stronger also meant harder to, more resistance to flexing. And Suomi when he was told about this he said aha, it's the extra stress of the wires bending against each other and he demonstrated this by ripping a phone book in half. [laughter in background] And he did it by creasing

Chapter 24 Marker - 1:08:52

the phone book and then bending it so that the pages would be torn one at a time as he bent against that crease, that crease was acting like a fulcrum and he would actually rip the phone book in half. It was quite an amazing demonstration. I mean the idea was pretty good, hard to execute though, not everybody can instantly [laughter in background] rip a phone book in half. [laughter in background] He must have practiced that quite a bit. But one of the more remarkable things that he did was when we had a review, we had the sensor design all, pretty much set to go and there was this final design review that would allow us to go forward and actually build the flight instruments. And the NASA team came to Space Science and they looked at all our results and at one point in the discussion they expressed a great deal of skepticism about the strength of what looked like this delicate little sensor which I have, somebody has, a sample of this delicate little sensor surviving this two hundred G deceleration. And Suomi, and he was great for bold strokes, I must say, and simple bold statements. And he, he grabbed the sensor head and stood up and flung it against the wall as hard as he could and the sensor was picked up off the floor and it looked perfectly fine. And he said now do you think it will survive?

[laughter in background]

FOX
He was a risk taker.

[laughter in background]

SROMOVSKY
He was a risk taker and no amount of planning will replace dumb luck because after the meeting was over and the review team left and went back to wherever they came from, I took the sensor out in the hall and I personally threw it against the wall myself and the windows broke [laughter in background] And in a way it didn't really matter because we ended up using diamond windows on all of the probes instead of one with quartz and the diamond wouldn't have broken anyway but he was taking a risk when he did that because it could have turned out the other way.

HAIG
Alright, tell them about the difficulty of finding those diamonds. You had to find flat, thin diamonds about an inch in diameter or so?

SROMOVSKY
Yeah, about

HAIG
They're hard to find.

SROMOVSKY
No, it was actually, I think it was closer to a centimeter

HAIG
A centimeter?

SROMOVSKY
If I remember, and a millimeter thick and I think you can go to De Beers to get the diamonds and I'm not sure it was all that difficult to get the diamonds, actually. I don't recall that being all that much of an issue. We got a pair of them for each sensors and I think it cost something like five thousand dollars for one pair of diamonds.

FOX
Would they've made good earrings? Look terrible, huh [laughs]

SROMOVSKY
No. But yeah, there's a little bit of a darker side of this sort of relationship, too

Chapter 25 marker - 1:11:57

because Suomi had a lot of frustration during this program, and not just with NASA teams, but with the way things were going in the development. And he would try to motivate people, and sometimes in rather, it seemed to me, inappropriate ways. And one of, one concern he had was the instrument electronics box was going to weigh too much. And, and he wanted that weight to get down below a certain amount and one method of achieving that was to, was to offer the engineer responsible a certain amount of money for every chip that he could reduce from the electronics design

SOMEONE
Clever

SROMOVSKY
and I don't think he ever paid off on that however. [laughter in background] And the other was, he once threatened to throw the engineer off the top of the building if he didn't [laughter in background] get the weight down. And I'm not sure whether we, whether those motivations, which of those was most important . And then the third time he was frustrated, he threatened to cancel the whole program and send the money back to NASA which is a strong motivator to all of us on soft money [laughter in background] Well, he was still funded as a professor. I didn't, we didn't all appreciate all of these motivations as much as

SOMEONE
He made a point
[laughter in background]

FOX
Alright, I'm going to leap frog here just a bit. I think I'm going to go over to Bill Smith and ask him to talk a little bit about the Cooperative Institute for Meteorological Satellite Studies, CIMSS as it became known. Another great example of which you provided a couple of earlier of Suomi building bridges to colleagues and government agencies and everybody else. So can you tell a little bit about the Suomi desire to create CIMSS as a home for the feds and other people?

SMITH
Yeah, well actually it all started I guess when I was a, after I got my PhD. After that defense. Suomi told me, he said you should go off to Washington and get some experience and come back in a year, he says after you get that experience. So I went to Washington, and of course I ended up being there over eleven years cause I got caught up in the space program there and worked for NOAA during that time. And then we were both working on a common project which was the GOES [transcriber's note: Geostationary Operational Environmental Satellite] VISSR Atmospheric Sounder, that ended up being flown on the GOES-D satellite in 1980. And we decided we should combine forces to build the ground system for that, for that institute. Combine my group that I had in NESDIS [transcriber's note: National Environment Satellite, Data, and Information Service, an agency within NOAA], or in NESS [transcriber's note: National Environmental Satellite Service, the agency that was later renamed NESDIS] it was called at that time in Washington, with the group here at Wisconsin. So he says, he asked me, he says why don't you come on back. And so he got Dave Johnson who is a very close colleague

Chapter 26 Marker - 1:14:58

And personal friend of his to agree to , to have us to come out there for a short time, a small group of government employees to work with Space Science and Engineering Center and that ground system. So I came out with really the six of my very best people and to work on that system. And Suomi was quite impressed. He thought I was probably coming by myself or maybe with one or two others, but he was impressed that the seven of us came. And a short time thereafter he said, he says, boy, he says these government employees they're taking quite a risk, you know, uprooting their families, and bringing them out here and so on. And he says, he says it wouldn't be fair if they get called back to Washington after going through that expense and so on of coming out here. He says we need to formalize this collaboration and that's where, that's where the Cooperative Institute came from. And Suomi wasn't, as I remember it, not trying to do any great things with the Institute except to provide stability,

FOX
Safe haven

SMITH
Personal stability for these government employees that came out to Wisconsin. That was first and foremost his motivation for forming CIMSS, to formalize the government, the relationship with the University of Wisconsin. That impressed me, because again, it was showing how he cared for these people, their personal wellbeing, and their families, over and above the work that they came to do. And the other thing, of course, Suomi was a bridge builder always between people, between professors and students, tried to bridge faculty [laughs] together and so on. And he saw this as an opportunity to bridge the University of Wisconsin's work with NOAA and so to him, I'm sure, CIMSS was also that. And eventually to be a bridge between NASA and NOAA. And those were in the back of his mind. Now people marveled at the fact that I was able to bring seven government employees out of Washington to a university. It just wasn't done at that time. And, but, but what made it happen was the fact that Dave Johnson who was the director of NESS had probably the highest regard possible for an individual for Vern Suomi. And I remember one time, just to, as a little story that went on in Washington, showing his loyalty and support of Vern Suomi. I remember I was, when I was at NESS in Washington, I was at a budget meeting and we were deciding what universities would

Chapter 27 marker - 1:17:59

Receive funding of their proposals and one of the reviewers, the proposal reviewers questioned Suomi's proposal, the legitimacy of it and recommended that this proposal not be funded. And Dave Johnson immediately, immediately stated, he says I don't care what that proposal says. Verner Suomi and his colleagues at the University of Wisconsin perform great work for the NOAA satellite mission. He says, they will be funded. End of discussion. [laughs] [laughter in background] Well, in any event

HAIG
I remember I was writing most of those proposals. And that made the funding of them so much easier, with that attitude on Dave's part.

SMITH
He didn't care what the proposal said. He knew who was doing the critical work.

HAIG
Right

SMITH
and Dave Johnson, he, I mean I must say he is probably the greatest director thus far of NOAA satellite missions.

SOMEONE (HAIG?)
Absolutely

SMITH
He was a very wise man.

JOHNSON
Let me ask a question here, too, on that because it had to do with essentially being the first ATS [transcriber's note: Applications Technology Satellite, late 1960s] experiment up. We know that Suomi went to Washington twice. One to be in the Weather Bureau as Chief Scientist and the other was to go to NSF. Now, he had a special relation with Dave Johnson, and of course this is sort of built and following that, but he also had a special relationship I think with Bob White who was heading everything and so I, can any of your tell me really, I suspect that Bob White was one of the key individuals that simply said we're going with an ATS experiment.

HAIG
I wouldn't doubt it.

SOMEONE
Yeah.

VONDER HAAR
In '60, '65

JOHNSON
There was at NASA Homer Newell, but I mean

SMITH
I remember one story. I don't know if it was true or not but it was related to me about how Suomi got Homer Newell to support a, I guess as someone said earlier, a lot of, they spent a lot of money trying to disprove his ideas. And finally I think Professor Suomi was getting a bit frustrated and so he stood up and he says, he says I just have one question. And he says, are you for me or against me? And, of course, who would dare be against Vern Suomi.

JOHNSON
Well, that was used on more than one occasion going to NASA.

SOMEONE
Yes,

SOMEONE
Yes.

JOHNSON
But there's also the aspect that Bob White, who was a brother of William Allen White, and they were very close to the Kennedy administration. Of course, Kennedy had been shot by this particular time, but there still was this

SOMEONE
Right.

JOHNSON
Impact there and that relationship. Suomi went to Washington when he had to. And I really feel that that was one of the reasons he went

SOMEONE (VONDER HAAR?)
Yeah.

JOHNSON
that particular year.

VONDER HAAR
Yeah, I would agree with that. Bob White was head of ESSA, [transcriber's note: Environmental Science Services Administration, became NOAA in 1970]

Chapter marker 28- 1:20:57

JOHSON
Yeah, right. What later came to be NOAA,

VONDER HAAR
at that time. And he, he was a good friend of Vern's. They were both in the National Academy of Engineering. And they, I can see Bob supporting that project and I think without the NOAA or the Weather support, NASA had many other proposals to fly experiments on what were then their very early geostationary satellite platforms. Some would spin, some tested other engineering stabilization ways. And I think there were competing proposals and I think that connection with Bob White and NOAA probably helped Suomi.

JOHNSON
Well, there was a bridge there between NASA and NOAA and that was part of this original CIMSS, too, or shortly thereafter, you had

SOMEONE (VONDER HAAR ?)
A big job

JOHNSON
You had a joint agreement with NASA and NOAA

SOMEONE
He had

JOHNSON
He had the built into that original

SOMEONE
That bridge between the agencies

VONDER HAAR
Yeah, I can remember some of those proposals and I shared with you all at lunch a time when Vern's also had to have money to test out his ideas. There were several different ideas, there were different types of cameras you could try to put on a geostationary satellite. And one day Vern was, projects were pretty much out of money and he needed some money to have Santa Barbara Research Corporation do some new engineering tests for him. And he went to his business manager who was Dave Cismoski at the time, who said we really don't have any money and there's no money to send out for this. And Vern said, well, where is some money. And he said, well, over here in this project there's money for the graduate students salaries, but that's all committed. And Vern said, well, we're going to have to spend that money. And he did. He took a risk. Got his engineering studies done, got over a big hump, and all good things happened and other monies came in. The graduate students were paid. And we all lived happily ever after. But I think that's an example of risk taking, which you mentioned, faith in his own ideas, which he had.

FOX
And you graduate students lived under higher stress for a short while.
[laughter in background]

VONDER HAAR
We didn't, honestly, we didn't know about it
[laughter all around]

FOX
OK. [laughs]

VONDER HAAR
Until later, years later.

FOX
Well, in addition to grad students, I think Suomi was a big instigator in cooperation among universities across the nation, in fact even internationally. And I'm leading into his early work in the UNIDATA Program with Dick Greenfield and NSF to try to establish some sort of commonality in system where all the universities could get data and research software at nominal fees. I think, Don, you were one of the main people involved in that startup as I recall.

Chapter 29 marker - 1:23:59

JOHNSON,
Well, there was this emerging technology to present satellite data with meteorological analysis with computers and to be able go back and forth and marry the two. And you also had, of course, the development of numerical weather prediction. We had the Global Weather Experiment and these things that all were happening or have happened. And we need to talk about Suomi's role in the Global Weather Experiment and FGGE, too. But we'll move on to the UNIDATA real quick like. This capability was developing. Other schools were developing some capabilities along this line but they didn't have the satellite input, Penn State, Purdue, University of Washington. So Tom can remember this, we had a workshop here sponsored by NSF in 19, 1977, I believe, and everybody came and marveled at this capability.

HAIG (?)
Yeah, right

JOHNSON
So there was a committee of four of five people appointed that reports in. With Verner Baum (sp?) and Francis Bretherton and I was on it and a few other people. And we took a preliminary look at this. Initially the costs for McIDAS would be too expensive to actually put in every university, so the thrust of it was if you're going to have this, you're going to have to collaborate. And of course, that turned out that UCAR [transcriber's note: University Corporation for Atmospheric Research, founded in 1960] became the vehicle for that formation of an activity called UNIDATA so that all the schools could get access to this sort of information. There was another aspect to this, too, that prior to that time the Weather Bureau had been using teletype links and everybody in the schools could go to the local communications head of the various cities and get access to the teletype circuit of information that was provided. They actually went to a new system called AFOS [transcriber's note: Automatic Field Operations and Services, data format used by the National Weather Service Forecast Office to handle meteorological data in real time] and that was going to do away with this. So universities would lose their access. And actually when that announcement was made that's what led to these ways in which we could come up with a means to provide this sort of information which turned out to be UNIDATA. It took about four or five years but it happened.

HAIG
Yeah, the process of getting the information out, we knew we had when McIDAS was going and Eric Smith was actually deriving really good winds from watching clouds move. We just knew that this had to get out to other people. And one of the very first things we did, and you remember this one, Don, we had three of these Ampex [holds hands out in front of him about 12 inches apart, like holding a circle) hard discs, they're about this big around. They had been developed so that video programs of football games could do playbacks. The first ones could contain

Chapter 30 marker - 1:26:58

only one television frame, and not even the retrace, just the first trace. And so they were very limited. But we had finally managed, and they had very limited life. It was very primitive. But we finally had accumulated enough money to get three of these things so that with the computer we could actually get three images in sequence and show the clouds move. We said, man, that's so good we got to do something with this. So we talked to WHA television [transcriber's note: public television station in Madison, Wisconsin] down here at the university and we ran a cable, a co-ax cable down through the old heating tunnels all the way across campus, and boy those are hot in there. That was awful. We got that cable all the way over to Vilas Hall and into their studio and for six months WHA was the only television station in the world that was showing television pictures of the clouds moving and the Earth stood relatively still. JT [transcriber's note: J. T. Young] was still working on making the Earth stand still, so once in a while it moves, but mostly it stood still. And that went on until finally it got to be on national things and WHA didn't want to show it any more because they were showing it on commercial television so, but I think that's a feather in the cap of public television, the local university station.

JOHNSON
May I add to that? We were the only place that happened, WHA

HAIG
Right

JOHNSON
But you see, Frank Sechrist [transcriber's note: associate professor, University of Wisconsin-Madison, Department of Meteorology] then decided he wanted to go the Antarctica and that's what brought the immediate end to that

HAIG
Yeah,

JOHNSON
And we tried to get somebody to replace him

HAIG
Ah, yeah.

JOHNSON
Namely Terry Kelly, but he went out to channel 27. Now what you have happening from that is the development of what Terry Kelly brought to Channel 27 [transcriber's note: ABC affiliate television station, Madison, Wisconsin], nationwide, Accuweather. And Joel Myer who heads Accuweather in Penn State and also then the Weather Channel in Atlanta. All these things grew out of that.

HAIG
Well ..

JOHNSON
Basically if you want to think about it

HAIG
Kelly was a graduate student and we had a program called innovative video applications in meteorology. We were trying to develop the concepts and the software for putting a weathercaster in front of a chroma screen and letting him do a good weather cast. Well, we didn't have the software. We couldn't really do it but we made, we simulated it with a little movie film and we needed to have a weather caster, somebody to stand in front of the camera. So we actually auditioned three or four graduate students and Terry was by far the best, so he got the job

Chapter 31 marker - 1:29:57

And he did a terrific job. That film, we took it down to the American Meteorological Society special session for weather casters that year. And showed it and boy, it was the hit of the house, I'll tell you. It, the weather casters all went crazy over it because that's was the best presentation that anybody had ever seen of a weathercast or weather program. So that's the only time I think SSEC ever actually made a profit on a product. We sold two hundred of those little VCR tapes to weather stations all over the country at twenty dollars a piece and they only cost us about six bucks, each one. So we actually made a profit.

SMITH
Yeah, I think Tom Whittaker deserves a lot of credit, too, for bringing other meteorological data and analyses and

HAIG
Oh, yeah.

SMITH
things that went into McIDAS that really made it the meteorological tool that it's been for the whole world.

SOMEONE
Yeah.

SOMEONE
Yep.

JOHNSON
Well, can I mention something here? Tom Whittaker was a programmer for me doing meteorological things and when this came along, of course, he got naturally attracted to that and did that on the side. And then, of course, sort of transition, Suomi hired him and that was all well and good because

SOMEONE
Yeah.

FOX
And I heard for five years about how we stole Tom Whittaker from Don Johnson.
[laughter all around]
I remember that well

JOHNSON
Well, that was the only thing I had to get at Bob Fox with
[laughter all round]

FOX
I want to follow up on your comment on the Global Weather thing that I don't want to gloss over that. Did you want to go further with that?

JOHNSON
I sure do

FOX
OK. Go.

JOHNSON
Well, you have after the IGY the emergence of what's going to be our next worldwide thing to work on and that turned out to be the Global Weather Experiment. It started really in the Academy. I think Sverre Petterssen had aspects to do with that originally, but then of course they formed a planning activity to go to WMO and the other countries and form this umbrella called the Global Weather Experiment to carry out now this observations of meteorological variables globally by satellites, by ships, by any means whatsoever and then that data was to be assimilated into the global weather prediction models which were coming on board at that particular time. So you had computers coming in and revolutionizing meteorology. You had the satellites coming in providing this dimension to give you global weather information. And then, of course, one of the key things was that to get five geosynchronous satellites around the globe so that you could get a complete coverage. You couldn't see the poles but you could see seventy to eighty

Chapter 32 marker - 1:32:57

percent of it. And the US had two. The Japanese I believe had one, and then also the other country that committed one was the Soviet Union. And Europe had one. So there was a missing link here. And they were going to have this missing geosynchronous satellite over India. And lo and behold, of course, there was a question. There's a spare one that NOAA has up there, can it be moved over? The other scientist said we don't need it. Suomi insisted you do need it. And it got moved over there and without that it would have been a real disappointment. The other people on that committee, of course, that were, I know three of them Charney, Tom Malone and Suomi. And I don't know if it was Pierre Morel, but there's a fourth person that sat in this four person, that played such a key role and overall this umbrella. It possibly could have been somebody from the Soviet Union or Europe. But these people then under the Global Weather Experiment you had what was called FGGE, which was First

SOMEONE
GARP Global

JOHNSON
GARP Global Experiment, There was ALPEX [transcriber's note: ALPine Experiment] which was for the European community. There was MONEX [transcriber's note: MONsoon Experiment] which was for monsoons over India. And I think that was it, but there may have been others. But that was probably the most successful things that we did as meteorological community in that two, in that decade so to speak. That eventually got changed into the emphasis on doing earth system science and there was a big discussion here at Suomi's retirement on that. Suomi and the meteorologists wanted to have a second FGGE going after the water planet and water. And of course the NASA people came out here and says no we got to make this into all earth science disciples and that's what became earth system science under the NASA umbrella primarily, as well as the world wide effort in this area. So Suomi was right up there at the top in all of these and because of his background in not only science but also the instrumentation, he was a dominate, well I wouldn't say he was a dominating figure but he was one of the dominating figures, leading figures

VONDER HAAR
Yes, I remember that, Don. You know when Explore 7 began to get Earth observations, quasi-globally, here and there, but it was enough to begin to get a picture. And then TIROS, and then the Air Force satellite experiments and others and the Nimbus program that someone mentioned earlier did come on and Bill was involved in that, and I was, and a lot of Suomi's people. This whole idea of global observations in addition to the geostationary, Suomi had vision, was to have both the polar orbiting satellites and the six

Chapter 33 marker - 1:35:57

Or five geostationary. And as we talked about earlier, his ability to communicate that to Russian academicians, to old line German meteorologists, to people in developing countries, in Japan and other areas, I mean, he was, he was a great one to bring people together on this so I think

SMITH
I think no doubt he lead the way

VONDER HAAR
You can, yeah, in many way

SMITH
global satellite system

VONDER HAAR
I think so and the whole World Meteorological Organization was ready for that now. And the World Weather Watch continued after 1979, after FGGE. And that World Weather Watch, you know, continues to be augmented up to today so the legacy back from Explorer 7 right here at Wisconsin and with their colleagues really goes, you know, up into this whole global observing systems and then you said earth system science

SOMEONE
[inaudible]

JOHNSON
Well, without the geosynchronous satellite we could never had a global system

SOMEONE
Yeah, that's right.

JOHNSON
To get observations

HAIG
I think that was probably true. The polar orbiting satellite helps a lot but it simply doesn't provide the coverage that the geosynchronous orbit satellite does. Provides more details.

VONDER HAAR
Yeah, he was many years ahead of his time. Today we are talking about constellations of satellites

HAIG
Right

VONDER HAAR
And there are some up there now, as you know, GPS,

HAIG
Right

VONDER HAAR

And others. And indeed they begin to provide that type of coverage if they look at Earth. But he was decades ahead of his time with that concept, with the GEOS.

FOX
Can we back up even well beyond all this? Wasn't he a force in the IGY, International Geophysical Year, planning and getting that started and bringing that data collection into fruition? As I remember stories I used to hear. That of course was in the '50s and I want to say slightly before my time, but you guys probably remember it well.

JOHNSON
I don't think he was the force that led to the origin of it, because there is a PBS show on this actually of how in the coming up with it, of having satellites here in this country relative to the Russians, that they were going to use the IGY so you could put up scientific experiment satellites going all over. We run into this problem, the airspace above each country was considered sacred. When the Russians put up Sputnik then that broke that

SOMEONE
That did.

JOHNSON
That did it. So then we put up our satellites and we weren't running into this problem. So the Eisenhower you know and they say and the military and that particular people were doing it at that particular time have run up to this that you know we put the satellite up now going over the Russia, we have, we're in danger here now because that was considered sacred territory. So but you know that IGY in Antarctica and that

Chapter 34 marker -1:38: 55

was to be a means by which we could all come together as countries.

SOMEONE
Yes.

JOHNSON
Now he got in, eventually in doing the science of it.

VONDER HAAR
I think he was one of the investigators whereas people like Harry Wexler and others, perhaps slightly before Vern, in the United States were more the US leaders for the, for the IGY.

SOMEONE
Right

VONDER HAAR
He was one of the young investigators at that point.

SOMEONE
How old was he?

STEARNS
His contribution was, was with the Vanguard missile.

SOMEONE
Yeah.

JOHNSON
Yeah, but that wasn't part of the IGY plan directly, other than it was to be a satellite system that could give us global information

STEARNS
Yeah

SMITH
But the funding I think with the NSF was based on the IGY. Wasn't it?

STEARNS
Yeah. Yes.

JOHNSON
That's probably true

SOMEONE
Right

STEARNS
But the trouble was

SOMEONE
Right

STEARNS
that they had the wrong company making that satellite or that rocket. Boy, they were sloppy. You know it went ruuppp [makes downward wave motion with his hand]

[laughter in background]

SMITH
Obviously

STEARNS
Right into the ocean

[laughter in background]

JOHNSON
It was, the other problem here. Do you have various countries staking territory

SOMEONE
Yes

SOMEONE
Yes

JOHNSON
of part of the Antarctica

SOMEONE
Right

STEARNS
Oh, yeah

VONDER HAAR
So it was a skillfully designed. The State Department was involved in this scientific experiments.

HAIG
You know, part of this whole globalization business was who's going to store the data that are collected by everybody and how are you going to make them available generally. There were data centers and the World Meteorological Organization had already started some work toward world data centers but Suomi somehow got me appointed as the chair of the data panel for the Geophysics Research Board. And for fifteen years my job [laughs] was to oversee all of the data centers in the United States and coordinate with the World Meteorological Organization for the world data centers and keep trying to fight for money for those data centers. And report back to Suomi when I got into trouble and say hey apply a little pressure because they aren't going to come through with the money for the data center that was for some particular kind of data like the petroleum research and deep earth soundings, this sort of thing. They were all going to be destroyed. So Suomi would get a hold of somebody that he knew in Washington and pretty soon the money came through. So, yeah, that worked out very well. Even five years after I left SSEC I was still chairing that, still feeding back to Suomi and getting the money for that, those data centers. I don't know who's doing it now, but somebody has to because data centers tend to be underfunded.

STEARNS
Well, we've been running a data center

Chapter 35 marker - 1:41:56

for the polar places for now for it's almost, it was twenty nine years just about.

SOMEONE (HAIG?)
Yeah.

STEARNS
And we give it out to anybody that wants it

[Someone laughs]

STEARNS
And we got just about everything you want on the poles. And of course, there is this problem, you can't get complete coverage with these satellites that are running around the Earth. But we come pretty close.

HAIG
Yeah, pretty close

FOX
Larry, I think we sort of skipped over the whole VISSR Atmospheric Sounder in this process, too, if we can diverge at little from some of this global political discussions and go back to a little practical science discussion. Could you lead us there?

SROMOVSKY
Yeah, this is, the VAS program is sort of where I started to learn by doing since I came to Space Science with a Ph.D. in theoretical physics and a complete ignorance of meteorology and atmospheric science. It was quite an education working with Suomi. At any rate, the VAS program, that's kind of a double acronym. It stands for VISSR Atmospheric Sounder. And VISSR stands for Visible and Infrared Spin Scan Radiometer. This was on the SMS GOES series and it provided the geosynchronous imaging of the Earth at half hour intervals. And Suomi was always looking for an opportunity to take something, something that already existed and find a way to do something new and innovative and scientifically useful with it. And the VISSR had, it was basically the framework to provide a new capability. And he proposed in 1969 the idea of making this imager do double duty as also a temperature and moisture sounder. Now this, this is a nice way of introducing this concept into the system because it didn't take an awful lot to make it happen. And it had built on an existing system that was working very well. And it had the advantage, the geosynchronous altitude had the advantage of giving a view of the changing temperature of the structure and moisture of the structure from a vantage point where the Earth stood still, as you heard before, and the atmosphere moved. But it's a little difficult doing this from a high altitude. The

geosynchronous orbiting altitude is about twenty two thousand miles above the Earth and a regular weather satellite or a polar orbiting satellite is about six hundred miles, so everything you're trying to measure looks a lot smaller from that greater distance.

Chapter 36 marker 1:44:57

And there less energy to measure so it's a little more of a challenge. Now VAS was conceived as sort of a combination of an operational and experimental capability. Sort of following along the trail of developing the original spin scan radiometer, that as you add something that's a minor thing but it makes a big impact. The VAS modification was designed to maintain that original operational capability of providing global images every thirty minutes but using multiple infrared detectors and filter wheels sequenced in such a way that you would actually sneak in these extra observations without really interfering with the normal imaging sequences. And then there are special circumstances. You could do what's called dwell sounding where you give up the full imaging of the Earth and focus on a particularly interesting meteorological event. And the work that we originally did at Space Science was to try to flesh out this idea with specific instrument designs, specific choices of filters, what kinds of lenses and detectors would be used, what kind of performance we could expect out of them and show that it would reach, achieve the accuracy that was necessary to really invert these radiance measurements into actual atmospheric temperatures. Following this work of Bill Smith we paid a lot of attention to what he was doing and what requirements he needed to get his polar orbiting work to be successful and we tried to achieve that sort of performance from geosynchronous orbit. And I think it was in, let's see, 1972 NASA was finally convinced to proceed with the development of the VAS instrument. And this lead to the design study by Santa Barbara and there was a working group that was set up with NASA and NOAA and the UW involved. And Suomi and I and others were constantly going to Santa Barbara Research Center and reviewing what it was that, you know, the instrument performance was like and fine tuning the design. And eventually this final design was established in 1974 and that instituted, at that point there was a VAS demonstration program instituted as well. And that's when I kind of lost contact with the program and started focusing more on the other planetary systems. But Space Science continued to work with that. I think that may have been where we started developing the forest of antennas on the top of the building to help with the dissemination of data from the VAS system. And that flew on the, let's see there was an '80, '81, and '83 launch

Chapter 37 marker - 1:47:55

and the UW participated in the evaluation of the VAS system after launch, adjusting, and analyzing, and distributing the VAS data and that phase of the program is something that Bill would be much better at describing than I am. Do you have anything to add about the demonstration program?

SMITH
Well, only that, you know, Suomi was capitalizing on the successes in the polar orbiting sounding program but really understood the real value of atmospheric sounding was for

predicting severe weather, tornadic storms and hurricanes and things like that. And to do that in a timely fashion you had to do it from a geostationary satellite. So he had the vision for the very important weather application, where the polar orbiters were more for global larger scale prediction. His vision was to use this concept for, for severe weather prediction. And in typical Suomi style he came up with a way, as Larry said, of doing it, sneaking it in, so to speak,

SROMOVSKY
Yeah.

SMITH
into an existing system so it was doable and cost effective at the same time. And actually that together with McIDAS which was under rapid development at that time for support of the FGGE program which Don just talked about and the GARP data systems tests which was the forerunner of the, of GARP, led to developments in McIDAS which which made us realize in Washington, where I was at the time, that McIDAS was an essential tool for making use of the VAS data, the geostationary data. Not only to process the data but also to quality control the data and get the data to the forecasters in real time in a form that they could understand it, see it. Not in terms of numbers but in terms of pictures, pictures showing where the severe weather was going to take place. And, and so that's what brought the government group which led to, back to Madison to develop a g round system that was really based on based on, on McIDAS. And of course we were working with the, the atmospheric sounding processing capability for the polar orbiters in Washington, so that was, that was and the rest of it is, is somewhat history. It's been very successful. It led to what I think someone pointed out, the congressional hearing that was held here, that got McIDAS in the National Severe Storms Forecast Center and all, all the improvements in, in geostationary satellite applications that exist today.

VONDER HAAR
Yeah, I can chime in a little bit on that. I was here in '68, '69 and worked on some of the very early studies but that was purely a Suomi

Chapter 38 marker - 1:50:55

concept as far as I can recall. But I don't think it came in really from any of his travels. It was taken off from what Bill was doing with the polar orbiters and Dave Wark. and others . And then, it took awhile, there were many skeptics being, I mean, trying to do it from forty thousand kilometers, or twenty two thousand miles . And again Suomi would talk about the analogy of trying to take a drink out of a fire hydrant and because so much data would be pouring down people would say how are you going to use it. Well, McIDAS was coming along. There were ways being demonstrated to use it. So I left Wisconsin in 1970 and I had my regrets, you know, when you leave to go to, I went to Colorado State University. You can't take everything with you, you'd like to. I bet Bill had that feeling, too. But I had to leave that one alone and Larry and others came on and it became very successful. So one day, here I am in the late seventies. I'm a, I'm visiting the National Severe Storms Center in Kansas City, Missouri and there I see a McIDAS

with geostationary satellite data coming in, severe storm forecasters are glued to that in the early morning hours watching to see if the moisture will change along with the way it had been forecast. And so I was one of the, one of the very rewarding things to see that, that technology, that idea from really, was born here at Wisconsin was being out there being, being used. And I don't know how long you directly, I know some of the UW guys would actually go to Kansas City, put improvements, software and things like that into that.

FOX
Fred Mosher, I think,

VONDER HAAR ?
Yeah, Fred Mosher. That's right

FOX
was in Kansas City

SOMEONE
One of his students

FOX
Fred had a direct pipeline in to us

SOMEONE
Yeah

SOMEONE
Yeah

FOX
A lot of time in more ways than I appreciated, but anyway

[laughter in background]

FOX
It was all for the betterment of the nation I guess.

SMITH
So, he had a similar effort with the hurricane center, the National Hurricane Center.

SOMEONE
That's right.

SMITH
And we had McIDAS down there and yeah, we'd communicate with them daily on, on what they were seeing on McIDAS and from the, from the GOES VAS data in terms of what it meant for hurricane strengthening and trajectory forecasting and so on.

VONDER HAAR
That's right

SMITH
And that relationship is still very strong today

VONDER HAAR
Still going on.

SMITH
Yeah.

VONDER HAAR
In fact the satellites that NOAA flies today still carry the sounder concept, the sounders. And so there you go, concept in '69 and here we are 2009. Another Suomi innovation, you know, with a lot of help from his friends, he'd be the first to admit, lots of others involved. But it's really attributable to Vern.

JOHNSON
I, anyone who wants to come to the Space Science and Engineering Center, immediately walks into the building and there's a great big display

Chapter 39 marker - 1:53:56

above the elevators. And the most beautiful images that are presented on there, as far as I'm concerned, are the family or the mosaic of geosynchronous satellite information on both clouds and water vapor, to see this turbulent atmosphere. You see hurricanes, you see motion in the tropics, you see baroclinic waves, you see polar. It's all there. And they, that's because of things that were developed here in the Space Science Center.

FOX
He had an expression for that. He used to always beat me about the head and shoulders about turning data into information. You know, data was no good until you made information out of it, you know.

HAIG
You know,

FOX
Very true

HAIG
One of the things I personally have been most proud of having had a finger in this, was that we gave it all away. I know there were certain people who said, oh, you should patent McIDAS, you should patent the software. It will return a great deal of money to the university. And Suomi was dead set against that and of course nobody, I was against it, everybody else was, too. We gave it to everybody. I remember when Nixon went over and opened up a little dialogue with China for the first time and then there was a little announcement in the paper that the Chinese had decided to reopen their embassy in Washington. Vern, I had a trip I was going into Washington anyway and Vern says well why don't you stop by the embassy and see if you can make contact. So I said well why don't you write a letter inviting the Chinese to send someone here to learn about satellite meteorology and everything. Oh, great idea. So he wrote up not only one letter, but I guess, a small packet with a whole bunch of information. I had a whole envelope full of stuff and I put it in my briefcase and went down there. I got up in front of that great big huge building which hadn't been occupied for quite a long time. Went up and it was about nine o'clock in the morning I guess and I banged on the door and there was no response for awhile and then I banged some more. And pretty soon somebody came up to the door and hollered at me through the door - What do you want? So I said, I want to talk to you about meteorology and offer you some opportunities. And he said ok, wait a minute. And he went away. Oh, maybe five minutes later here come two guys with guns, you know, and two other guys. The guards stood back and they opened the door about that far [holds hand about ten inches apart] and they said what do you want. [laughs] [laughter in background] So I told them where I was from and that Professor Suomi and all this kind of stuff and the World Meteorological

Chapter 40 marker - 1:56:57

Organization, I used all the big words I could think of to convince them that I was legitimate and handed them this package and everything which was the invitation. And said please we would like to establish good relationships with your meteorologists so that we could learn about how to coordinate with satellite meteorology. Oh, we will get in touch. Close the door. Three months later. We had not had time to coordinate with the State Department before I went down there

[laughter in background]

But in the meantime after I got back I said, I mentioned to Vern that it would be a really good time to go through the university and try to tell the State Department that we'd at least made an initial contact. So we did that. Three months later we got a letter coming down through State Department channels this time, saying that there would be a delegation of Chinese meteorologists and scientists visiting SSEC. And from the time they arrived which was another several weeks, for many years, I don't know we may still have some Chinese representatives at SSEC. But we had meteorologists, programmers,

FOX
Engineers

HAIG
engineers, technicians, everybody there learning about McIDAS, learning about the satellites and the result was the rebirth, the growth of the meteorological system in China and their Chinese meteorological satellite which is now a part of the whole constellation and really, I think, continuing good relationships, as far as I know.

SOMEONE
Oh, yes.

HAIG
And we gave, they came over and learned all about McIDAS and wanted us to build them one. Well, by that time they had progressed in the design to the point where it was now based on a little IBM computer. Getting the permission to ship that to China through the State Department took a long time. [laughs] Finally got permission and shipped that and then it was followed I think by two more units. But that's the basis really for the whole Chinese meteorological system is McIDAS. Their whole data system.

JOHNSON
We just touched on a contentious issue and that is whether you privatize meteorological information or you make it available to the public at large.

HAIG
Yeah.

JOHNSON
And of course in the World Meteorological Organization that has been a contentious issue because in Europe and many countries that have meteorology organizations they have always kept certain classes of information in their own domain and then you, it's not freely available to the rest of the world. And so that has been a problem in the World

Chapter 41 marker - 1:59:56

Meteorological Organization to get over that. I just put two and two together here. I think very likely Suomi's resistance [laughter in background] to privatize it may well have been a factor here.

HAIG
I, it, it changed a lot of the attitudes in the world data centers, too. Access to the data centers became more and more and more open and available globally to any country. Whereas before there had been very severe restrictions when I first became associated with it. And we gradually worked and worked and worked and got those down. A lot of help for the World Meteorological Organization in breaking down these barriers

STEARNS
And New Zealand's one of the worst.

HAIG
There's still some bad ones.

STEARNS
Yeah. And I, I kind of wanted to not give the data, that the data be sent to people who were wanting to be paid for their data.

SOMEONE
Yeah.

STEARNS
But that wasn't going to win anything, was it?

HAIG
No.

STEARNS
No, you give them the data.

HAIG
I know for the First GARP Global Experiment they wanted the data from the Japanese geosynchronous orbit satellite, the Himawari [transcriber's note: Japanese Geostationary Meteorological Satellite (GMS) series, also known as its nickname, Himawari]. And I was sent over there with fifteen thousand dollars from the National Science Foundation to buy one year's worth of tapes of data. We got over there. I found that all of the data, two days after it's collected it becomes the property of the retired scientists at the Japanese Meteorological Society. They own it and they can sell it if they want to. And it took about three days of negotiating with them and with the technicians and everything and we finally got an agreement. My fifteen thousand dollars was just enough to buy the tapes. [laughs] The Japanese scientists, the technicians and the retired scientists, all voluntarily donated their time and their data to give the complete year's worth of data to the GARP Global Experiment, which I thought was a very generous thing for them to do and a great change in the way [laughs] they were set up. But that happened all over the world. That's good.

FOX
Gentlemen, I think we're sort of running towards the end here. What I would like to do is just sort of go around the table and give everybody a couple minutes to reflect on anything they would like say about how Verner Suomi influenced their lives and their careers and their outlook on the world. And then I think

Chapter 42 marker - 2:02:56

we'll wind this thing up. So can we start with you Bill. Take two, three minutes and give us any reflections you might have on the impact that Verner had on your life.

SMITH
Well, obviously Verner Suomi had a great impact on all of our lives sitting around the table and those of many, many people around the world professionally and of course his innovations are responsible for better livelihood of all of us in the world in terms of his contributions to predictions of severe storms and things like that with this, with this space gadgetry. As we said, he was tremendously educational. He was amusing. He had, he had quotes that when, that when he would, he would make a statement they don't go away. They stick with you forever. I gave, I gave an example earlier about, you know, the principle of pressure broadening and what an impact it had on my life of atmospheric remote sensing, understanding that, that principle. He had another one which I want to mention cause I think it was ingenious. It has to do with assimilating satellite radiance data into numerical prediction models. It's a practice that's done today and but before it was, it was even attempted and it had, had to do with the satellite sounding radiances. He says trying to retrieve atmospheric soundings from satellite radiance measurements is like trying to separate the yoke from the white of a scrabbled egg. [laughs] He says, how can it be done? He says simple. You feed the egg back to the chicken [laughs] [laughter in background] And you know it was a one liner, a quote but you never forget it and it and it had, it made a lot of sense. And it was things like that had tremendous impact on all of our, our lives. And I think what I remember most about Vern that sticks in my mind, is when he was dying. And I remember asking him, I said, he had the choice of going on dialysis or essentially terminating his life. And I, I pleaded with him, I said why don't you go on dialysis, you have so much to give yet. And he says, he says Bill, he says, I've lived a wonderful life. He says, I have no regrets. He says, it's time for me to pass on. He says, don't feel sorry for me. He says I'm fortunate, he says. He says, I've got time to talk to all the people I've interacted with over the years and give them my last thoughts and thank them for what they've done and so on. And that's what he did during his last few days

Chapter 43 marker - 2:05:56

Of life And so most of all Verner Suomi taught me not only how to live and professionally, but also how to die.

VONDER HAAR
Well, yeah, in my case again the life lessons that you learned from Vern stay with you for a long time. And the many thousands of people he encountered and we've just talked about all of his international activities and others. He kind of boiled it down one day for me and said, you know there's a big difference between leadership and headship. He said there are a lot of people who are the head of something but they're really not leaders. And the attributes of leadership include creating opportunities for others. And that's something that I've, you know, really tried to practice and I, and I always remember Vern, when I, when I, when I run into that situation and you're looking at a situation like that. The other thing he told me, oh, in the mid '70s, when I became a candidate for the department head or department chairman out in our university, our atmospheric science program. I remember driving with Vern in the rain. He had a seminar in Blacksburg, Virginia and we were driving through the rain one night to get to this seminar and

something going on. And finally out of the blue he just said, well Vonder Haar now that you're stupid enough to be considering that, that position, I want to tell you what you really have to do. I said, what's that. He said well, they're only going to remember one thing, that the good faculty that you find and hire and help mentor. And I think that was characteristic of Vern because he created so many opportunities for others, including those of us around the table. And he'd reach out, he'd reach out into the Air Force, he'd reach out internationally, and but he was always creating opportunities. And I've tried to do a lot of that, too.

FOX
Chuck?

STEARNS
Well, I left Suomi's area about two years after, well, in about 1959. And I just went on my own way and wasn't influenced by him anymore. So I didn't have that influence, but on the other hand I have set up a program of automatic weather stations in Antarctica. I've equipped the last continent for weather stations at the surface. Nobody will ever do it again. There are no more continents that are open. That was the last one. My data's going out there, every one of them. I have worked with I think five or six nations on this and a whole lot of people and I have a whole organization going that's

Chapter 44 marker - 2:08:56

working on automatic weather stations data in Antarctica. And we also are collecting the data from the satellites and giving it to people. We don't charge them for anything. And we have a vast supply of data at home in our office, on the it's on the seventh, eighth floor is it? I don't know which floor it is, ninth floor. At any rate I have a question for Tom, though. I was, this was my weather station [has small decal]. But, I would like to know, Tom, how. No that's yours

VONDER HAAR
I'll look at it here.

STEARNS
Ok. I'd like to know how you processed the data from the

VONDER HAAR
Suomi's

STEARNS
Suomi's____[inaudible] number seven, yeah.

VONDER HAAR
Well, let's see, we processed it how? Every thirty seconds satellite's moving seven kilometers per second. The satellite saw a view about the size of the state of Texas, plus

outside this [holds hands apart about two feet, then expands that] so we'd probably just get a couple of observations as we passed over Antarctica

STEARNS
Yeah, [laughs]

VONDER HAAR
in those days, yeah. And Chuck's got a network here with, looks like about twenty stations scattered [looking at decal]

STEARNS
Oh, there's about sixty of them

VONDER HAAR
Oh, sixty of them.

STEARNS
They're not all on there

VONDER HAAR
Those were, those were the early, early views. Very smooth, very exciting, but lacking in the detail that, that eventually we made.

STEARNS
Yeah. How did you calibrate them?

VONDER HAAR
Well, we used the direct sun as a constant source. We used the sun.

STEARNS
Ok. And that gave you everything.

VONDER HAAR
Not everything

STEARNS
Just about. Just about.

VONDER HAAR
Well, it gave us some

STEARNS
I knew that when it went into orbit we had no idea what it was going to measure.

VONDER HAAR
There was an awful lot of after, afterwards

STEARNS
Yeah.

VONDER HAAR
processing by a lot of people.

FOX
Thank you, Chuck. I appreciate it. Let's move down to Larry. Larry?

SROMOVSKY
Well, Suomi for me was like a tipping point. I could have gone one way and had a different life and because of him I had a completely different life from what I might have had. He set me on an exploration of the universe, of the solar system at least, that I had no idea I'd ever even begin. So I certainly was profoundly affected by getting involved with him. When I first interviewed for a job with him, I. read the kinds of research papers that were being produced and I realized I had no experience in this area at all and I thought I could contribute nothing to it. And I told him that and he said don't be so narrow minded [laughter in background] and that's a good point

Chapter 45 marker - 2:11:56

To remember with him. Don't be narrow minded. [laughter in background] He was bold. He was memorable. He had a way of making you remember a point. He did. He had dramatic actions that he took or dramatic statements that he made and they somehow seared into your memory so you'd never forget them. I wish I could remember them all. [laughs] He was obsessed. He thought about all of the things he needed to do or wanted to do all the time. He kept waking up in the middle of the night. He always told me he couldn't sleep because of this idea or that idea. He was really obsessed and constantly, constantly thinking and planning and generating ideas, many of them not very good ideas but a few were beautiful, wonderful ideas. In football parlance he never took a play off. He was always at it. And I guess one of the inspiring things about him is he, he always would take a risk to try to do something unusual. So swallow your bravery pills and try something new, I guess, is the message he gave to me.

FOX
Thank you, Larry. Don?

JOHNSON
I became a colleague of Suomi's through being a faculty member in the department although I came here out of the Air Force to go to graduate school. But my major professor was Lyle Horn, and during that time I did work on some of Suomi's innovations but at a different purpose. And this is a radiometer, called net flux [hold instrument] put on a balloon and it measured the upward and downward radiation, infrared radiation at nighttime. And so you know, this happened and he was aware of it. There was a fellow by the name here of Pete Kuhn who was a scientist from the Weather Bureau who worked with him closely on that. And I got involved with Pete and indirectly with

Suomi. My real link to Suomi happened after or during while I was chairman of the department for three years and during that period, apart from his taking Tom Whittaker from me, but no, I'm, that was with his blessing, and this was beautiful. [laughs] He asked me afterwards, well you know, how about coming and being an associate director with, because we did have a good relationship, Tom here [indicated Tom Haig] in getting McIDAS, meteorological satellite information on the WHA 21. And I said, yeah, that's interesting, you know. You don't tell me what to do and I won't tell you what to do. And that's where we started and that was a very successful relationship until he actually passed on because I, too, visited Suomi at those last days when he refused to actually have dialysis and he asked me to do several things. But we had a common heritage in some sense, a value system in being

Chapter 46 marker - 2;14:56

Both Lutherans and we didn't dwell on that, but there was a value system that we really appreciated. He served on the Lutheran campus ministry. I served on it. And as he retired and I retired we would go to lunch once or twice a week. But as he was on that last days he asked me to say a prayer with him, a childhood prayer with him. And that decides the contacting of the people he wanted to talk to. That was my last live association with him which I valued dearly. He just lived life as passing on was another day in the normal lifetime of an individual. He just had that beautiful view of everybody and relationships. Only wrote one paper with him jointly, but it had to do with Neptune, why the winds are so strong and we only get one nine hundredth of the energy but that's because I had interests in the way circulation's created and why he had come and said you know, is there any means by which we can explain why that happens and we had a great relationship.

FOX
Thank you, Don . Tom?

HAIG
Well, there are two things that I would like to say about my overall feelings about Vern. First of all, when I joined I was going to be the executive director and the executive director's job is to manage an organization smoothly, evenly, calmly and keep it funded well and all that sort of thing. Well, that wasn't Suomi's idea at all. So I was frequently rather frustrated, like I would get a phone call and say Suomi's on the fourth floor doing it again. Now, the fourth floor was where all the technicians were busy building McIDAS systems and doing other kinds of things where a systematic approach is really essential to get something out the door. Well, and I would have something all set up and something moving smoothly and it was funded and everything was going fine. Suomi would get in there, he'd get bored with whatever was going on up in his office, get down on the fourth floor and he would immediately start giving directions to every technician in the place. Totally different, don't do this, do this, do this, do that, creating total confusion and chaos. Well, this upset me greatly at first. Two, three times. And then I saw the results of it afterwards, was that there were new ideas coming out of the technicians that they would not have had if he hadn't been in there stirring them up. And I began to realize,

my god, this is management by chaos, only it's a different kind of management than anything I'd ever seen before. Well, it didn't always work,

Chapter 47 marker - 2:17:56

Sometimes the chaos just persisted and you had to go in and straighten it all out again. But sometimes you got really good things out of it. So, I learned to live with it. And the other thing about Vern was, that he, his influence on the programs like the global experimental programs, GARP, and global, all these things, had an influence which was so pervasive and lasted for such a long time that his, that the shape of the world meteorological system whether it was a free exchange of data all over the world on a good, equitable basis and to the benefit of everyone in the world, he contributed a great deal to that. And that I remember about him, too.

FOX
Thank you, Tom. I like Larry's expression of a tipping point to describe my own situation cause I don't know where I would have gone or what I would have done upon retiring from the Air Force if I hadn't of come here and had twenty good years, but it's the first day I remember the most, that struck me the most about Suomi. I shared a little of this at the luncheon with some of you people. The first day after we had the morning staff meeting and stuff, or what I thought was a staff meeting, which in my opinion was an extremely poor staff meeting, I asked him, I said how do I get oriented, where do I go to look at the three year plan or the five year plan? Where do I find the organizational structure charts? And he stopped and he sort of looked at me and he says, Bob, he says, one thing you got to understand. He says, we don't have any of those things here. Your job is to go where I want to go, when I want to go there with all the resources that I need. That's your job. And so I staggered in the office and tried to put this in some, [laughs] some sort of context thinking, my god, what have I got myself into [laughter in background] you know. And as I'm setting there, this head pokes in the door and it was Vern and he looks at me and he says, I forgot. He says, another thing we never do around here is criticize anybody. [laughter in background] He says, you can praise them lavishly or you can praise them a little. But he says, even when they screw up we praise them. He says, you get far more by praise that you ever will by criticism. And of course he's talking to a twenty four year old, or twenty four year military veteran who may have once or twice criticized somebody in his career [laughter in background]. And so I set there and had a little moment of truth while I tried to decide what this second career was about to be like. But it was twenty good years and I don't regret a day of it. I would like to take this opportunity then to thank each and every member of the panel here

Chapter 48 marker - 2:29:56

I would like to reiterate that this has been an oral history recording of Remembering Verner Edward Suomi, the Father of Satellite Meteorology, made on November second, 2009. Thank you, Larry, I got it right this time, at the Monona Terrace Center. I would also like to thank our camera and recording crews and everybody else who participated,

and specifically Jean Phillips for organizing this entire affair. And as far as I'm concerned that's my cut. You can all say whatever you want now.

HAIG
Thank you, Bob.

Several voices
Thank you, Bob

SOMEONE
Thanks.

Transcribed by:

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