

Jinny Nathans: This is Jinny Nathans on June 5th, 2018 at the Weather and Forecasting/Numerical Weather Prediction conference in Denver and I am interviewing Lance Bosart, and in a very few seconds he is going to talk about the beginnings of his career. I love the reading of the New York Times, but what what first interested you in meteorology, and then what took you to MIT?

Lance Bosart: Well, I was always interested in the weather, but didn't know you could do anything in the weather, it was just like a side hobby, supposedly. I think my parents thought it was a genetic defect that would go away with time, but it didn't. In those days we always had the New York Times in the house, growing up, and the New York Times had weather tables. Daily high, low temperature and rainfall, for cities all around the world, and a real honest-to-goodness weather map, with plotted observations and analyzed isobars. So that's how I would look every day. And I started noticing the climate of different places around the world. I had no idea why, I still remember asking people, well, why is it the hottest time of the year in New Delhi, India, in May, pre-monsoon onset, but I didn't know that at the time, I was a little kid. But no one else knew anything about it either, there was no Wikipedia, there was no online google what's the answer to this question in there, so I just started noticing these things.

I learned statistics, elementary statistics, at the same time from the backs of baseball cards. I had to know what all those numbers meant, and figured that out by doing multiplication, division, and then figuring out okay, that's how they're calculating those things.

So I had a pretty good idea about the way the weather and climate varied around the world, just by watching the weather every day in the New York Times. The New York Times was one of the very few papers that printed all the weather tables. In those days they also had the shipping routes, the times of ships that arrived in New York, arrived in Southampton, England, time of transit across the Atlantic, and I noticed differences in the winter versus summer transit times and wondered if that was weather-related. Just noticing stuff, that's basically all I did.

JN: Well, it certainly paid off eventually, as you started putting things together. And MIT seems like it was also a fruitful time for you.

LB: Yeah, but I didn't go there for meteorology. I went there for aeronautics and astronautics. I liked the classes that were more theoretical about the flow of fluid or air around a rocket or around an airplane's wing, but I didn't care that much for the engineering classes, because they seemed more, you had to make stuff, and it had to work, and it was like trial and error in a lot of cases. So I was more interested in the theoretical stuff. But I knew engineering was not going to be for me when before moon landing, before the Apollo program, I had to design a rocket to go to the moon and back, and get the person home. I had no clue what to do with that, so I just proceeded and I handed something in, and the professor said "Bosart, not only would your rocket not get off the launching pad, the resulting explosion would wipe out the whole, and he used a very strong word, complex, launch complex in the process."

Just by chance I happened to take, in the senior year, an introduction to theoretical meteorology class, it was a graduate-level class taught by Norman Philips, and I was the only undergraduate student in that class. I thought, what am I doing in this class with all these graduate students? But

then this remarkable thing happened. Turned out I knew more math than most of the graduate students, because at MIT you cannot go through the program without being pounded into calculus and physics and subjects like that, so that was an eye-opening course. I loved it, because I could see how the weather worked, there was a theoretical basis for how the weather worked, and I just thought that was awesome, that you could actually say something about weather prediction and understand how the weather behaved from equations. To me that was just astounding, I had no idea in that. I also had no idea who Norm Phillips was at the time, and if I had known who Norm Phillips was... He only did the the world's first general circulation model, among other things, if I had known who he was I probably would have been too scared to take the class. [laughter]

So I got an A in that class and thought, well, gee, maybe I should go into this meteorology field, but my undergraduate grade point average at MIT was not very good, because of some of the engineering classes I didn't do very well in. But Norm Phillips went to bat for me and got me into the graduate program at MIT, since if he's good enough to get an A in this class with all other first-year graduate students, he's good enough, let's give him a chance to be in the program. So that's how I got into the program. Accidental meteorologist, there's no other way to describe it.

JN: That's actually a little bit different from some of the other stories I've been hearing, where people saw a storm and that put them right on a track for meteorology.

LB: Well, I did that too, but I didn't know you could have a career.

JN: Yes.

LB: Hurricane Hazel for me, Hurricane Hazel and a family picnic, were for me. I was about eight or nine on a family picnic and my parents had a whole bunch of people over in the backyard, and I could see a storm was coming, but the backyard faced to the east, and so they didn't notice around the side of the house that if you looked to the west it was getting awfully dark. I went and I said it's going to rain, storm coming. And it's a little eight-year-old kid. Oh, well, right kid, go away, kind of thing. And then about ten minutes later it just blew right in.

JN: Wow.

LB: Knocked over the barbecue, the umbrella went flying, lots of things happened. That was actually I think a derecho-type structure, very rare on Long Island to have that, I had no idea what a derecho was, or anything like that, but it was very very impressive. Nobody said anything, I helped with the cleanup. But I did get an extra helping of ice cream.

JN: Well, that is some reward. I like how when you described it you also said the sky had begun to turn green. That's one of the things I think maybe twice in my whole life I've noticed that, and everybody said I was crazy, but it really can turn green.

LB: Yeah, just the right amount of light in the cloud and the filtered sunlight, that's usually a signature of hail, when it hails. I've seen that a lot now. When you go out storm chasing you see that greenish sky.

JN: Yeah and when I have seen it the couple of times, it almost makes you sick to your stomach. You just know it's not going to be good.

LB: It was like a case of badly overcooked vegetables, it doesn't look particularly appetizing.
[laughter]

JN: That's appropriate.

LB: That, and then Hazel, Hurricane Hazel. I was going on 12, that was 1954. Hazel I know came into North Carolina and gave New York City the highest measured wind gust, at the old Battery Park in the south end of Manhattan, that's still a record. I think it was 112 or 114... I think 112 miles per hour, highest recorded wind gust. And that was amazing because it was extraordinarily windy, and with the low clouds going by, I'd never seen clouds moving that fast at those levels, the wind just above the surface was phenomenal. But there was hardly any rain. And everybody said, hurricane, the pop thing was that you get wind and you're supposed to have rain with a hurricane. So I was asking around, I asked my mom, why isn't it raining more? And she said I don't know, go ask your dad. I went and asked my dad the same question, I don't know, go ask your mom. Argh! Nobody knew how to answer those kinds of questions. So, just things I noticed about the atmosphere. But I was always doing that, remarkable weather events growing up, it was always an interest.

JN: And once you made your way over to the Green Building at MIT, then that world just opened up for you.

LB: Yeah. Boston has quite interesting weather, as you well know from being there.

JN: Oh, yes.

LB: So with the sea breeze, and the convection... the thing I didn't like was that the sea breeze would kill off thunderstorms in the summertime, because the air is colder and it's unstable, so out by Rte 128 there'd be a good line of storms and then it would fall apart before it got into Cambridge and Boston, so many times. So you learned about the effect of how colder boundary-layer air can choke off convection in there. I learned many years later what was going on, but.

JN: Right.

LB: But it's just something you see.

JN: No, and you just explained something to me, because I would see that line and wonder about it, it always seemed to be in the same place.

LB: Yeah. And then there was always interesting rain and snow in Boston, it was always in the winter, “is the snow going to turn to rain, is there going to be sleet mixed in?” and whatever. I learned growing up that I loved big snowstorms. So the fear of God was always going to be it was going to turn to rain. And then there was always the dreaded sound at three in the morning of sleet on the window, and I knew that meant it was turning to rain. There’s no reversing it, when you heard the sleet it was like “oh, no, it’s going to be school tomorrow,” or something. Yeah, so Boston has such fascinating weather.

JN: Yes, and the thing about wondering about whether there will be school tomorrow was always, you never knew when you went to bed.

LB: They didn’t cancel school back then like they do today.

JN: No. Absolutely not.

LB: It was assumed you would figure out a way to get to school.

JN: Yes, in your wool flannel leggings, they would just bundle you all up and say “go.”

LB: I learned about backdoor cold fronts for the first time sailing on the Charles River, MIT is very big on sailing.

JN: Oh, yes.

LB: These little, they were called Tech Dinghies, I think they’re still called Tech Dinghies. Single mast, one sail boats.

JN: Did you hear about the tech boathouse, that it kind of slid off?

LB: No, I didn’t hear about that.

JN: That was I guess it must have been this spring, and they've righted it and pulled it back, but yeah.

LB: It was old then, so it must be really old.

JN: Yes, yes. But beloved.

LB: They have a championship sailing team this year. But I was out sailing, it was April, and it was one of those days where it was southwest wind at 20 miles per hour, and it was upper 70s, so everybody was just nuts, you know, spring fever, and all that. We were sailing on the Charles and I didn’t know a thing about backdoor cold fronts, I was still an undergrad, and I noticed ripples on the water coming, a line of ripples on the water, and my brain is trying to process what I’m watching, and it was a wind shift.

By the time I realized that that was the wind shift for the northeast, it was like a 180 wind direction change, instantaneously from southwest at about 20 miles an hour to northeast at about 20 miles an hour. And so of course on a sailboat, you're sitting on one end and you're hiked out a bit sailing into the wind, so what happens is an accidental jibe, and then what happens after that is you swim. And the water temperature was in the 40s, that wasn't too pleasant. So you held on, they come out and fish you out of the water, you hold onto the boat and you can right the boat and all that, but you're all sopping wet, hopping mad, "what was that?"

Later on I figured out when I was a graduate student by watching the observations for these things, I got very good at predicting when a backdoor cold front was going to come past Boston. Watching the data I noticed that if the sea level pressure at Portland Maine became one millibar higher than Boston, a backdoor cold front was going to come through Boston. I learned that by watching and checking with the data. So that became my private little way of determining a backdoor cold front, watch if Portland got one millibar higher than Boston and it was coming through. Didn't matter what the forecast, I didn't care what the forecast was, it was coming through.

JN: That makes perfect sense. I actually learned to sail at the Metropolitan District Commission, the MDC, where if you were 12 you could pay a dollar and learn how to sail, and sail all summer, so when you said jibe, yes. And we could not go sailing until we had gotten a tetanus shot.

LB: Oh, because the Charles was really polluted at that time.

JN: Yes. We're about the same age, so yes.

LB: That's right, I took sailing classes at the Pavilion there, you had to do that before they allowed you in a boat, and then you had to go out with somebody for a while, then they allowed you out.

JN: Right, and you had to have your swimming certificate.

LB: Right. And you always wore the jacket, the life vest and that kind of stuff.

JN: Well...

LB: I did, because I wasn't that good a swimmer.

JN: I just remember the tetanus shot, and the thing is if you fell in, you had to stand under the shower for like 20 minutes, and I lived in Harvard Square so I would have to go home on the subway. So I only did it once.

LB: The sailing people said shower for an hour, that was the slogan, shower for an hour if you were in for a dive in the river.

JN: Absolutely, absolutely. So when did you become an AMS member?

LB: As a student, while I was a grad student. I don't remember the exact year, it would have been in the late '60s.

JN: And you began going to the meetings?

LB: The first meeting, there was a meeting I think I attended... Well, first of all, some context. Very few graduate students went anywhere because it cost so much to fly. I mean, from Boston to say San Francisco today might be what, eight hundred dollars maybe, six hundred to eight hundred, if it's a cheap fair.

JN: Right.

LB: But that's what the fare was fifty years ago. So in terms of real dollars the cost of flying cross-country was almost, say, 5-10% of your annual salary. So obviously people didn't fly very often. Today relative to inflation, it's the same price, but everyone's income in round numbers is ten times as high, so it's more like 1% to fly. Still very expensive, especially for a student. So we didn't go places, but if we went, if there was a local conference in New York or Boston we all went. Or we just piled into a car and went as far south as Washington or something, we did that.

Also in those days we would go 4, 5, 6 people in the hotel room, you were only in the hotel room to sleep so what was the big deal, you just slept in a corner somewhere with a sleeping bag or something. So it was very cheap in that context.

I think the first tropical conference I remember, there was a conference in Barbados, and it was December of 1971. That's where I first got to watch Bill Gray in action, for example in debate, and Jule Charney and Dick Reed, there were a lot of big names in the field. Back in those days it was only single sessions, so everybody attended the same sessions, and there were a lot of sharp elbows among the senior statesman of the time. They all had different opinions about how the atmosphere worked and they would love to argue with each other. They got along, but they took no prisoners when they got into scientific arguments. It's much calmer these days, people don't like to argue anywhere near as much compared to back then on science. So that's how I got slowly introduced into the process.

JN: And so you've continued completely since then.

LB: I drag students all around the country.

JN: I was going to say now you do a lot more. And there is a small segment of the student population that still travels the way you described. You know, six in a car and six in a hotel room.

LB: Yeah, because it's good for them to see how the field works by going to conferences.

JN: Absolutely.

LB: And so we try and get as many of them to go as possible. One of the biggest impediments to student travel today is not money, it's the advisor. I don't know how many people appreciate this. A lot of advisors don't like their students going places because they figure while the students are out of the way, they're not working. But that's very short-sighted thinking in my view, because they're gaining perspective, very valuable perspective on the field, and meeting future colleagues, and so I think it's extremely valuable. And also expensive, so if the students go on trips then there's less money on the research grant, and so on, but I always figure I'll worry about paying for it later, I'll figure out how to pay for it later. I've been known to throw in money from my own personal pocket and never tell the student, because it's good for them to go.

JN: Yes, it seemed, I was as you know at the Hurricanes Conference a few weeks ago, and it seemed as if there were many more students there than there are here. I haven't really seen anyone in particular I can even identify for sure as a student.

LB: I have three of my graduate students who are here.

JN: Good, good.

LB: One gave a talk this morning and the two others have posters on Thursday.

JN: Oh, excellent. That's very good, but it seems each conference sort of has its own tone and this one is a lot quieter than the Hurricanes one.

LB: Traditionally the Hurricane Conference has always been boisterous, let's just put it that way, when Bill Gray was alive it was guaranteed to be boisterous. First of all he had a voice like a foghorn, and second of all he never met a theoretician that he could accommodate, in other words Bill always thought "oh, you guys don't know how the real atmosphere works, come out with me in the tropics and we'll show you what it's really like." So there have been a lot of interesting characters in the tropical community.

JN: That was the sense that I got from the people that I interviewed, that there was a very lively history.

LB: Since I've worked in both the tropical side, because I do tropical work and have for years, and like at this conference, Midlatitude Meteorology and the Weather Analysis and Forecasting, and Mesoscale Conference, Processes Conference, I have people who I've known for years in the tropical community who really have no clue that I do other work other than the Tropical, and vice versa when you walk into Midlatitude.

JN: Oh, that's amazing.

LB: So I work across the disciplines, it just works out that way. The problem is I'm interested in too many different things.

JN: Well, you seem to have managed very well to navigate your way through them. When I was talking to some of the students at the Hurricanes Conference, one of the things that they

uniformly said, and these were younger people and then people much further along like Jenni Evans, everybody said that one of the things they really valued at these meetings was that people of eminence whose names only, they knew their names, they hadn't met them, were very, very approachable, and that you could go up and talk to someone whose papers you had been reading for the last two or three years, and I think that's very special.

LB: I think that's always been true. I can remember Jerry Namias used to come visit, and Dick Reed used to come visit Fred Sanders at MIT, and whenever they were around I was always sitting in, watching what was going on. You could talk to them.

JN: Yeah. Yeah. Again, I think that's something very special about this field and also something that through its meetings the AMS makes possible.

LB: Yeah, the meetings are a good thing.

JN: They're very important. I'm learning about that as I'm going to these meetings rather than just the annual meeting. How about the journals?

LB: Well, I can remember when there was just one journal, Journal of Meteorology, and it came out six times a year, every other month. Everybody read the same journal, and I remember maybe six articles in it, or something like that. Now it's like trying to drink from a fire hose. There are so many things that are out there, it's virtually impossible to keep with the literature today. If you try to keep up with the literature, you'll be doing nothing else, it would be like on a treadmill going nowhere. The growth in the field has been explosive.

JN: It definitely seems that way.

LB: The downside is people used to be more generalists back then, because there was only one journal in the US. Then you had the quarterly Journal of the Royal Meteorological Society, which was another one everybody read, and then Tellus, those were the three main journals, international journals that people would read. Then the Journal of the Meteorological Society of Japan. Between those, that basically covered the primary journals around the world. There were others, but that was the primary ones.

But you could get together and discuss a paper, because everybody would read the same journal, and you couldn't help but notice when the paper copies of those days, you would read an article and then you'd notice this next article, oh, because it's in the journal, so you'd look at it. Now when you go search online for a specific journal, the serendipitous discovery thing has been lost. It's like in the old days in the library with real books, you'd go to the shelves to look for a book and you'd find your book, and then you see this book three books away, "oh, what's that?" and you pull it down and look at it, that's serendipitous discovery. But now in these targeted searches you lose that opportunity to see things. But on the other hand you can find all kinds of stuff.

JN: Right.

LB: There's always overhead to anything you do in life. One of the overheads of being able to find everything quick is you don't see things that maybe you would be interested in, that are adjacent to whatever that is.

JN: It's absolutely true, as a librarian I totally agree with you, that is one lack in the way information is organized today and the way that you get at information. There's no sitting on the floor in the stacks just pulling books down and seeing what's in them.

LB: My advisor, Fred Sanders, encouraged all kinds of behavior that would maximize academic learning, in addition to the science. What the implications were on people in dealing with weather, and broad-based education all the way, using the real atmosphere to teach you everything that was going on. That was very good. All the time, through the forecast contests we did, and discovering the weather and creating science opportunities from talking about the weather. "Okay, why is this happening?" Fred would always ask that question, why something's going on, dangle bait and get us to try and respond. He was very very good about asking Socrates style questions to get you to think and get discussion in class going. He emphasized there was never a right answer to everything, there's always uncertainty in all the answers, we didn't know everything, and the more you knew the less you knew in some respects. He was an extraordinarily good advisor. When you were feeling down on yourself he nicely picked you up, and when you were too full of yourself, he nicely put you down. Those are very good lifelong learning processes.

Plus he would sail. Fred was a master sailor, so he would take the students every year on what he called an air sea interaction cruise, we'd go out and sail somewhere, Boston Harbor, up the coast a bit, or down the coast and take water temperature readings, things like that. I remember one time we went to Nantasket, one of his students' parents had a summer home on Nantasket. And Fred said we're going to cook dinner, and we all looked around, we didn't see any dinner. And he says well, we're sitting on it. We're all looking in boxes, and he meant it's in the water.

JN: You have to catch it.

LB: We're going to catch dinner and then cook it. So that's what we did. We dug up clams and we found various fish, and that was dinner.

JN: Very New England, very resourceful, absolutely. That's a wonderful story. Is there anything else that you would like to get into the so-called transcript?

LB: Oh, geez, I don't know. The whole time at Albany has just been... I just finished my forty-ninth year in the classroom.

JN: That's incredible.

LB: One more year to go, and then I go into like a phase, well, I don't know, it's not a phased retirement, but I'll retire from formal teaching and retire from administration. No more faculty meetings, no more of that kind of stuff, and come and go as I please, but I still have... I mean, I just started a new Arctic meteorology project, with Dan Keyser as a matter of fact, and Ryan

Torn and Andrea Lang in Albany and a bunch of people, we just had a meeting last week in Monterey, California, it was a kickoff meeting for a potential five-year project, we've got funding, so okay, I can still be able to do some science and still have a few graduate students, but I'll just come and go as I please. But I may wind up teaching if say for a week I need to run a little informal seminar class, for a couple classes or something a week. Just on an ad-hoc basis.

JN: That sounds very genteel, not too taxing but still mentally engaged.

LB: I've had plenty of students. Over the course of almost fifty years you have quite the range of students in their abilities, and it's interesting to see how things have changed like that, and I think on the spectrum over the 50 years, you have to learn different teaching styles, because every student is different. Some of them you can joke around and say "that was pretty stupid, wasn't it?" and they would laugh and you'd have a big laugh at it. Other ones if you just raise your eyes they're crushed for the next six weeks. You gain basically a degree of experiential, I don't remember what the word is, but experiential degree in psychology, applied psychology on the job in terms of educating students, because everyone's different, and the strategies to maximize their potential are all different. You have to figure it out for each student, each student is different in that regard. I've taught students who were to the left of Karl Marx all the way to the right of Attila the Hun, so the full spectrum and range. Students from fifty years ago looked just like today, the same jeans and T-shirts, styles change and all that, but basically students from fifty years ago look like students today.

The positive change is, the students from fifty years ago were virtually all male, and virtually all white. Now we have substantial numbers of females. It's still not 50-50, but there's a substantial number of females and you definitely see much more diversity in the students, so this is a good thing. It enriches the educational experience.

JN: I think so, and actually, yesterday I interviewed a woman who said that she was mentored to a small extent by Joanne Simpson, and she said just seeing somebody who looked like me made all the difference.

LB: Yeah, that makes a huge difference, and people who don't have that perspective don't understand that, because people like me, white male, always just assume there will be something there. So you know what do you and until you're in somebody else's shoes, yeah. It's very very important for students who are not mainstream to see people that think like them or have their kind of background or whatever, that's very very important. So that's been by far the biggest change in the students.

JN: And a change for the better.

LB: Oh, absolutely.

JN: I also think that AMS has done, you can always do more, but they have done a lot to move things forward and make sure that people feel comfortable wherever they are, whatever they're doing.

LB: The scholarships from the AMS, undergraduate scholarships and graduate student scholarships, are very valuable. My only criticism would be there aren't enough of them, but hopefully enough money will come in during the course of getting ready for the Centennial.

JN: They seem to be doing quite well, and that's definitely one of the intended goals, is to get money for scholarships and actually I know from doing the history stuff that the history fellowship is the only unnamed fellowship, and they're working on that, because that's a tremendous boon to get \$15,000 for your PhD.

LB: Yeah. Yeah. I should make one more student comment, it's so obvious that you forget to make it, and that is, the students keep you professionally and personally young and intellectually invigorated, because they're curious about stuff and they'll ask questions that you hadn't thought about in a while, then it's like oh, that's a good question, I hadn't really thought about that for a while, and they'll ask about how something works, and why something works, so it forces you to go back and rethink about some old problems from new perspectives.

JN: That's good for both sides.

LB: Yes, exactly. I don't know how well students believe it, when you tell them "we learn from you guys just like you're learning from us, it's a two way street," I don't know if they really believe that, but it's absolutely true. That's what good students do, if you're connected with your graduate students very well, you can have that.

JN: I completely agree with you. You want people who are curious and don't know the answers.

LB: It's very good for a student to see that you're ignorant of things, it's good for their self-confidence that you're not this omnipotent person, if they ask a question, "I don't know the answer to that question, here's how we can go find out." So then it's a shared learning experience, a shared research experience and otherwise. That's how you teach people to be scientifically curious and it's okay to ask a question, you know, it's okay to say you don't know something.

JN: Absolutely, and that's certainly how I was taught, not in science, but it's true of any field. You have to spend a long time learning what you don't know.

LB: That's right, that's right. Every day I sometimes feel dumber when the sun goes down than when the sun came up, that's a negative work day. I go home and I tell Helen, you know, I thought when I went to work this morning I understood this problem, and I discovered during the course of the day that I don't understand this problem. So does that mean I should retire?

JN: No, it means you should be like Scarlett O'Hara and say tomorrow is another day.

LB: Yeah, it means I need to do some reading in the literature and do some deeper thinking...

JN: Right.

LB: Check the data and things like that, yeah.

JN: Right, absolutely, absolutely. Well, I'll ask you one last time. Is there anything else you'd like to bring up, or?

LB: Just it's been a very great ride, I'm grateful for the AMS and everything that it does.

JN: That is a wonderful note to end on.