Dr. Martin Pomerantz
10 May 2000

Brian Shoemaker
Interviewer

(Begin Tape 1 - Side A)

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BS: *This is an oral interview with Dr. Martin Pomerantz taken as part of the Polar Oral History Project conducted by the American Polar Society and the Byrd Polar Archival Program of the Ohio State University on a grant provided by the National Science Foundation. The interview was conducted at Dr. Pomerantz's home in San Rafael, California, by Brian Shoemaker on the 10th of May 2000.*

Dr. Pomerantz, you've had one of the longest careers in polar research. I think it's important that we know where you come from - your background, what led you to science, and in particular to your specific research which took you to the Polar Regions.

MP: Well, I was born in Brooklyn, New York, and when I graduated from high school, my interest was in journalism. I went to Syracuse University because it seemed to have the only journalism course available for undergraduates at the time. And in the process, I took a course in physics, which was a non-mathematical course that today would be called "physics for poets." I found I enjoyed it and was good at it. I had been told over the years never to take a physics course. But, under these circumstances, as an elective, it seemed worth a try. And to make a long story short, I got so fascinated with physics, that I switched over and had to go to a number of summer schools in order to take mathematics courses which were, of course, essential for someone going into physics. And that's the basis for it. Had I not been a physicist, I obviously would not have gotten to the Antarctic.

As a graduate student at the University of Pennsylvania, I took a course that was given by the then Assistant Director of the Bartol Research Foundation of the Franklin Institute, and that course was called Cosmic Rays and Nuclear Physics. This was a one year course of three hours a week and it included everything that was known about nuclear physics and cosmic rays. That's kind of remarkable to recall. During the term, the instructor invited me to come and see Bartol and observe what was going on there and gee, it looked very exciting. Primarily, the work was in cosmic ray studies and the development of Geiger counters, which became very famous afterwards, but which were an essential part of the cosmic ray work that was then in progress at Bartol

BS: *What's a cosmic ray?*

MP: A cosmic ray is a very, very energetic particle. A cosmic ray. . . primary cosmic rays - those that are coming into the Earth's outer atmosphere from space - come primarily from outside of our solar system and are the only bits of matter, essentially, because they comprise mostly hydrogen nuclei, the core of a hydrogen atom. The next most abundant is helium and so forth. And these are very energetic particles that have sufficient energy to propagate through their progeny down to sea level. Eight or ten of these go through your body every second. The main project that was then in progress involved balloon flights, but then I became interested in some other aspects of cosmic ray studies that were being done with apparatus that was carried aboard ships and so forth to determine how the intensity of cosmic rays varies with geomagnetic latitude, with location on the Earth essentially.

Because cosmic rays are charged particles, they are deflected by the Earth's magnetic field and this is one of the reasons the Polar Regions are of great interest because specifically at the geomagnetic pole that is in Antarctica - one pole - and another one up in northern Canada, the rays are not impeded at all by the magnetic field.

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So the lower energy cosmic rays, relatively speaking, and by lower energy I mean in the billion volt range, have access to those Polar Regions. That's the connection that ultimately led to my interest in going to the Polar Regions.

BS: *So they're basically stronger in the Polar Regions. Is that correct?*

MP: The intensity is higher. There are more of them because the energy threshold that's admitted to a particular point gets lower as you go toward the Pole and at the Pole it's zero except for the atmosphere that's above the point of observation. That limits the energy. But yes, for example, when the sun, as it has on many occasions, has a tremendous thermonuclear explosion called a solar flare, it produces cosmic rays - particles of cosmic ray energy - but they're indistinguishable from those coming from elsewhere in the galaxy, except that they preponderantly have lower energies, and that's another reason you want to be in the polar regions because that's where you can observe these particles even on the ground, whereas at mid-latitudes, you cannot because of the intervening atmosphere and the geomagnetic field.

BS: *So they get filtered out here in the San Francisco area.*

MP: Yes, the Earth's magnetic field acts like a giant filter, exactly right. The most energetic particles are able to reach the equator and as you go north or south of the equator, lower energy particles are admitted. So that's basically the answer to how I got into the Antarctic and the Arctic, in fact.

BS: *So here you are in college, studying all this stuff right now. What did this lead to from college? You're at Bartol when you get interested in this? I mean, you're still a student, correct?*

MP: What happened was . . . I'm a student still. I was offered a fellowship at Bartol - a research assistantship which actually turned out to be more attractive than the fellowship at the University of Pennsylvania and I could continue there as a student and earn my keep, so to speak, at Bartol. So that was in 1938, when I started my career at Bartol, and actually that was my only job. I stayed at Bartol for the remainder of my scientific career, going through the ranks and ultimately winding up as Director and President.

BS: *You got your doctorate at Bartol?*

MP: Yes, I did my research at Bartol - the research for the doctorate and that was a cosmic ray research program that I had conducted which, again, went to high latitudes. It was absolutely essential to do this experiment. Maybe I should tell you a little about that experiment.

That particular experiment was a balloon flight - a series of balloon flights. My first venture into at least the sub-Arctic. Churchill, on the shore of Hudson Bay, is a place where the geomagnetic latitude is very high. It's, in order words, close to the geomagnetic pole, and at that time, it was believed that the sun has a general magnetic field of about 50 gauss. This is maybe 50 times that of the Earth's magnetic field at its surface. Just as the Earth's magnetic field keeps cosmic rays away from the Earth, if the sun had a magnetic field that strong, it would prevent cosmic rays below a certain energy level from reaching the Earth, even, because it's magnetic field extends way out into space.

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And we thought we would see if this really were happening. If it were, then sending a balloon to the top of the atmosphere, essentially, at Swarthmore - our home base - that I'll call a low magnetic latitude, would be the same as at Churchill because, if the sun's filtering any particles from coming, they wouldn't reach Churchill either. It turned out that particles of lower energies were reaching Churchill, so we were able to show for the first time that the sun's magnetic field was not nearly as intense as had been believed. It was closer to one gauss or, more or less the range of the Earth's magnetic field at its surface and that's common knowledge nowadays.

BS: *This is proof that it was coming from deeper space.*

MP: Yeah, these are not particles produced by the sun, of course, but in this effect, it's just the sun's magnetic field enveloping the Earth, too. This is a permanent magnetic field. I'm not talking about solar wind or interplanetary magnetic fields. Just the field equivalent to that of a bar magnet, as it were, at the sun's center which has the same effect as a bar magnet in the center of the Earth in the model that simplifies the description.

BS: *So, this was your thesis research for your doctorate?*

MP: Yes, it was.

BS: *Quite significant research, then.*

MP: Well . . .

BS: *Something that you can look back on that's historically significant.*

MP: At the time, it was a very exciting result. As in most cases, later work . . . you soon forget about it because it becomes just common knowledge. As the techniques improve for observing the sun, it became clear that the magnetic field couldn't be that big.

BS: *Got you a few brownie points for a while.*

MP: Yeah. So that was, I guess, a very important step in going farther North or South. The next step came with the IGY, as with most people my age.

BS: *When were these balloon flights? I think we should put a date on that.*

MP: These balloon flights were actually in the 1940s and the Churchill trips were '48 and '49. So, I continued sending up balloons. In fact, I launched thousands of balloons around the Earth at different places including India, and so forth, that are not relevant to the polar story, but that was my primary interest. Until the IGY, which was in 57-58.

BS: *It was July 1st, 1957 to December 31st, 1958.*

MP: Right. That was the event that really got me into the Polar Regions. And the way that happened is also strange, as most of these chance occurrences are. Earlier in the '50s, I became very friendly with some scientists in other countries, particularly Canada and Sweden. And there had been some shipboard experiments which were designed to measure cosmic ray intensity along the routes of these ships - some of them going from the northern hemisphere to the southern hemisphere. In order to observe, again, the effects of the geomagnetic field - the Earth's magnetic field - on the cosmic ray intensity as a function of geomagnetic latitude. And the Swedish colleagues said, "Well, we have some ships in Sweden that go from Göttenberg to Cape Town and back," and at this point, just as in the case of the intrinsic solar magnetic field, there were great arguments about the details of how the Earth's magnetic field was affecting cosmic rays in detail.

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The original model was that it was just like a simple dipole planted off-axis a little bit and not pointing to the geographic poles - a little bit off. And that seemed to be the model that applied all over. Well, we started to have some doubts about this and the way to investigate it is to have these shipboard or airborne instruments doing surveys and then checking the results against the model and the ultimate result was, from our shipboard and some subsequent airplane experiments, that we now understand in great detail, exactly how to calculate what the effect of the geomagnetic field is on cosmic ray energies.

But that's what started it and my Canadian colleague had built a shipboard apparatus. I had never thought I would be interested in doing experiments of that type on long-term ground based experiments. But, I decided it might be fun to build what was then the best new, most sensitive detector of cosmic rays called the neutron monitor. A neutron monitor is like a nuclear reactor in reverse. And essentially what happens is that particles go into it, cosmic ray particles - the secondaries of the primaries that are coming in at the top - and they disrupt nuclei and neutrons are formed, more than one, and with the right kind of a detector called the neutron counter, you count these particles, essentially. And the good part about this instrument is, it was sensitive to lower energy cosmic rays that are the ones that are most sensitive to the Earth's magnetic field. So, this was a natural device with which to investigate an important problem at that time of the details of the geomagnetic field effects on incoming primary particles. So I built this monitor at Bartol.

BS: *This is the first monitor ever?*

MP: No. This was the first one that we built. The monitors had been developed by John Simpson at the University of Chicago, who I call the inventor of this particular technique of a pile, as it's called, of carbon material which might be wax - a hydrogenous material, that's the moderator - and the producer which is lead mixed in the thing. So there had been devices of this sort and they had been used on some ship journeys by my colleague in Canada with Simpson. Well, the Swedish ship seemed to be an interesting approach because it was going on a much better route for this purpose than had ever been traversed before. And so we built this and we went to Göttinberg and put it on the ship and it was all very exciting and that program went for quite a few years and again, got definitive results on this question of the location of the geomagnetic equator.

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We also were invited by the Navy Hydrographic Office to put equipment in Project Magnet, which was the magnetic survey aircraft. This was an incredible opportunity because this covers the Earth in a few years making magnetic measurements all over the Earth for the Navy's purposes, but also for more general use, in fact, and they gave the definitive measurements of the geomagnetic field all over the Earth in fairly close- spaced grids - maybe lines a few hundred miles apart or so.

BS: *You participated in Project Magnet.*

MP: And so, for many years we had detectors aboard the Project Magnet and I went on a number of cruises with that aircraft and that, also, was a rewarding program because it gave us a resolution, as it were, of detail, that you couldn't get any other way, even though people have been flying aircraft with cosmic ray detectors for years.

BS: *Did you work with James Van Allen?*

MP: No, I did not work with James Van Allen. We were colleagues going along in some cases parallel paths a lot of the time. He was flying balloons also, and our paths crossed scientifically, but we did not actually work together. So that's the background with these neutron monitors and how I got into that game.

BS: *You need to define something that you mentioned - geomagnetic equator.*

MP: OK. The geomagnetic equator, at any given longitude meridian, is the point at which the cosmic ray intensity would be lowest because that's where the geomagnetic field is greatest - the horizontal component geomagnetic field is greatest. That's the geomagnetic equator and the geomagnetic pole is the place - the two places - where the intensity is highest.

BS: *That's where the comic ray radiation intensity is the highest.*

MP The cosmic ray radiation intensity.

BS: *So the geomagnetic* . . .

MP: That's the effect on cosmic rays, but the geomagnetic equator is also defined in a mathematical model of the geomagnetic field - that's where the geomagnetic field is the strongest, is greatest - where the horizontal component of the field is greatest.

BS: *Is it on the geographic equator or . . .?*

MP: No. It's like eleven degrees off of the equator. The simple dipole theory that to a first approximation worked for many years - we believed in it, although it can be radically wrong at particular places - had an eccentric dipole, that is, it would displace some hundreds of kilometers from the Earth's center. And the North Pole comes up in Canada. In fact, Thule is at the geomagnetic latitude 88 degrees. So it points up to, Boothia Bay, Canada but in the Antarctic, it's Dumont d'Urville, which is some distance from the geographic pole. The geomagnetic equator is calculated from a mathematical model of the Earth's field being produced by a more complicated magnet than a bar magnet.

BS: *I understand. So the geomagnetic pole, today, is near Dumont d'Urville. Correct?*

MP: Yes. It's near Dumont d'Urville. And that's why the station was built there.

BS: *Um-hum.*

MP: And the northern one's in an inaccessible place in Canada - Boothia Bay, I think it's called.

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BS: *Boothia Peninsula. Yeah. So that's different from the magnetic pole*.

MP: It's different from the compass-pointing pole - the magnetic pole.

BS: *The magnetic pole.*

MP: The geomagnetic pole is strictly derived from a model where you take all of the measurements you can of the Earth's magnetic field (i.e. Project Magnet), intensity and direction, and then do a mathematical model to see what could produce this.

BS: *Does this pole drift like the magnetic pole does?*

MP: It does drift. It does drift, indeed.

BS: *At the same rate? Are they related?*

MP: It would be similar. It drifts similarly, and the new detail is that you have to go into higher orders (i.e. finer tuning). By that, I mean a dipole alone doesn't work. You have to have, in technical terms, you know, quadra-poles and higher order terms. But when you are using the measurements of cosmic rays at given points, you need to know very accurately where the rays are coming from and you calculate that using the geomagnetic field model.

BS: *Rather than the geographic field model?*

MP: What you do is shoot particles from the Earth theoretically, and then watch where they go in the actual geomagnetic field that's calculated from these detailed measurements. They come from a quite different direction than your instrument is pointing. So, obviously you need to know that. So, that's what led to all this interest in ships and airplanes to pin down that model of the geomagnetic field so we understood how it affects the direction of incoming particles and their energies. OK?

BS: *Dr. Ramsey at Harvard . . .. Norman?*

MP: Yeah.

BS: *Was he involved in this?*

MP: No, he was not in cosmic rays. He was an expert on magnetism, but not the geomagnetic field.

BS: *I understand. I cruised with him to Antarctica on a cruise ship. We had a wonderful time together.*

MP: Yes. Oh he's an outstanding physicist. He did tremendous work. But, we never crossed in the Polar Regions.

BS: *Well, he knew you.*

MP: Yeah. So there's the background. The background is that all of these things used this neutron monitor detector, OK?

BS: *Yes.*

MP: Then the IGY came along. The IGY Committee was charged with formulating a whole program obviously of geophysics, and cosmic rays was an important part of this program - it was one of the disciplines, along with upper atmosphere physics and all of the other geophysical phenomena.

BS: *It sounds like the cosmic ray people were more intent on the poles than just about anyone. It's the key to your research.*

MP: They were very interested in the Polar Regions, and incidentally, just as an aside, there was also a space experiment and it turned out that the first satellite was supposed to go up under the IGY auspices. It eventually went up as Explorer VII because Van Allen had a head start when he collaborated with Von Braun to have his Geiger counter taken up and some of those apparatus.

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But, the irony is that Van Allen and we, and two other groups had the first four experiments of what was supposed to be the first satellite which would have seen the radiation belt if Van hadn't already seen it. And in fact, the radiation belt had great effects on the experiments including ours. But, we were able to get a lot of data out of it. But that was the only satellite I've ever participated in.

BS: *So, you got a load on the first satellite?*

MP: It was called Explorer VII when it finally got up in 1958.

BS: *I see.*

MP: But, that was completely different. That stemmed from the balloon experiments. That was an experiment that was an extension using a detector that we had successfully used in balloons for studying heavy particles.

BS: *And that's what Van Allen put up on that?*

MP: He had just a straight Geiger counter. But, hitting the radiation belt hindered all of our efforts. It was too late to do anything about it, but there were a lot of places we could get data and that turned out to be fun. But it killed some. . . like Herb Friedman had an experiment in ultra-violet. It just knocked that to pieces. But, that was one aspect of our IGY program.

The other one involved the Polar Regions and now, for the first time, we're really getting to the Polar Regions. I received a phone call from John Simpson whom I've mentioned as the father of the neutron monitor, and he had a number of neutron monitor stations around the world - maybe four or five. And other countries had agreed to put some in. There weren't any in the Polar Regions. And he knew of my experiment on the ship and called and asked - he was on the Cosmic Ray Committee of the IGY - and asked if I'd be interested in putting a neutron monitor at Thule, which is, as we've noted, close to the geomagnetic north pole and I said, "Sure. I mean we can easily make another detector like the one we have on the ship and put it up there." So that's how the polar program started. We built the monitor, made appropriate arrangements through the Air Force which had complete control of Thule at that time, and installed the monitor on a hill in the vicinity of Thule and that ran for the entire IGY, ran very satisfactorily.

BS: *Did you go up there?*

MP: I went up there to put it in, and then I'd visit it annually. Initially, it was operated by the Army Signal Corps while we weren't there, that is the tape changing and all that sort of thing. They had a group there on one of the mountains. Later, it became a SAC Base, but Thule is well known as a place where, of course the nuclear stuff was located and a lot of activity was going on and the Signal Corps was busy. But, they were able to take on operating this neutron monitor for us and mailing us the tapes.

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BS: *The Signal Corps operated it.*

MP: Yeah.

BS: *I understand.*

MP: The Signal Corps operated it after we showed them what to do. And they'd send us the tapes and we'd analyze them. OK? And that went very well and I did go up there. It went remarkably well . . . after a very funny start. I should digress because this is kind of funny, but it's part of the polar region operation. Initially, this pile, as it was called, and the electronics associated with it, was going in the building that the Signal Corps operated on a mountain - whether it's called P-2 or so, I don't remember exactly. And my colleague who went up with me and I put this thing together and it's quite a job because it involved many tons of lead pigs and boxes full of - metal boxes full of paraffin, in those days. We later used polyethylene, but you had to lug these and pile them in a certain way and clamp it all together and it was a couple of days work to put it together.

BS: *What's a lead pig?*

MP: Just blocks of lead. They're a rectangular cross-section and you would build up a structure that had the hydrogenous material inside, which was wax in cans, and then a whole layer of maybe 10 centimeters or more - of lead all around it and then more paraffin and that's how it went. But it was a physical job to get all this stuff together and we turned it on and it worked fine. And then suddenly blurrrrrrr, everything went crazy. Then it stopped. And it continued to work again. And we were puzzled. We talked to the people there. They had picked out the site. Someone had gone up before us and picked the site so we didn't even question it. But, someone who presumably knew what was going on had visited the station and the Signal Corps had agreed to put it in this building, which was very nice. It turns out that there was an anti-aircraft radar on a mountain across the way that was scanning and of course every time the beam hit the instruments, it went crazy. So, we tried using all of our physics knowledge. We got a bunch of bedsprings and grounded them, and so forth. But, we couldn't keep that signal out, it was so strong. Very powerful signal controlling the anti-aircraft guns.

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Of course, it was all futile and it was obvious that we had to get below the peak of the hill, out of range of the anti-aircraft. Well, it turned out we found the site and they got some kind of a very large military trailer that we put the equipment into and that worked fine. It meant the guys had to walk a quarter or half a mile to check the apparatus and they ran power out there and all that sort of stuff. And that ran real well for many years.

BS: *Did you move the trailer about?*

MP: No. We knew there was a spot just over the hill that just actually overlooked the big BMEWS (Ballistic Missile Early Warning System) antenna that wasn't any problem at all. And it stayed there and it was there for many years. There's still a station running at Thule, but we moved in subsequent years, right onto the base.

BS: *The Cosmic Ray Station.*

MP: Cosmic Ray Station.

BS: *Still there today.*

MP: It's still there today being run by some of my associates. So, it started in 1958 and it's still running, albeit not on that same hill. Anyway, that ran well and now we're really coming to the core of how we got into Antarctica.

BS: *Well, we're interested in the Arctic too. You said "we." Who were the people that were involved with you in setting this up?*

MP: Setting it up, I was essentially alone except for technicians. I had some technicians who worked with me. But at first, I was essentially alone. I had graduate students also along the way. But other than the graduate students, I was pretty much doing this alone.

BS: *It wasn't a collaborative effort.*

MP: No. The shipboard work was collaboration with the Canadians and a Swedish group.

BS: *I understand. This was paid for by the US IGY Committee or . . .?*

MP: Yes. The construction and the initial operation was paid by the IGY Committee which continued until the National Science Foundation was founded at which time the National Science Foundation took it over and the Air Force cooperated.

BS: *OK. So, you were part of the plan - this station up there was part of the plan for the International Geophysical Year.*

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MP: Yes. It was part of the IGY plan and as far as I know, there was no cosmic ray detector in operation in Antarctica. Maybe that seemed logistically too impossible at the time as compared with Thule where you could go with an airplane from McGuire Air Force Base that was convenient to us. Anyway . . .

BS: *Well, Van Allen, to interject something here - it's a question - did rocket launches during IGY for cosmic ray studies. Correct?*

MP: Yes. He did [rockoons?]. Yes.

BS: *And he went from the Arctic to the Antarctic? Or was it just in the Antarctic?*

MP: Well, he did it on ships.

BS: *Yes.*

MP: And he may have gone south, but I don't think he hit the Antarctic. I don't think so.

BS: Yeah. He did. He was on the *Glacier*. He didn't go ashore.

MP: I'm not too familiar with that and John Simpson also had a detector on some ships, and his might have gone pretty far south. But, I mean, there were none on the ground station.

BS: *I understand - a permanent station. Year-round?*

MP: No year-round station.

BS: *Correct. OK. I understand. So this was the Arctic Cosmic Ray IGY effort in total.*

MP: Yes. That is correct.

BS: But at the same time, you had Churchill going.

MP: Well, Churchill was already finished. I had really closed that off. Almost closed the balloon flight program down because I was getting into this ground based stuff.

BS: *I see. So Churchill was defunct by then.*

MP: Churchill was gone. The last international flights . . . well, the last balloon flights at all were just before the IGY and I sort of came to a point where I decided I liked what was going on with these neutron monitors. I was going to switch fields and do that full time. I was flying balloons until about '55, '54 or something like that, including in India and so forth.

BS: *Significant results of this first effort up in Thule during IGY.*

MP: OK. The IGY started off with, I guess . . . well, just before the IGY. It was '56. There was the greatest solar cosmic ray event in history. Still stands. And it was a fantastic one. But, we weren't up there yet.

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In terms of significant results during the IGY, we did a number of studies. You know, it's so long ago that I can't even remember. There was nothing that I can put my fingers on specifically during the IGY period other than to get data which went to the World Data Center and which were used in connection with data from other countries. So, it started off almost as a public service to provide the data, because the IGY's interest was getting data which would be shared with other countries around the world.

BS: *Same with the Weather Service.*

MP: Yeah. It was just like that.

BS: *So it was really solar weather. Or cosmic weather, I guess it . . .*

MP: That's right.

BS: *OK. I understand. Now you said '56 was the greatest cosmic event?*

MP: Yeah. But we didn't have. We weren't on the air in Thule yet.

BS: *Nobody expected it?*

MP: Nobody expected it. And I wish we had been a year earlier, but we didn't get there until '57 sometime with the detector, so . . .

BS: *What caused it?*

MP: Well, it was just the biggest flare that's been observed since people have been . . .

BS: *Looking at flares.*

MP: Observing these things, you know, consistently, continuously. But, there have been very many since and Thule has contributed very, very greatly to our understanding of the processes. We later spent full time and I did have associates - post-docs and so forth over the years. And Thule was very important because of being the lowest energy available anywhere at any site in the world. So, the data were very much in demand and we did many papers that analyzed the processes whereby the particles are accelerated - the sun and so forth that utilized the Thule data extensively in connection with data from other locations. Because that was the idea, to have a network of stations looking in different directions because of the way the Earth's magnetic field controlled the cosmic rays.

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BS: *OK. You headed for the Antarctic.*

MP: OK.

BS: *This got you pointed south, or thinking south.*

MP: OK. The next step was the end of the IGY and the decision to continue Antarctic research under the National Science Foundation. So, the Office of Polar Programs was established, which as you know, had just a handful of people whom I remember well. And Tom Jones who had been a friend, a chemistry professor at Haverford College which was near Swarthmore - I didn't know him before he got into NSF, but he was the first director. And in 1959, they were officially in business and I don't know exactly how decisions were made at that time about what science to do, but I received a phone call and I remember distinctly it was in the spring of '59 and I'll tell you why I remember it so distinctly.

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(Begin Tape 1 - Side B)

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MP: There was George Toney. And I never heard what subsequently happened to George Toney. I lost track of him. I guess he was doing the equivalent of logistics management and he said, "We'd like to have a cosmic ray station at McMurdo. There's no science at McMurdo yet, although there's going to be a lot of biology and other stuff involving field work." But there wasn't anything on the station on a year round basis. And somehow or other, they got the idea they wanted a cosmic ray station there, which made sense.

BS: *When was this? '59?*

MP: '59. And he said, there was a Polar Committee of the IGY that oversaw both the Arctic and the Antarctic. They had visited Thule and they liked what they saw. They liked the set-up. They thought we did a good job. He said, "But there are three universities that want this we need to know if you're interested." So I said, "Sure, it makes an awful lot of sense to have a complimentary station to Thule. Fantastic! Looking in opposite directions to the field and so forth. It's a fantastic opportunity. Sure we'd love to do it." "OK," he said. "We'll put you on the list."

Well, sometime in May. It was then the Executive Vice President of the Franklin Institute, came out to my office at Swarthmore and informed me that I had been selected to be Director of Bartol. There was only one Director before me and he was 75.They had been searching for years and they had every famous physicist you want to think of going through a search thing, but somehow he stuck on. But, they now decided (the Board of the Franklin Institute) Dr. W.F.G. Swann must have a successor, and they chose me. And while he was telling me this, I got a phone call from NSF and it was George Toney telling me that, "You're it!" And I mean it made this guy just . . . boy . . . because they had just made me Director and here, now, I had got this big deal of a grant from NSF to put a cosmic ray detector in the Antarctic. So that's the start.

Of course, we then start to build the equipment and he asked what we needed and I defined a building. And he said, "OK." You know, I went down for visits and so forth. Then they produced some blueprints of a building. I forget what you call that kind of a building, but it's a modular . . .

BS: *Terry building?*

MP: That might be it.

BS: *The orange . . . ?*

MP: Yeah. The orange . . . the buildings that were then common. And it was to be built at Curtis Bay. It's a Coast Guard Yard in Maryland near Baltimore. And I defined the building and I included having copper shielding inside the whole building. It would be like a Faraday cage. It would be completely shielded. Of course, I remembered the Thule experience, and I figured if we shield this thing and ground it as well as you can ground anything at McMurdo, that will reduce the effect of outside stuff because I knew there'd be a lot of radio stuff going and whatever.

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The building got built and they erected it at Curtis Bay that was an easy drive, of course. It was very convenient. I went down to see the building and everything was great. So, it was going to be shipped down the winter of '59 - I mean the summer of '59 - which it was. It went on the ship. And I needed a winter over person, and I had known a guy that worked at Bartol and actually had been to the Antarctic doing traverses during IGY named Hugo Newberg. Run across that name?

BS: *Um-hum.*

MP: Hugo had been a physics student - student of Serge Korff, who was at Bartol when I first came there as a student back in the late '30s, whom I knew very well, of course. And I felt very fortunate to have somebody like that who could do the first winter over with this neutron monitor. Incidentally he had been on the Finn Ronne group.

BS: *With John Behrendt.*

MP: And Hugo was a very good guy, but the gear came down late in the season so I couldn't go down to do anything with it. He had to set it up after the station closed. And, you know, I'd talk to him. I'd send messages back and forth. And he was busy tiling the floor and stuff and it was just dragging along and not getting the thing up. Finally, sometime in the spring, it got going.

BS: *Spring of '60?*

MP: Of '60.

BS: *Like November*.

MP: Well, pretty late. It was, maybe it was the winter there. Maybe it was June or July.

BS: *Yeah.*

MP: It took a long time. It was very frustrating, but finally it started to operate and we started to receive data. The way we did it in those days, both at Thule and all the other places - we punched paper tape and we had it arranged so that the paper tapes should just go to the teletype and be transmitted to us - the punched paper tape with the data. So, that's what was done and we started getting data sometime from June or July. What's interesting about those days is we had these two stations, but we didn't have one at Swarthmore yet. But, we had one at Thule and one at McMurdo and I think we had about five ladies who were doing the. . . you know, reading the tapes and doing the arithmetic and doing everything manually for those two stations. Compare that with today. It's hard to believe. So, we had quite a big group doing the data reduction. And we started getting some very interesting looking stuff. Well, of course, I was anxious to get down and '60 - austral summer of '60 was the first opportunity. And I think I've mentioned before about how Helen Gerasimou fixed up the whole itinerary on a commercial airline because that was the only way of sending people down there at that point.

(100)

And I guess I picked up gear at Skyline Drive. Then you had to carry the gear home and then carry it down on the airline.

BS: *You got your cold weather clothes at Skyline Drive?*

MP: Yes.

BS: *They didn't issue them in Christchurch or anything?*

MP: No. They had big trucks full of stuff. The American Geographical Society had the contract to operate the supply procurement and distribution and so forth and they were in Washington. In fact, I had to bring the stuff back to them in Washington and give it to them. There was nothing in New Zealand.

BS: *Explain . . . what were you doing up at Skyline Drive?*

MP: Skyline Drive was an orientation meeting where they sort of told you what to expect and they, over the years, developed it into an annual orientation meeting.

BS: *All the new people or old people too?*

MP: I think they stopped them recently. They were a combination. They were basically for new people, but old people would talk and I must have been there ten or twelve times over the years giving lectures in subsequent years, as long as that was operating, before they started doing it at a hotel in Washington. And I liked that because that way I met a lot of people I might not have bumped into otherwise. And those were very good meetings. There were rustic cabins and they would put in one cabin the people who were going to a particular station, so they'd get to know each other beforehand. But, that was how you got the clothing in those early days, and I forgot when the New Zealand set-up started. I don't think it was too many years after that.

BS: *But, for a while you had to lug them back and forth.*

MP: Certainly the first year you did. But, you also could stop off any place you wanted on the way, and I had an itinerary that's incredible. I stopped in Tahiti and Hawaii and this, that and the other thing. You had all this luggage with you. Wore you out.

BS: *Cold weather gear in Tahiti.*

MP: Cold weather gear in Tahiti, but it all worked out. It was a great trip and a great experience. En route down, of course, there were many stops. This was pre-jet, so the piston aircraft would stop all over heck-and-gone for fuel. And at one of the stops, there was a telegram for me and it was reporting a solar flare event at Thule and it was the first one we had observed and it was a pretty good one. I think November 1960, was the date of that event, and here was this great flare event and, of course, I couldn't wait to get to McMurdo and see what we observed down there. And . . . well, after a very adventurous trip.

Let me just describe how the travel was in those days. In the first place, the weather was supplied by a ship or two that were stationed . . . they had a name. I've forgotten what that is - halfway down, or something. And everybody who was going down in that year was staying at some rooming house in Christchurch. We arrived on a Sunday. There wasn't any restaurant open, so nobody could get anything to eat. And we were at this boarding house for at least a week for weather. And finally we got airborne and got to McMurdo.

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BS: *And that was your first trip?*

MP: That was the first trip.

BS: *This was October . . . November . . . ?*

MP: November '60. And I get to the station . . . the station, the building was located in town right . . . there was a little puddle of a lake right near where the geology building is now. It was very close to town because a lot of those buildings weren't there. And there was actually a little pond overlooking Observation Hill. And I asked Hugo for the data and what happened is, the instrument was going faster than usual because solar cosmic rays were arriving and he thought something was wrong. He had shut it off to test with a radium source and stuff to make sure that it was working all right. But, we got a good part of the result. He got back on and finally realized there must be something natural happening. In those days, we didn't train people the way we subsequently did because we thought he knew all about cosmic rays. But anyway, we did get data when the thing was halfway on the rise, or something. And that was the first time that one observed a solar cosmic ray event at both ends of the Earth. And that there were anisotropies I mean . . . the subsequent story is just wonderful. A lot of things happened because we had that station.

BS: *What do you mean by that?*

MP: Well, with those stations plus with others, we subsequently did put a station at Swarthmore and the South Pole and I'll describe in a minute how that started, but we had a network of stations and by that time there was a pretty well developed worldwide network with different countries exchanging data. And so we could do things like study the way the solar wind was interacting with cosmic rays, how it changed with time, and we eventually had data with three solar cycles and we were able to study phenomena that the reversal of the sun's field takes two solar - takes 22 years. The solar sun spot cycle is 10 years. But, the flipping of the magnetic field of the sun is every 22 years. In ten years, it flips, and then it's back in another 10 years. So it goes from the north to south and back again.

BS: *So that's where you get your 11-year cycle?*

MP: Yeah. And the sun spots numbers change and all. But, the direction of the field of the sun takes 22 years to get back to the original, so we were able to investigate 22 year cycles and the diurnal variation and a whole lot of things about the interplanetary medium that get very technical. We put out hundreds of papers. I mean, I can't remember how many, but many hundreds of papers based on the polar observations, with other stations and satellites, in some cases, being involved.

OK, well here we are comfortably operating this station at McMurdo, and as I said, the first science winter over was the Cosmic Ray Station in McMurdo and then one or two years later there started to be noises that the Navy wanted to put a nuclear power plant at McMurdo.

(200)

And there were all sorts of tests at various locations and it turned out to be that the only place in Antarctica that you could put this station, this power plant, was about 100 yards from the Cosmic Ray Station. Now, the Cosmic Ray Station is based on neutron detectors. They're very, very sensitive neutron detectors. Neutrons are particles that you really can't contain. They just go through anything. They slow down in water, but it's slow neutrons that our detectors count. And there were all sorts of conferences with the people that were responsible for the reactor and they assured us, no there won't be any problem. Everybody wears badges! So, I said, "This is going to cream us. I mean, there won't be any cosmic ray observation at McMurdo because this thing will just go crazy." And a blue ribbon panel was formed with a number of good outside people who knew what was happening and, of course, the panel said, "This won't work. Of course, you can't have a cosmic ray station there." And they were determined to have Nukie Poo where it was planned to be, and so the only solution we could come up with again was to go to the other side of the mountain. I mean, that's how you get away from stuff. And Ob Hill is a pretty good absorber. I mean, they don't get absorbed, but they can't get through that much mass.

So, we were given a new site on the other side of the mountain where it still is, half-way to Scott Base. And we were able to run the two stations simultaneously for a period for overlaps, before the nuclear reactor started of course, so we could get a baseline and see that everything was OK. And NSF kind of enjoyed this, because these were the days the Navy was doing all of those logistics, paying for it - it didn't come out of the NSF budget. And I knew right from the beginning . . . I made, in fact, a trip to South Pole to see what it looked like there because that was another obvious place to have a station because of it's altitude - it's pressure altitude is so high and that's a tremendous thing. I mean, that plus the latitude and so, I mean that would be the best place in the world to observe on the ground, solar produced cosmic rays and it still is. So, I went down in '60 to the Pole and I tell you that trip was interesting. I'll continue on the station at McMurdo for continuity.

In the first place the station was going to be three miles away from the Base and you can't have an observer just walking back and forth with any kind of weather coming and so forth and so on. So this station had to be self-contained. So, the new building had living quarters. It had a shower. It had a head - I mean not a flush head, chemical. And the laboratory was enlarged to put in some other kind of detectors that we didn't do very much with eventually, but which looked like we needed at that time.

(250)

And the idea was we would then move the old building near Nukie Poo to South Pole, and get a free building. And that happened in '64, when South Pole was put on the follow-over the IGY which was the International Years of the Quiet Sun - IQSY of which I happened to be the US Chairman.

BS: *What was that again? IXIE?*

MP: International Years of the Quiet Sun. . . . International Quiet Sun.

BS: *ICCSY?*

MP: IQSY.

BS: *IQSY - International?*

MP: Years of the Quiet Sun. And that was two years starting in '64. That was organized by the International Geophysics Committee that was started after the IGY. And the IQSY was a much bigger program than IGY was. You know, IGY originally had like 12 nations and the IQSY had now over 50. And here, they went in for extensive networks and things and South Pole was an obvious place to be included as a cosmic ray detector station. And we were all ready to go since we also had the detector. So, it was a matter of moving it. And that was done in '64 and I went down for that.

BS: *So you got set up at South Pole in 1964.*

MP: Yes.

BS: *That was when you began business there. But you visited, somewhere around 1960.*

MP: We visited during that first trip in 1960. And that was a notable trip in contrast with subsequent years. I went down with a biologist from Stanford whose name, unfortunately, escapes me. But, he was a very good biologist. And he had what I thought was a marvelous experiment - so simple to understand. He was investigating circadian rhythm and the theory was that it might be due to the Earth's rotation. So, he had something like a phonograph turntable that he would put his specimens in and they would move in opposite direction to the Earth's rotation, just counter out the rotation. So, it would go around contrary to the Earth's rotation once a day, and he had all kinds of insects, crickets, and beetles and mice. He was a great guy, but the experiment didn't give any result. But, that was a nice man. We became very friendly. And you know, nobody really told you what to expect there even with all the orientation and so forth. And here I come green. I've never been to this kind of altitude really. And the station was all buried by that time. And the cosmic ray station had been erected and was on a berm outside of the rabbit warren complex.

(300)

And I was given a bed in a room that must have had 20 or 30 sailors - beds, you could hardly walk between. And it was the typical kind of a thing with a heater where you had to put the beer in just the right place so it would not freeze. It would freeze on the floor and it was terribly hot up above. Anyway, I didn't sleep for the whole week. I was there a week. And I had the big eye. And there were all these snoring guys and I mean it was something. The reason I was there for a week . . . I was supposed to be there a couple of days, but in those days, the plane would come in and nobody said anything about it. And you're supposed to be ready for the plane and get on it. So, the plane came and I had my gear. No announcements. No public announcement (PA) system or anything. And I had a lot of film and a good camera that *National Geographic* had given me because I was taking pictures for them of this first trip. And the plane was there and I started to take pictures, and soon the plane's taxiing away. And here I am - I mean, nobody could have cared less. Nobody knew who was even going on the flight. You just got on.

Then it turned out with the weather, I was there for a full week. And then I read every book I could put my hands on in the library. It was a good opportunity for that to read about polar explorers. But, the system was a lot different than it is now.

BS: *Tell me what the "big eye" is.*

MP: The "big eye" is your inability to sleep. That was the term that they used, the "big eye."

BS: *What was it caused by?*

MP: Well, you know, headaches and stuff. Just altitude sickness.

BS: *They had the "big eye" at McMurdo though.*

MP: Well, they used the term for sleeplessness. So wherever that is, it happens. It's jet lag or something, but at Pole, the call it the "big eye."

BS: *Interesting, because at McMurdo, you know, the big Building 155, most of the buildings have windows in every outside room and everybody closes them. They sealed it off. There wasn't even a ray of light coming in because they had "the big eye."*

MP: Well, I never really heard that term after that first trip, but I mean, I had all the symptoms of the worst kind and the only thing that got better in subsequent years . . . most things get worse, but I never got sick again and I can go there now - in 1994, I was down - and I mean I was fine immediately and I mean all the young kids were sick for a couple of days. So that one thing improved. But the first time was awful. OK, so the second trip was '64 and, of course, I knew the ropes better. So I wasn't going to let that happen. But, that leads to another story of getting the cosmic ray equipment working.

(350)

There again, the building had been put up at a place that someone had determined was OK before I ever got there. And it looked like a fine location, and we got that one running and we had trouble there with interference. Not the same as at Thule, but on some occasions it would just black out. That turned out to be an ionosonde antenna that was very close. But, we had the foresight to do all this shielding inside the building. I mean it was like being inside a copper cage. And we hadn't hooked it all together. It was there in case we needed it. Well, we suddenly needed it. So, OK, let's wire it all together to the outside. We had strips . . . the inside was all OK, but we had strips coming out places you could connect to and I wanted to get all the girders that the building was sitting on all hooked together with thick wire. And that took drilling holes in the beams and then screwing big bolts with the wire from one to the next. So, we did that. It was going fine and then at one point, I went inside as we did periodically to get warmed up. We had a bed in there and had a water bucket and stuff in this building. And I was drilling this hole and the drill stopped. So I did what I always did at home - twist it. Well, I had gloves on, of course. But it was a geared down drill and the glove got carried around and my finger is still this way, but the finger was pointing, I mean, like that.

BS: *Wow.*

MP: So, I had my first experience with the Navy doctor. They had a great doctor. The only problem is he had done his residency in obstetrics at the Philadelphia Naval Hospital!

BS: *Typical!*

MP: So, he did a lot of radio chatting back and forth.

BS: *He was the winter over OIC?*

MP: He was the winter over . . .

BS: *OIC. What was his name?*

MP: I'm sorry, I can't remember his name. He was a very good guy, but I can't remember his name.

BS: Y*ou had a guy wintering over that first year . . . at South Pole. Who was that? Who was your first winter over at South Pole? You left an observer there.*

(400)

MP: Our first one was Newberg.

BS: *At South Pole?*

MP: Oh, I'm sorry. No, no, no, no, no. Bill Trabucco, I think. I think it was Bill Trabucco. I could be wrong.

BS: *But he was one of the winter-overs, huh?*

MP: I have a list somewhere, but I really think it was he.

BS: *Probably would be important historically, you know, who all these guys.*

MP: I have a thing we call the "honor roll" that had all of our . . . in fact, we used to send observers up to Thule after a while when the military got out and even when the Air Force took over that station, we would supply - they would hire, but we would supply a cosmic ray observer at Thule. So, we had like 60 or 70 people over the years that wintered over either at Thule or McMurdo or Pole. And a lot of those people have gone on to become famous scientists.

BS: *In fact, since they wintered over, you know, that's part of what we're interested in, the history.*

MP: Anyway, he did the best he could and improvised a splint that had a metal clothes hanger or something in it and had it all plastered up and of course I was medically evacuated. I was a med-evac. And went back on the commercial plane. And of course, there was a lot of consternation when people would ask me, "What happened? Where did it happen?" And I told them, "The South Pole," and they thought I was crazy. But, it was all set up for our orthopedist who was a friend of ours back home. He had gotten a guy specializing in hands and they set it. So that was my first and my only disaster.

BS: *Did the station work OK after all this?*

MP: When we got that thing together, we did finish the job and it worked fine. And it worked subsequently.

BS: *So a piece of your thumb is at South Pole.*

MP: Well, a lot of blood. But anyway, what obviously happened is it got a little wet inside and then froze immediately and froze the glove to the drill and it was a geared down drill so it just kept going after you shut it off. I always remember this vet that used to give talks at the orientation. Do you know whom I'm talking about?

BS: *Dr. Holsrichter? Harry Holsrichter?*

MP: About frostbite?

BS: *Holsrichter? A Captain? Doctor? Navy?*

MP: "Use your head and save your ass."

BS: *That's Holsrichter.*

MP: I always remember that, but I didn't hear that until after this accident! But I tell you, every time I've gone down since, that made an impression on me and I did no foolish things later. It was very effective.

(450)

Anyway, so that was that. You know, the med evac and everything was very smooth even then. So, I did mention about how uncomfortable South Pole was - this rabbit warren. It had one incredible thing - it had a flush toilet. It was the only flush toilet at that time in the Antarctic. In stark contrast to McMurdo that at that time didn't have any flush toilets. In fact, McMurdo, that first trip . . . there were just two latrines - enlisted and officers and you know, you'd be sitting there with the Admiral next to you in the latrine. At McMurdo, there really weren't many facilities for civilians because it was really 100% Navy and at the Officer's Club where the bar is, there were those couple of Jamesway buildings that were used. That's where we stayed as visitors. And the galley was the last building down on the road toward Hut Point. And it was a genuine Navy galley with officers and chiefs and enlisted. And it was nice to be a civilian. You could go anyplace.

BS: *How was the food?*

MP: The food was very good. The food has always been good.

BS: *South Pole too?*

MP: Yeah. South Pole was extremely good. Even from the beginning. So, McMurdo was, as I say, was really run like a Navy Base. And the first time that I remembered sort of civilian contracts and stuff was building the new Pole station in the '70s. The subsequent history of the stations - I already mentioned the new building at McMurdo and for the IQSY, there was a new standard of neutron detectors that was much bigger and much more sensitive, with higher counting rates.

(500)

And we put that in this new building at McMurdo as part of the deal. But the old, smaller one could go to Pole because Pole was so high that you get a high counting rate with a smaller unit, so everything worked out very well with Nukie Poo. We had all these benefits without having any trouble from the emissions from the reactors.

BS: *OK. So you're set up. You've got Swarthmore, Thule and McMurdo and South Pole. Four stations.*

MP: Yes.

BS: *Are those still being run today?*

MP: Those are still being run. They are all being run today.

BS: *Through Bartol?*

MP: Yes. Bartol. My successor at Bartol is operating all those stations and, in fact, they're adding some more stations because these techniques are getting more and more sensitive. Essentially, cosmic rays are an essential part of the space weather observing system. And some years ago, Thule was hard-wired into Cheyenne Mountain, Colorado, to the center there and in that day, they were continuously going in from Thule because . . . as part of the space weather system that the Air Force runs, I guess. And the stations are still being used for basic research to try to understand about predicting solar events that will have repercussions on the Earth.

BS: *OK. That was 1964. How often did you go back?*

MP: I was down, in total, 26 different summers for various reasons. We started with the ground-based stations and that was the first few visits.

(550)

Then two things: I had been in the balloon flight business and I mentioned that that had slowed down. But, it turned out with some new detectors that detected electrons and x-rays and so forth, that was stimulated by a group in Germany at a Max Planck Institute, I thought it would be interesting to do some of these observations at Thule because we were going to Thule. We were well established there in the late '60s. Everybody knew us. I could do anything I wanted, essentially, up there.

BS: *So you're talking about balloon flights now.*

MP: I'm talking about balloon flights and I wanted to do these balloon flights and by this time, I had been going to Thule regularly, almost once a year.

BS: *How many trips there?*

MP: Dozens.

BS: *Um-hum.*

MP: And it was logistically a good place to operate because they had me the equivalent rank of a Lieutenant General or something and I could get things done at Thule. Well, I told some of the Air Force people who wanted to deal with us and there started to be objections to balloon flights at Thule because the Cold War was going on and they were afraid of stuff getting to Russia because Russia would make a fuss about balloons coming over. So . . .

(End of Tape 1 - Side B)

(Begin Tape 2 - Side A)

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BS: *This is Tape 2 of Dr. Martin Pomerantz's oral interview of 10 May 2000. Dr. Pomerantz, you'd just begun to talk about the balloon flights being resumed at Thule, and which year was this?*

MP: This would have been 1967, and I had been trying to get permission to fly balloons and, as I said, each time I would ask, there would be some question about problems with the Russians. So, we developed a sort of triply redundant system that would guarantee to cut the thing down before it could get anywhere near Russia and we also had all sorts of assurances that there would not be any problem. And finally, the word came from Air Force Cambridge Research Laboratory, "It's a go. Go ahead." So we transported all the gear to Thule, all of the balloon flying gear. I believe that they were going to supply helium from their Met balloon flight program at Thule. But, there was a considerable amount of equipment shipping the balloons and the ground base equipment and the airborne units. When we reached Thule, as we got off the plane, our local sponsor met us with a signal that said, "Under absolutely no circumstances, fly balloons from Thule." It turned out that there had been a file several feet high that developed about the subject over the years. I mean we annually visited Thule anyway, so maybe it wasn't too bad and we had good friends there, but we just couldn't fly balloons. All we could do was not unpack them.

So I said, "By gosh, we're going to fly these balloons. And what's the obvious place to do it? I know it's going to be hard for all the obvious reasons, but let's see if we can fly them in the Antarctic." So we put in a proposal and did all the things that you need to do and got approved to fly in Antarctica. This might even have been '66 because we actually went down to Antarctica in '68, as I recall.

At Thule, also, we were going to fly non-extensible balloons. Let me explain that. Over the years in the earlier days, I flew neoprene balloons which are like weather balloons, in tandem, where you'd fill a whole bunch of balloons and string them together and fly as heavy a payload as you need and have accordingly the number of balloons that you need. Here we were starting with these plastic balloons where one single unit, still the teardrop shape, and then the gas expands and ultimately fills the whole balloon and you essentially stay at a constant altitude. So, these balloons were large balloons for the purpose. They were 300,000 cubic feet. Some of the larger ones these days are in the many millions of cubic feet. But, it was a pretty big size balloon to handle and I was collaborating with George Baird who was my post-doc who had gone up to Thule with me on this ill-fated trip and he stayed on and went to Antarctica this first year. So, we were planning to have the flights in January when the weather is presumably best.

BS: *January of '68?*

MP: Yes. And we went down and, of course, conditions were much different than they were earlier. Things had been improving about logistics right along, but the usual problem was that no matter how well you planned and how early you got the gear there, it didn't arrive when it was expected. So, we reached McMurdo and had to wait for the . . . I guess a lot of the stuff was on the ship including helium because we were going to use a lot of helium. More than was around. And we had some time to spend, so we decided to go out and look for a launching site because, as I said, these were pretty large balloons.

BS: *This is at McMurdo now?*

MP: This is at McMurdo. And they can't be inflated in a shelter as we had done with the earlier version. So we had to be somewhere outside where you could launch a big 300,000 cubic foot balloon - inflate it and launch it successfully. And we borrowed a hand held anemometer from the Navy weather people and we started riding around the McMurdo area making observations - local observations, because it's kind of micrometeorology you're dealing with - looking for a good place to launch balloons where there was low wind velocity. And to find out what time of day was the best, if any. Of course, the day-night cycle wasn't the same as it is up North, but there still is one. And we finally found this place that seemed ideal. After looking closer to the Station, we found a site that wasn't far from the road to Willy Field on the Ice.

(50)

And we checked this point at various times of day and it was consistently good. I was embarrassed to look at the map later and find this was called Windless Bight. And it sure deserved the name and it had to do with the way that the slope of the hills is and this kind of katabatic winds or whatever, it cancels out. And it turned out to be a marvelous site. It wasn't far from Cosmic Ray Building that was a good thing because that's where our receivers would be. So, we started the program and every flight was successful. The first one lasted almost 24 hours. Of course, we were counting on the fact that the sun was always out although it changes altitude at McMurdo, that balloons might stay up a long time. And that was our aim, was to get long-term observations at high altitude. And by high altitude, I mean 6 or 8 millimeters. For the program we were performing, that was sufficient. And that's pretty high.

BS: *Six or eight millimeters of pressure altitude, which would be how high, feet-wise?*

MP: It's about 130,000 feet, 135,000 feet.

BS: *How many launches did you make that first year?*

MP: The first year we did, I think, about eight launches, but, we immediately recognized that the flight was being cut off before the instrument had descended. And we always had a crude direction-finding antenna and Ob Hill was in the way again. So, we decided to have a satellite station on the other side of Ob Hill near where the original Cosmic Ray had been and we made up a duplicate antenna and ran telephone lines from there to Cosmic Ray and then we had flights lasting up to five or six days. We'd switch from one antenna to the other as required and we discovered that this was a fantastic place to do ballooning for long duration flights and now this is a very commonplace activity. In fact, I just got a notice about a picture of a solar flare that some colleagues of mine have gotten with longer duration flights that are floating around in the polar vortex and they keep going for days and days. But we kind of serendipitously ran into the fact that this is a superior place to have long-duration balloon flights. So that was another facet.

And we went down the next year and repeated the flights. Serendipitously, what came out of that was not what we had originally intended the program to do. And that is there was a prediction that certain x-rays of a range that we could detect with this balloon flight might be emanating from a source that, it turns out, was in the sky over McMurdo about 8 or 10 hours a day - a stellar source - the name of which I can't remember. Because there had been some ground-based observations of what's called extensive air showers and it looked like this might be an active source of x-rays and we were able to show that there really, in fact, weren't any x-rays. Part of the reason for expecting x-rays was if there were gravitational radiation coming to the Earth, they would be accompanied by x-rays.

(100)

Gravitational radiation is still being sought. It's a big field of activity, trying to observe gravitational waves and some experiments were in progress and they claimed the detection of gravitational waves from this source. But, we were able to show, at least, that if there were gravitational waves, which we now know there weren't, there weren't any of these x-rays that were predicted to accompany the gravitational waves. So, that was a serendipitous result. The other is that now everybody is doing flying there, which is great.

BS: *Tophat?*

MP: Yeah.

BS: *Are you involved with the Tophat experiment?*

MP: No. I'm not involved with any of that.

BS: *Has it gone up? Did it go up this last season or did they put it off again?*

MP: I'm not sure. I'm not sure. I really haven't stayed on top of that. Those are the only flights we made, and in '68-'69, my colleague, George Baird, had returned to Ireland - he was a native of North Ireland - and he later became Dean at the University of Ireland, or something. And that was the end of our balloon flight activities. It was kind of a one shot experiment, because the German Institute was giving us all of these gondolas with great x-ray detectors. It looked like a wonderful opportunity to study certain aspects of solar x-rays.

BS: *This the Max Planck?*

MP: Max Planck Institute. So, that was another facet. But, all this time the neutron monitors are going on and so it's like two summers were spent doing that. Other summers were occupied with putting in a new platform at South Pole, for example. That was a jackable platform to hold the detectors, which would get buried in snow. And three or four platforms were added subsequently over the years as each 16-foot high one was buried. And I don't know what they're doing right now. They're probably just building on top of the old ones. So that was a lot of the trips.

The real extensive program had its origin in that 1968 trip when I went to Pole. My first visit to Pole, even though I had the "big eye" and wasn't very comfortable, it was pretty clear that when the weather was good at Pole, it was fantastic. I mean on the days that the weather was clear, for a little while during this one week I had, when I landed, it was fine, and when we worked on the building it was fine. But, it looked like an outstanding place to do astronomy because here you are in a high altitude. There's nothing but snow whichever way you look, so you have a constant background. You don't have a lake here and forest there and all that sort of stuff. And it's on the Earth's axis. So, any object in the sky is always at the same altitude and it's always there, day after day. And I was particularly interested in solar physics because I mentioned solar cosmic rays and we've been tied closely to solar physics, and it would be a great place to study several questions about the sun where the interruption of observations from day to day prevent you from doing things, like observing certain structure forming and changing. At a mid-latitude overnight, the whole thing changes so much that you can't carry on. So, sometime in the mid-'60s, in collaboration with an astronomer who I had hired at Bartol to do astronomy, we talked about doing astronomy at the South Pole.

(150)

BS: *Who was the astronomer?*

MP: He was Arnie Wyller. He came as a professor and had been a solar astronomer in Sweden and together, with his strength in astronomy and mine in the physics and the Antarctic, and with collaboration of a University of Pennsylvania astronomer named Brad Wood, whom I'll say some more about later, we started talking about things that could be done there and there were a number of obvious things to do. We put in a proposal and I guess over subsequent years we put in seven to eight proposals that were all declined. There was more than the proposal. There was a study of a sub-committee of the Committee on Polar Research of the Academy and Arnie Wyller wrote a chapter in a big report of the Academy citing the possible advantages of doing astronomy at South Pole and recommending that certain kinds of measurements be made - base measurements to check this out. Well, various proposals got turned down.

One of the strong points had to do with a field that none of us were active in, but we knew that soon that there'd be some people active in the field that would be interested, and that's infra-red astronomy. Because of the extremely dry atmosphere, that seemed to be a wonderful place to do infrared astronomy. But, there were political implications or something and we were really panned especially by the infrared community. For one thing, the Mauna Kea Observatory was going up and a lot of astronomy was banking on that. People wrote in books such things as, "Why would anybody be stupid enough to go to Antarctica when you could be in Hawaii and then go to the beach in the afternoon?"

BS: *That was with your dollars, though? You were stretching their dollars.*

MP: This is exactly it. And even though . . .

BS: *That was a question.*

MP: And even though NSF was willing to fund this thing and it would have been extra money for astronomy, the astronomy division was afraid that that would show up as total money going to astronomy and cut them out. It's all dollars, exactly as you said. So, this went on for years, that is, we'd just turn these things in and they'd get turned down. We had the endorsement of a number of very leading astronomers of those days in various fields like double stars and so forth that thought it would be a good idea, but as I said, it just had no status with the astronomy division.

BS: *Of NSF?*

MP: At NSF. That's changed significantly.

(200)

Well, years went by. In fact, in '68, we took down a couple of telescopes - small telescopes - to permit the winter-over people to make some observations. Just check observations to see what the visibility might be like.

BS: *This was your cosmic ray operator.*

MP: This was our cosmic ray observer. And we simply borrowed a Questar and another telescope that some friend loaned to us that we could leave there for the year. And we went down during the summer when we were not flying the balloons and made some observations of the sun and it looked pretty good. There's a certain kind of measurement you make that I can't get into, that made it look like the resolution would be quite good for the sun. And then he made observations all winter, visual, just a few times a day. And it showed that the place wasn't outstanding, but it was as good as, for example, the measurements he was making were comparable to Palomar. So, it wasn't that bad. But, it had the advantage, as I said, of infrared transparency, or microwave transparency that you don't have at Palomar. And the non-day night cycles.

Finally, in '78 - again with this friend, now. Arnie Wyller had gone back to Sweden and become Director of the Solar Observatory of the Swedish Royal Academy. And they were moving to another location from Capri to the Canary Islands and they had a number of old telescopes available and he said we could use some of these parts . . . solar telescopes they had used. So, we decided to build a special kind of solar telescope designed for the South Pole that would take advantage of the fact that the sun just goes round and around at some angle - 22 degrees or thereabouts. And decided to bootleg it on the cosmic ray experiment and see what would happen. So I went down with . . .

BS: *You had no funding for this, in other words.*

MP: No funding. I was going down anyway with cosmic rays. And we didn't make it any official thing because that would ring bells with astronomy and so forth.

BS: *Did you tell them you were taking this stuff?*

MP: I told my program manager who at that time was Ben Fogel it won't come to me. One thing that happened was that program managers had changed and the guy who had been there earlier who was somebody I had put in that job, essentially, because they asked me about him and he had been with the Air Force and that was right here. He died, subsequently.

(250)

But he was afraid of the astronomy opposition and never would push the thing with the Polar Division. But, a new director came in who was much more far seeing, and he thought it was a good idea and it was ok with him, as long as we didn't make a whole logistics deal, which we didn't. We just were going to ship a few more crates down. And we needed a small portable building which was no problem finding there. So, we went down in January and set this thing up.

BS: *January of '78.*

MP: Yes. And in the meantime, we got a proposal ready. This time we were emphasizing solar phenomena because we were well known in the solar community, and so there was a proposal in, but it was just in the early stages. So, we did what was the first flare patrol at one place. There had been flare patrols right along - there still are - from observatories all around the Earth, that they just put all this stuff together looking for solar flares originally.

BS: *So this was the bootleg solar flare patrol.*

MP: This is it. And so for the first time, from one point, we had a continuous flare patrol and phenomenal luck, good weather lasted for a week. So, we got pictures every 10 minutes for over a week before we just decided to shut it down. Because this was just a test to see what we would get. And the pictures were just stupendous. These are through a hydrogen alpha - a very fancy filter that I can't describe, that we had borrowed from an institute in Germany. It was all borrowed equipment that we had put together and built a suitable telescope with the Swedish parts.

BS: *And really, this every 10 minute photos was the only place in the world that you could do this.*

MP: That's right. You can't do it at the North Pole.

BS: *It's significant. It's floating ice. Yeah.*

MP: Well . . .

BS: *So this was the breakthrough.*

MP: Well, this was the breakthrough. But, another fortunate thing is, NSF at that time, had started to have a summer NSF Rep at Pole, which they didn't have before.

BS: *Who was that at that time?*

MP: His name I'm not going to be able to pull out without thinking.

BS: *Cameron. It wasn't Dick Cameron was it?*

MP: No, it was before Dick Cameron. It was the first one. And he was actually an astronomer. He was a radio astronomer, but he was in the astronomy division.

BS: *And he was there just for the summer.*

MP: Just for the summer. And I showed him these pictures. You know, he could understand how good it was. We were getting the resolution that the telescope would allow. I mean the limit of the resolution. It was just marvelous. So, he was really enthusiastic about it. So then the proposal was now in at just the right time. And one of the things that we had mentioned but hadn't specific plans at first to do, was a new field called solar seismology which is, essentially, observing the modes of vibration of the sun.

(300)

It had just really started in 1975, so it was very new. The helio-seismology we were talking about was one of the ideas that were enunciated in the proposal, but actually the first experiment was going to be to measure the lifetime of certain features on the sun telescopically.

Then it was very early in the planning and I received a phone call from Bernie Jackson who later turned out to be the first astronomer to winter over at Pole, later being before this event I'm talking about. He had applied when he first heard that we were proposing to do astronomy at the Pole back in the early 70s, he wanted to winter over as an astronomer. Anyway, he said he was sitting at lunch with a visitor from France named Eric Fossat, who was doing helio-seismology, and I didn't need him to finish saying what he had to say when I said, "Gee, we've got to get together." Of course, that's why he was calling us because he had heard that we were going to be doing some solar observations at South Pole. And Eric stopped off on his way back to France and it wasn't long before we had a firm agreement on an experiment, collaboratively, and we were able to utilize the telescopic arrangement that we made the first tests on earlier that year, in January.

BS: *This is '78? '79?*

MP: This is '78. And, to make a long story short, they built their part of the payload, which was to attach to our part of the telescope, and even though we were dealing with millimeters and inches, which has been known to cause some problems recently, low and behold, the experiments fit together beautifully and in '79, in the winter, we went down to make the first helio-seismological observations at South Pole.

(350)

BS: *You left Bernie Jackson behind then?*

MP: Yes. Bernie Jackson was merely the catalyst in this case. He was already well established doing solar physics.

BS: *So NSF approved your proposal?*

MP: He was at the High Altitude Observatory in Boulder. NSF approved the proposal independent of this collaboration. But, we anticipated working in this field and it was all very timely.

BS: *So, you were ready to go.*

MP: We were ready to go. We were going to do something different, but this was really a hot field and the Antarctic offered tremendous possibilities which the experiment proved were by far the best observations ever made before that time of solar oscillations of the sun's vibrations. And very much fundamental information came out of even that first year - the observations the first year, which was in January '79. I remember very distinctly when finally all the equipment came and still in those days ,there were problems with getting equipment in time and in good shape, and I saw my optical equipment being grasshoppered off the C-130. But, everything survived OK.

BS: *Grasshoppered?*

MP: Yeah. You know. They'd just move along and let the boxes fall out.

BS: *Drifting. I put a stop to that.*

MP: Yes. Well, that was a good thing. Anyway, the equipment came and we set it up and I'll describe a little about what that involved. And on New Year's Eve, I was in the bar, we were starting to celebrate New Year's Eve because the weather had been terrible, and someone came in and said, "Dr. Pomerantz, Dr, Pomerantz, the sun is out." And despite all the imbibing we had all done, we raced out to the site and we got the experiment running. And we had the longest observation of the sun that had ever been made in the helio-seismology experiment. I forget whether it lasted 8 or 10 days, but it was just fantastic.

BS: *Were these photographs?*

MP: These were photographs with a Doppler mechanism that shows how the sun is shaking, essentially.

(400)

BS: *Waves?*

MP: Yeah. But they're photographs of the sun which are taken periodically, like every minute, and in that experiment, we were observing the sun as a disc, as a whole, as a star. So, those observations we were just averaging over the whole sun. And you took a series of observations that did some very complicated mathematical analysis that showed you what we call the normal modes of vibration of the sun. It's like when you hit a glass of water, you hear a ring. Well, the sun is doing that, except the period is 5 minutes. It isn't anything you can audibly hear, but it's the same phenomenon. And this ringing in different ways, gives you information about what's happening inside the sun. It's the only technique that exists for studying the sun's interior. So, these were called full disc observations. And they were very successful and the telescope picture was on the cover of *Nature* with the article giving the first results.

BS: *This was January of '79.*

MP: January '79.

BS: *January 1st, '79. Uh-huh. How many days did those go on?*

MP: I think for 5 or 6 days or 10 days. I can't remember. I could look it up. But, it went on a long time. It just broke all records. And the resolution of the spectrum, as we call it, was just unsurpassed as compared with observations made at High Latitude Stations where you could only observe for part of the day. And the accuracy here depends on uninterrupted long-term observations. In fact, what's very important in these experiments is not having one kind of disturbance at the same time every day, so for that reason, we went five miles from Pole Station to establish the first observatory.

BS: *What's this? You mean a building dedicated to this?*

MP: Yeah. A building dedicated to this was 5 miles from the station so that the telescope would not see the heat rising from the station essentially at the same time every day.

BS: *This was built in '80? '79?*

MP: '79. It was built at the end of '78. It was the austral season of '78-'79. And so that local heating wouldn't affect the telescope, we buried the building in which the hardware computer stuff was housed, under the snow by digging a trench and building a roof over it and so forth.

(450)

And that became the method in future years of doing helio-seismology. We would always trench, dig a trench and bury a building of some kind. And shield the telescope that was a few hundred feet away from the building from the heat rising from the building because it was all covered with snow. We also had a separate generator building that was about a quarter of a mile away from the scene, again, so that smoke from the generator wouldn't . . .

BS: *Um-hum.*

MP: And that sort of became standard. It was pretty crude the first time because our camp consisted of a generator housed in an old dilapidated building on sleds and a wanigan that had been used by some other group for some chemistry, atmospheric chemistry, and we made that into a laboratory and living quarters. And we actually stayed at the site, cooked meals there, etc., as long as runs were in progress because in those days, we didn't have techniques for transmitting data by radio and all that sort of stuff. So, the early apparatus was crude because we didn't have the computer of the sort you now have. It was kind of a home built one that was built in Nice, France.

Nevertheless, the results were outstanding. Well, that opened it up and a year or two later, I returned with another group from the National Solar Observatory - that's Jack Harvey and Tom Duvall who was from NASA. And we did the next phase of the observations that involved resolved observations. Instead of observing the sun as a disc, as a whole, we had a camera - a CCD camera which is just like a television camera where you're observing on a number of different pixels so you can resolve the data and look at higher resolution and that greatly extended the range of what we could observe in the way of these solar oscillations. That program went for many years. Each time we would introduce improvements. These were the years that added up to the 26 really, because before that the only big event that went for two summers were the balloon flights involving the . . . oh there's one other thing I'll add in a moment. Keeping the helio-seismology observations going - that program extended into 1994. That was the last time I was down and we closed the program because we had then accomplished everything that you could with the technology that now exists in that field.

One point that I missed along the way that's interesting is the change from Old Pole to New Pole of the cosmic ray apparatus. So, this should have been somewhat earlier. It's a little bit out of context now.

BS: *Old Pole was prior to Dome?*

MP: Prior to Dome, where we had the separate building that, by the time the Dome was being installed in the new station, was pretty well buried, including the cosmic ray building. There was very little sticking up above the surface, even though efforts had been made to dig around it and keep it clear. So the new Pole, I've forgotten the exact years . . . maybe it was '73-'75. The move, I think was '75. And I went down one of those summers while the station was being built to shut it down because they were closing Old Pole that winter, that summer, and moving and there was no place in new Pole Station for a cosmic ray observatory. It hadn't been included in the plans. . . well I'm sorry. Back up. It had been included in the plans in one sense in that a structure that would house this big heavy many-ton pile was included in the plans - one that would be jackable so that it could be kept above the snow. But, there was no room inside the building for cosmic rays and by that time, there had over the years been various arguments about how many cosmic ray stations there should be in Antarctica with committees always arguing that there should be two - one at Pole and one at McMurdo.

(End of Tape 2 - Side A)

(Begin Tape 2 - Side B)

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There had been discussions about this and even though there was strong demand to have two stations, the then program officer, the same one that didn't back us in the astronomy, said, "Marty, you have your choice. You can have one station. Where will it be?" Well, I knew that South Pole had such overwhelming support and it was a more drastic thing because it would need a changeover to a new station, that I said, "Well, we'll keep McMurdo going." Well, of course, there was demand for a station at South Pole, which would be the station most sensitive to solar cosmic rays in the world, and when I went to close down the old station, I moved the equipment to a building in the Dome which is called Skylab. The only place I could put it was in what was called, in the diagrams, the cloakroom. That's kind of on the first level as you go up the stairs to the lounge. It's just a big open area and I put the equipment there and said, "Well, we'll leave it here until we see what happens. It still wasn't approved that we had a station at South Pole.

Anyway, I was able to swing it and we were approved for a station at South Pole.

BS: *And is it in the tower still?*

MP: It's in the tower still, but, yeah . . . a room was built. This cloakroom that was just open space was built into a room. It's a small room. But, that's where the recording equipment was stationed and still is, presumably. And the platform that jacks up, that held this many tons of stuff outside, turned out to be sitting at McMurdo on a berm. Nobody knew what it was. When I went there, we identified it and had it shipped to Pole and erected. So that was pretty exciting. So, we got a station started at South Pole and that's where it still is.

BS: *So that was with more modern equipment. It wasn't the stuff that you took out of the lab at McMurdo.*

MP: No, by this time it was third generation.

BS: *So, you played your politics right, is what you're saying.*

MP: Yeah. And the equipment . . .

BS: *You outfoxed NSF.*

MP: The equipment is the same as at McMurdo. And it was a generation behind at one point.

BS: *That's what you made clear. Yeah.*

MP: So, there was a case where just being bull-headed and saying, "We gotta be here somewhere, even though no room was built for it. We have it there, so . . . " I thought that was an interesting play on this.

BS: *Still going today, right?*

MP: Yeah. There also was a change of personnel and things like that. Unfortunately, politics come into these things.

BS: *I understand.*

MP: OK. Getting back to the astronomy. That, of course, turned out to be a spectacular success and by this time, people are starting to feel differently about it. So, the next obvious thing to do at South Pole was infrared or millimeter or sub-millimeter astronomy because that is the aspect that takes advantage of the extreme cold of the atmosphere and the penetrability - the low water vapor content. Now, clearly I'm not in every one of these fields and so you don't just suddenly get into the infra-red field from after being in helio-seismology, anymore than I got into helio-seismology from cosmic rays. You had to have some very solid collaborators.

BS: *You didn't have the background.*

MP: You know, I could pick up the physics pretty quickly. I understood that. But, you need experienced people.

(50)

So, this is why I've always had a collaborator with other groups after the cosmic ray business, which I did independently. A lot went on over the years with the helio-seismology. The first, I'll call it sub-millimeter because that goes from infra-red which is just beyond the visible all the way up to radio-wave lengths - the first group that I thought was appropriate and was interested, was a French group which I contacted and they were a highly reputable group at a number of different French universities and establishments. And we put in an appropriate proposal that was approved, to do sub-millimeter astronomy that extended just to the threshold of the microwave background radiation spectrum. We went down with that group, I think it was about '84 and that was a very big operation that was done at the same site that we had been using year after year, even though we had to put in different buildings. But, always at the same general site - five miles from Pole. This was the first experiment that involved helium to cool the detectors. Now these days there are big, tremendous cylinders of helium sitting down there, but in those days, we had to stage the delivery of helium cylinders - this is liquid helium we're talking about now, liquid helium. And that was in operation. That turned out to be the really limiting factor. The experiment was very successful, but we essentially only had one shipment of liquid helium at the right time with the good weather, and so forth, for making observations. When that ran out, there was supposed to be another shipment on the way that turned out, came to McMurdo and was sent back to New Zealand and then it was too late to do anything. The logistics were a little bit confused that year. The logistics of getting liquid helium just hadn't worked out because it was the first time it was being done and they didn't understand the nature of the problem. So, reluctantly, we ended that experiment so that the French could get home in time for Christmas because they weren't willing to stay another month or two waiting for helium, which I couldn't blame them for. So, I let them take a vote and they wanted to go home and that was it.

However, under the circumstances, we got very, very good results which showed very definitely that it's an outstanding place to do microwave astronomy. So, the next step was to get into the game of trying to determine whether there indeed is an anisotropy in the microwave background. That is, whether some places are hotter than others in the sky.

BS: Aniso*tropy?*

MP: Anisotropy. Just the difference - if you look in different directions, essentially, it's the temperature of this three degree black body radiation left over from the big bang - does that differ a little bit? It's looking for the first signs of structure in the universe.

(100)

BS: *Um-hum.*

MP: This was not the main objective of the collaboration with the French, which actually got a number of other results not in the microwave range, that were interesting. It had nothing to do with the . . . but it showed that this was the place to do these searches for anisotropy. And so there I went to the discoverer at Bell Labs, Bob Wilson.

BS: *Where's this? Bell Labs.*

MP: Bell Labs in Homdel, New Jersey. He's one of the two Nobel Prize winners for discovering the microwave background radiation, which is at a temperature of 3 degrees.

BS: *What's his name again?*

MP: Wilson. Bob Wilson.

BS: *So he became your collaborator.*

MP: So, I had talked to him a number of times, but finally, he and his group got really interested in it and they had a new detector and they wanted to do it, so we went down - that was in '87 - and made the first attempt, specifically, to try to detect the fluctuations in the microwave background radiation. Well, after that, things exploded. I didn't need to continue in that field because that group and many other groups went down and they're still working on the microwave background radiation. It's such an ideal place to do it.

BS: *So Bob Wilson became your collaborator on that phase of it.*

MP: Yes, for that summer.

BS: *Um-hum. You hunted him down for this particular project? You initiated it?*

MP: Yeah. I initiated a talk with him and then he and Tony Stark was the main person who actually went in the field and headed the Bell group. And, by that time, the helium was working better and so forth, because of the previous experience. So, I then just sort of left it to the teams that were coming. I mean it exploded and we had four or five groups that regularly sent people down doing that. So, that was my connection with the microwave background. See, in all these cases, I'd sort of try to get the thing started and then the good people would see how good it really is and then they'd continue it.

OK, the next thing is finally getting back into cosmic ray. I'm not that sure about the years. Well, it could have been close to the Bell labs trip, but another advantage of the South Pole that we've already mentioned is the circumpolarity of the sky - the fact that any object is always in view if it's in view at all, uninterruptedly. And for certain cosmic ray experiments that are looking for cosmic ray sources, we used what is called an "extensive air shower detector" which is a method of essentially pinpointing where in the sky a very, very energetic particle came that then made many, many particles raining down on you and you could zero in on what stellar object they came from.

(150)

There, a group with which we were very friendly and we kicked this around together was at Leeds University in England and so we designed and proposed and conducted the first extensive air shower experiments. OK, I can get the year. The year is right. We put that in in the fall of '86 and had it operating at the beginning of '87. And another serendipitous thing happened in that there was a supernova in the sky over Antarctica - tremendous one that did give low energy radiation that was detected. And it was the first opportunity hopefully, to see cosmic rays coming directly from a source - very, very energetic cosmic rays. Unfortunately, it gave a negative result. We didn't observe any. But, that's why you have that experiment. To see if that's happening or not.

That experiment is now going on in a somewhat different form. It's still going in collaboration with the vast under-ice experiment. Isn't it awful how you forget names?

BS: *You mean the one where they dig the big hole?*

MP: Yeah.

BS: *That they put the strings down?*

MP: Yeah.

BS: *I know what it is, but I can't think. . .*

MP: AMANDA

BS: *AMANDA from the University of Wisconsin.*

MP: Yeah. AMANDA. Is that right?

BS: *Um-hum. It goes onto the ocean and . . .*

MP: Yeah. It wants to detect neutrinos coming through the Earth, and the extent of what we call SPASE, South Pole Air Shower Experiment is associated with that. And that's still going on. So, all of the things that started over the years are still going along with the exception of the helio-seismology which will probably pick up again sometime when somebody has a great idea of a new thing you can do if there's new technology. The last time I was at Pole in '94, which was the last expedition for the helio-seismology, was when the new observatory was dedicated and that summer; I think there were about 38 astronomers at Pole with large tanks full of helium just like diesel fuel tanks almost.

BS: *So it grew to 38?*

MP: Something like that. 38 during the summer. It's probably bigger now, actually.

BS: *And how many would winter? How many projects did you have wintering?*

(200)

MP: The winter over population, I think, is about 27.

BS: *As far as astronomers though.*

MP: Astronomers. My guess is there are 4 down there now. I'm not certain, but I would say there must be 4 winter-over astronomers. Four or five. But see, the other thing that has happened is that the communications have improved so much that you don't need a large number of people to keep some of this stuff going because you can even direct telescopes from back home over the Internet, for example. And they're sending back results immediately.

BS: *So, you talked about the new observatory. Tell me about the new observatory.*

MP: It's a very nice, new building on stilts. I believe it has solar heating. It has a fully equipped shop and laboratory space. It's the headquarters for a number of the experiments that are going on.

BS: *Anyway, the new AMANDA Observatory. And how many other disciplines . . . ?*

MP: Well, it's all astronomy and the Harvard-Smithsonian group has a number of things there. There's also, of course, the group at Yerkes. The Science and Technology Center, Center for Astrophysics in Antarctica has a number of experiments. I mean during the summer it swells because people go down for summer observations or to upgrade equipment.

BS: *I assume Bartol is still involved with cosmic ray?*

MP: Bartol is continuing the cosmic ray work and they're also still involved in SPASE, the high-energy cosmic ray experiment.

BS: *Who was the new center named after?*

MP: Well, somehow or other, they decided to stick my name on it.

BS: *That was the last time you were there?*

MP: That was the last time I was there. That was a surprise.

BS: *Did you get to hang around for that?*

MP: I was there for it . . . the uh . . .

BS: I mean after that?

(250)

MP: I went home a short while after that. We had finished our campaign and they were waiting for the Director of the National Science Foundation who is now the President's Science Advisor, Neil Lane, to come down for the dedication and he did. And they had the darndest party. It was a marvelous party. Fantastic party. I have videos of it. I'll have to show you the videos. It was a great experience. Yeah, I'll show you the videos. Good thing.

BS: *So, Neil Lane came down for the dedication of the Pomerantz Center, is it called?*

MP: It's the Martin A. Pomerantz Observatory.

BS: *OK. Was this . . . did you continue working after that or was this close to retirement?*

MP: Well, I had already retired in '87, so this was seven years after retirement; I made my last trip down. I retired in '87, and I went down at least two times before '94 doing helio-seismology with the group at the National Solar Observatory.

BS: *Where's that?*

MP: That's in Tucson.

BS: *Tucson.*

MP: But, the last time we went down was '94 and as I said, that wound up and I've not had a good excuse for going down again since.

BS: *So you haven't been back for six years.*

MP: I haven't been back for six years. I'd love to go to the dedication of the new Pole Station if it ever gets finished.

BS: *It's going to take a while.*

MP: It's going to take a while.

BS: *An awful lot of science got set back for that.*

MP: It's got to be pretty expensive in terms of resources and time that it takes to do it.

BS: *So have you kept up your interests? Well, I'm sure you've kept up your interests, but have you kept up your work or have your turned your life around doing something else?*

MP: Well, in 1990, I decided to do something kind of way out. I became an automobile dealer. And I still am the dealer at Quad Cities Nissan, Muscle Shoals, Alabama, although when I moved out here in February, I essentially retired from daily connection with the establishment.

BS: *How'd you get into this business?*

MP: My son had been in various phases of the automobile business over the years and it looked like it might be a time to try having a dealership. So, we bought a dealership and I found it was very challenging to get into a different area although the experience I had over the years turned out to be useful, more useful than I expected. We moved to Alabama because it was an hour from Huntsville and I expected to make Huntsville my scientific home.

(300)

But, it turned out that there were things enough for me to do to keep me busy doing business aspects of an automobile dealership - not selling or marketing. And I found that very challenging, but after ten years, I decided it's on autopilot now. We have a good situation where my partner is running it. Not my son. He's left it. And in the meantime, we actually had a Ford-Lincoln-Mercury dealership that was very successful which we sold, so that was just a different experience. I keep up with what's going on in Antarctica. I get an e-mail every day with information about what's happening. So I'm in touch with it, but not closely with the science.

BS: *Um-hum.*

MP: Which is going at a great rate. It was gratifying the other day to receive notice about an article in, I think it was *The Washington Post,* one of the big newspapers, about someone using helio-seismology to observe activity on the other side of the sun before it comes around and this was work that came right out of the Antarctic helio-seismology. We started doing that sort of thing. So, it's nice to see so-called useful results come from what was a purely scientific endeavor, that is, to understand the sun and how it operates.

BS: *That must be pretty gratifying to see that your work is still going on. It didn't end when you walked away from it.*

MP: Well, it is nice. It is nice and . . .

BS: *How many post-docs did you grow?*

MP: Oh, I probably had about 20 or 30 over the years, at least.

BS: *Still in the business, most of them?*

MP: About five or six Ph.D. students and they're all doing very well. Yes, in fact, one of the exciting things is I've had three generations from Japan. That is, I had a man who is now retired. His student and then the student's student. And they were all involved in the cosmic ray program. The other aspect has been the winter-overs, some of whom I am in touch with. Some of whom I have no idea of their whereabouts, but they include people like Ken Jezek who was Director of the Byrd Polar Institute. I say was, because I understand he was retiring from that.

BS: *Ken retired from that to move into full time mapping, downstairs. He's gone right back to full-time science.*

MP: Right.

BS: *He's not retired by any stretch* . . .

MP: Oh, retired no! He's got a long way to go.

BS: *He built the Institute up. He did a wonderful job.*

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MP: That's a very good place. He was our winter-over man at McMurdo one summer some time back. We always made a point of bringing people who had an undergraduate degree in physics or engineering or astronomy who had intentions of going to Graduate School because we felt it was a wonderful opportunity to have a year off to think about things and . . .

BS: *Well, Ken ran the lab at McMurdo.*

MP: He ran the lab at McMurdo. And in some cases they decided not to go into physics, which is fine. We were not trying to proselytize physicists. Ken was an excellent example. He stayed after the season and went out on some field trips with geologists and became interested in geophysics and that's what he did his degree in with Charlie Bentley.

BS: *But he got started with you.*

MP: But he got started with us.

BS: *Charlie put all of his papers . . . you know we were talking about papers. He gave them to the Byrd Polar Research Center Archive because the University of Wisconsin does not have a good archival program.*

MP: Charlie is one of the earlier persons that I'm familiar with, especially from these Skyline Drive talks and stuff. I used to run into him often there. If not, you know, going through McMurdo. And there are a lot of people over the years, some of whom stayed and a lot have disappeared. But, other people have gone on in physics. In fact, ironically. . . ironically . . . it's great, one who was there who was not at all involved in the helio-seismology - he's now a theorist in helio-seismology and he went to the Cambridge University in England and is a theorist in the field.

BS: *Who's that?*

MP: His name is Merrifield. Bill Merrifield. Others have become engineers and one chap worked for Ballard, the guy that goes under the water - the Titanic and stuff was involved in that. He's another McMurdo winter over. And so forth. There are many of them.

BS: *So, you could really pick the man rather than a specific background in cosmic rays to run the cosmic ray . . .*

MP: Oh, the background in cosmic rays was not required because we would train them. We would have them all summer at Bartol and they got to know quite a bit about cosmic rays before they went down and then they learned more as they were there. So, yeah. Only one I know went completely out, which was fine. He went into economics at the University of Chicago, but it's a good place for people to decide they don't want to do this.

BS: *About like switching to a Nissan dealership, isn't it?*

MP: I'm the only one that's done that.

(400)

BS: *Well, let me ask you a retrospective question. What would you have done different?*

MP: Gee, that's a good question. That's a good question. With respect to the way the whole career turned out? Probably had I any inkling of what would happen in the future, I might have gone into astronomy as an astronomer instead of getting in the backdoor as I did as a physicist. Now a lot of people have done that. Physics and astronomy are now getting almost indistinguishable, but I sometimes feel stupid not knowing which constellation is which and all that sort of thing. So, I think one thing I'd do differently is study more astronomy, but who knows. It might be that coming at it from a different view as I did, remember the astronomers were the ones that didn't think it made any sense to go down there at first.

BS: *You might not have made it down there.*

MP: I might not have made it down there at all because they were strongly against it except for those that were involved in trying to do it. So, it might be better that I came as a physicist with a physicist's stubbornness.

BS: *About the Pomerantz stubbornness, I know about that.*

MP: Sure. I don't know what I would do over differently. Because most of these things weren't a matter of choice. I mean they were a choice of some kind, but you didn't know when you made the choice what it would lead to.

BS: *You were overcome by events, though.*

MP: You had to be at the right place at the right time.

BS: *You have to be there ready to jump when the event takes place.*

MP: Yeah.

BS: *Well, you certainly had a successful career and I'm certainly glad we got to do this. And I hope . . . this will be on the top of my list for transcribing for the limited money we have. But you and Charlie Bentley and a few others really spent a long time in the Antarctic.*

MP: I must show you this video. Do you have any more you want to ask me?

BS: *I think that's pretty much it.*

MP: I mean the video may suggest some things.

BS: *It might be. We might want to return here.*

MP: You might want to just take some of the stuff from the video.
In retrospect, I'll say something that I should have introduced this whole discussion with. You did ask how I got interested in Antarctica. Actually, the truth is that in a way it happened when I was 12 years old and I was a newly admitted Boy Scout in Brooklyn, New York, and one day all the schools were allowed out so everybody could attend a big parade on Fort Hamilton Parkway in Brooklyn.

(450)

And the parade was in honor of Admiral Byrd, who came down in a big open touring car and he was accompanied by Paul Siple, Eagle Scout, who had spent the winter at Antarctica. And here, a tenderfoot scout, was watching this and could he ever dream that some day he also would be going to Antarctica and even know Paul Siple personally? So, you never can tell how even a childhood experience may sometime forebode the future.

BS: *Thank you, Martin. It was an outstanding interview.*

(End of Tape 2 - Side B)

END OF INTERVIEW