NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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IN PARTNERSHIP WITH NOAA HERITAGE AND THE NATIONAL WEATHER SERVICE

# AN INTERVIEW WITH JOHN BOSSLER
FOR THE
NOAA 50th ORAL HISTORY PROJECT

INTERVIEW CONDUCTED BY
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TRANSCRIPT BY
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Molly Graham: This is an interview with Dr. John Bossler for the NOAA 50th Oral History Project. The interview is taking place in Fort Myers, Florida, on January 7, 2020. The interviewer is Molly Graham. Thank you so much for having me here. I'm so glad this worked out. Could you start at the beginning and say when and where you were born?

John Bossler: I was born in 1936.

MG: Where were you born?

JB: In Johnstown, Pennsylvania.

MG: I was curious about your family history and how they came to settle in that area.

JB: My grandfather lived in Saxton, Pennsylvania. He was a lumberman and ran a mill, and actually did very well. He contributed an opera house to that area – built it and donated it. But then the Depression came along, just about the time he bought a whole bunch of new equipment, and so he got hurt bad by the Depression. It broke his heart, and he passed. He had a lot of sons, one of which was my dad. My mother's background, I don't know much about. She was raised in the town, the city of Johnstown, but I can't tell you a story like I did for my grandfather. My father was – and this is important actually to my career – he became a surveyor and a self-employed engineer in Johnstown and built lots of things, mostly sewers and developments, and so forth. I was raised with that and liked it. He fostered my development in that area. So I went to the University of Pittsburgh in 1955 and graduated in '59 with a bachelor's degree in civil engineering.

MG: This was before you were born, but there was the Johnstown flood of 1936.

JB: There was one in '36, but there was a really famous huge flood in [1889], maybe. There's a book by a famous author, who wrote *John Adams* and *Truman* – David [McCullough]. He wrote a whole book on the Johnstown flood, the big flood, where two-thousand people died. The '36 flood was small compared to that flood. By the way, that was the year I was born.

MG: I was curious if it impacted your family's life or even your father's career as a surveyor.

JB: I don't think so, actually. The timing was such that it really didn't bother him tremendously. He remembered the flood. He was barely a baby born then at the big [flood]. I'll have to get the date of that flood. I should know that. For heaven's sake, it's very famous. Very famous. It went down as the biggest disaster in the country for many years. You have to qualify what kind of disaster because in 9/11 more people were killed; there were thousands killed in this disaster. It was a bad story. All these rich people – [Andrew] Carnegie and [Andrew] Mellon, all the people from Pittsburgh who had a lot of money built a very luxurious country club on top of a hill in Johnstown. They didn't maintain the dam front, and a heavy rain came. It broke the dam, and it rushed down through a valley and swept away all the railroad cars full of oil, which caught on fire. People were burned alive. It was a very, very nasty thing. David McCullough [was the author of *The Johnstown Flood*, published in 1990].

MG: Yes.

JB: Yes, you know him.

MG: I knew there were a number of civil engineering projects in the years that followed the ’36 flood. Did your father work on any of those projects?

JB: Not that I recall. No.

MG: Can you tell me more about growing up? Where did you live?

JB: Well, I was a normal kid in a residential area of Johnstown. I played sports, lots of sports. There was a ballpark right there, so I played baseball, and I played tennis. I did the normal things of a kid that age, nothing really for you to write about, I don’t think.

MG: You had an older sister.

JB: Yes. She just died.

MG: I’m so sorry to hear that.

JB: Thank you. She was ninety, going on ninety-one, and had cancer. She was happily married, had two children. I’m still missing her quite a lot.

MG: I bet.

JB: Yes.

MG: You mentioned your father fostered your interest in engineering. I was curious about how? Would he take you on the job with him?

JB: Oh, yes. By the time I was thirteen, I could set up a transit. Do you know what a transit is? Yes. A surveying instrument. I could set that up faster than probably anybody in the city because I was born and raised with it. My father wasn’t well-educated. When my grandfather died, my uncles vanished. They all went different ways. My dad stayed at home and took care of my grandmother and the family that was left – there were some sisters, aunts to me. My dad was always was resentful about that. He couldn’t get an education. One of my uncles ended up to be fairly noteworthy. He was a professor at Texas A&M. Earlier, he was an oilman in Oil City, Pennsylvania, but then he went to Texas A&M in his second career, so to speak, and became a professor in petroleum engineering there. My dad really coveted his brothers because he had to bring in money for everybody, and they all bettered themselves. Not that they didn’t work hard to do that because, in those days, things were tough. So by the time I was done with college at the University of Pittsburgh, I was really teaching my dad. That was good. The best part of that story is that he used to tell me – he said, “There’s an organization that is the finest in the world, and it’s in the United States. That’s the organization that does the supreme kind of surveying that you don’t know anything about. What we do here in this little town is nothing.

They really are the masters. That's called the Coast and Geodetic Survey [C&GS]." Well, later, I became the head of that. He never knew that. He was long dead, which is of great sorrow because he would have been the proudest person ever because he was very interested in that history. He would have been thrilled that I did that.

MG: Do you know how he got interested in surveying?

JB: I don't really. I would have been a little boy, so I don't know how. He really didn't have a job or an education. I would guess that there were people that he somehow made acquittance with who were developing land. Johnstown, at that point, was growing because of steel mills and coal mines. He probably got to know people who were developing land for housing and said, "I can do that for you." I'm guessing. I really have no idea.

MG: So was your father able to introduce you to the tools and techniques of surveying?

JB: Yes.

MG: I imagine they were a little different than what you would go on to use.

JB: [laughter] Oh, yes.

MG: Can you describe them at all?

JB: Well, sure. I have many in my basement in Ohio. These were crude tools. They were compasses that you used instead of a transit. By the time I was ten, we were using a transit, of course. But before that, they used compasses with chains, very heavy cumbersome chains that you measure distances with. Well, years ago, that all went away with electronic measuring devices first, and then finally today, GPS [Global Positioning System]. It's like an elevator operator; we don't need too many of them anymore. And we don't need surveyors to measure anymore because is a magical device. It really is. I had a lot to do with the development of GPS, too.

MG: I know. I'm eager to hear more about that. But I wanted to ask you about the war years. You were fairly young during World War II, but do you have any memories from that time?

JB: I remember my dad being too old to go to war, and I was, of course, too young to go. He talked about it every day – "Those poor guys over there," and things like that. It came right between us age-wise.

MG: Did you have relatives who served?

JB: Yes, but distant. So I didn't really know them.

MG: What were your interests and favorite subjects in high school?

[Tape paused.]

JB: I don't know how you'd lead into this at this point, but I went to Kiski [School], and there really wasn't anything to do there. You couldn't have a car. Girls were verboten; it was a boys' school. So I studied because I didn't have anything else to do. I got good grades. I was not dumb. Also, this is the big thing – if you got an A – I think it was an A – you didn't have to go to a night school class. I think it was 8:00 to 9:00, or something like that, maybe 7:00 to 9:00 at night. Well, that was hideous to me. I never wanted to do that. Everything was poised for me to do well, and I did. So I had really good grades. When I graduated from Kiski – it was just one year post-graduate school –I could have gotten in most schools anywhere in the country. I chose, because of money reasons, to go to the University of Pittsburgh in Johnstown. They had, like many schools, a campus in Johnstown, the University of Pittsburgh in Johnstown. It was only two years. Then I went down to campus in Pittsburgh and finished. By then, I had the habit of studying, and I knew what to do. The girl thing was okay. I had a nice girlfriend. I had my dad's car, and finally my own. So I did well. The Coast Survey came – in those days, that was very common – and interviewed me, as they did at many schools. They were after civil engineers, almost a hundred percent. Nobody else. That's changed now because there's no need for so many civil engineers as there is for oceanographers and the like. More information about the ocean is important now. Kiski saved my life literally, and I went to the University of Pittsburgh, and I graduated cum laude. That was the end of that saga of my life. It was kind of squeaky because it could have gone wrong. I don't tell that (secret) story, and I sure don't want it in here.

MG: It was off the record. So it's between us. You mentioned the Coast Survey would come to do interviews on campus, and they interviewed you.

JB: Yes.

MG: Did they offer you a position right away? I know you continued onto school after the University of Pittsburgh.

JB: Well, that education was for merit in the Coast Survey. In other words, I had worked – let's see. I came in in '59, and I went to Ohio State in '63, so four years after I joined C&GS, they sent me to [Ohio State] because I had done well in the Coast Survey and I showed interest in geodesy and geodetic science, rather than hydrography, which by the way, would have carried me onto various ships. I had ship duty and did that, but they wanted somebody in geodesy. So they said, "If you sign a contract for three years, we will pay your way to a school of your choice in geodetic science. Well, there aren't very many schools that focus on geodesy. At that time, there was really one that was the best, not only in the United States but worldwide, too, pretty much. That was Ohio State. So I went there. You didn't go there for a master's. You went there to learn geodesy. If you got a master's, good for you. The Coast Survey did not care about your masters degree. There was a director at that time at the Coast Survey, or maybe he was deputy, I guess. Yes, deputy, whose name was James Tyson. He liked me. So I could have probably said, "I think I want to do this or that," and he'd have made it happen. There was also a very interesting story, which changed the tide a bit. I had no intention of staying in the Coast Survey after I learned about it. I had a good professor at Pitt [University of Pittsburgh] that I liked very much. He had a robust company in downtown Pittsburgh in soil mechanics. His

name was A.C. Ackenheil. I liked the man. I liked the company. I liked everything about it. I was thinking all the time when I was in the Coast Survey, "I want to go work for this guy, and that company is just going to go gangbusters," and it did. But two of us, young commissioned officers, Charles Burroughs and I went to Hawaii and surveyed the islands together, which had never been done, believe that or not. At night, we went out, and we looked from one island to the other because it had a light on it. That's how you used to do that work before GPS. We worked hard. We worked really hard. I don't know why we worked so hard, but we did. At that time, there were two courses that a commissioned officer had to pass – CELNAV [Celestial Navigation] and PILNAV [Piloting Navigation]. They were very simple courses, but you had to pass them before you got promoted. So I said, "This isn't right. We worked all those hours," to Charlie Burroughs, who was my boss, by the way, at that time. I just talked to him here the other day. Anyway, I said, "This isn't right. I'm not doing it. But let's see how they think about that." So I wrote a telegram to H. Arnold Karo, he was the famous director of C&GS at that time. I said, "We've been working our buns off doing this job, and now we're late getting these courses done, and that's not right. I request" – I forget – "three weeks on Waikiki Beach" – that's exactly what it said – "working on these courses," which was at least partially true. In those days, we got per diem. Do you know about per diem? Yes. It was an outrageous amount to me. It was like fourteen dollars a day, which was an absolute fortune. So we got a cable back within two days that said, "Three weeks R&R [rest and recuperation] on Waikiki granted, Karo." I said, "I like this organization. I like this Coast Survey thing." [laughter] Anybody that would do that – there's heart in it, and there's good stuff in it. But I went to Pittsburgh, and I interviewed with Ackenheil, and he offered me a job of Vice President of the company. That was pretty good at age twenty-seven or eight, maybe. But I didn't take it because, really, of Administrator Karo – that one little thing, it mattered a bunch. So then I got into the Coast and Geodetic Survey and, after Ohio State, went through a bunch of work in Washington with a famous scientist by the name of Helmut Schmid, and he was doing satellite triangulation in those days, '64 to '68. I worked for him. I learned a lot, and I needed to learn more, so I said to somebody – I don't know who – I want to go back to Ohio State and get a PhD. "We're not interested in a PhD, but you need the knowledge, and we'll be happy to send you." At that time, I was well thought of, modesty aside here. So they said, "Do it." So I went back for two years. I had to sign a document that said, "You have six years commitment now." That was fine. By then, I was hooked to staying in. Nothing could have prevented me from staying in at that point. By the way, Charlie and I had a great time. We would get up early in the morning, and we worked on PILNAV and CELNAV until about noon. Then we'd hit the beach, and we played, and at night – I'll never forget this. A lot of rich families put their daughters over there for the summer. Well, there were like ten thousand girls and two guys. [laughter] So we went on dates left and right. Oh my gosh. It was one of the best times I've ever had.

MG: Can you walk me through, in a little more detail, your first few years with the Coast Survey? You were in Hawaii, but then in Washington.

JB: Okay. After I was accepted – they don't do that anymore, and I didn't think it was proper, but that's how they did it – the recruiter came. I said, "Okay. You are in the Coast Survey." They sent me to the Eastern Shore of Virginia, onto a field party that was measuring the water of the Chesapeake [Bay] for navigation purposes. The chief of that party was an old officer by the name of Howard Cole, and he was a very nice man. He stayed in a house that he rented. He

said, "You can stay with me and pay me part of the rent. I'll cook if you do the dishes." I said, "Deal." So I did that and stayed there, working there for about three or four months, then shipped me then to Norfolk, to the ship *Cowie*, C-O-W-I-E, which was an old yacht that Andrew Mellon owned and gave to the government. Imagine that! They used it as a working ship. You could never do that today. But I was on the *Cowie* a year or two. I don't remember exactly. But we surveyed the Potomac River and the Chesapeake Bay and that area. I liked the work quite a lot. It was fun. Then I was assigned to a geodetic field party. That carried me all over the country. Oh, boy. I really went all over. Three weeks at one spot, and that was it. Then to another spot. Those spots could be in Montana and then New York! Then they plucked me out of there for the Hawaiian job. So I worked in the field doing astronomic observations for a few years right around the '61, '62 timeframe.

MG: You mentioned your field service in Maine before we started recording. Is that what brought you there?

JB: That's exactly what brought me to Maine.

MG: Can you talk about the nature of the work? You said you would work at night. Can you say more about how astronomic observation works?

JB: Well, you have a very elaborate theodolite, not just one that would look at a light that was ten miles away, but one that looked up at the stars. They were complex. You went out at sundown, and you set this thing up. You had a log that you set angles on the instrument, and it was able to see the stars that you wanted to see. Then you tracked them. Now we get into pretty complicated geodesy, and I don't think that you would understand it. It was good for measuring points on the surface of the earth. That's what we were doing fundamentally. We worked until we got the observations of the stars, every night that you could see – sometimes it was cloudy. You recorded that, and you got home around one o'clock in the morning. Then you slept until whenever you got up, which, for me, I'm always up early, but the other guys weren't. Anyway, we met at the office, which was just a rented house somewhere. We computed what we measured. Every day that the stars were visible – no clouds – we did that, and we were measuring the coordinates, determining the coordinates of missile sites. At the time, it was quite secret. Around Presque Isle is an Air Force Base.

MG: Loring Air Force Base.

JB: Yes. Around it, all in a circle – I imagine they're still there – are these big holes in the ground, huge. Down in there is a missile. It was headed for Russia, really. Nobody knew that, but it was. So we were getting the coordinates of that point so that the missile could go from this point to exactly the point where it was supposed to go. That was contract work by the Coast Survey to the Air Force, or the joint services – Army, Navy, and so forth. So I worked on missile sites in Montana and all over the place. That's why we were moving constantly, wherever there was a base that had those sites, until the Hawaii job. Then things changed a lot.

MG: This would have been around the time of the Cuban Missile Crisis. [Editor's Note: The Cuban Missile Crisis of October 1962 occurred after the U.S. discovered that the Soviet Union

was installing nuclear missile sites in Cuba. As a result, the U.S. and the Soviet Union engaged in a thirteen-day standoff, until the Soviet Union agreed to remove the missile installations in exchange for American military concessions in Europe.]

JB: Yes, we were aware of that and thinking, "I wonder if they're doing the same thing over there." In other words, getting their locations so that they could bomb this way, send the missiles to the United States, and they were. So our counterparts were there doing the same work we were doing. Yes, but we had our job to do. We did it. There was no magic. We knew what we were doing.

MG: Were you doing this as part of what would become the NOAA Corps [United States Coast and Geodetic Survey Corps]?

JB: Yes. Well, the NOAA Corps is a very strange thing. Really, it is. I don't know why it was set up that way, way back in [Thomas] Jefferson's day. He established the Coast and Geodetic Survey. I think it was because we had ships. You're not on the bridge of a ship to negotiate whether or not you should turn right twenty degrees. You don't negotiate. You tell somebody to do it, and they do it, period. So that's a command thing, and that's why – well, there are naval captains – there's a Merchant Marine, which is quasi-civilian, quasi-military. The officers drive ships, and so do private pilots. But, most of the time, ships are manned and driven by commissioned officers. Certainly, that's true for every service – the seven services that exist. I think that's why the Coast Survey has officers. I don't know really, Molly. And it's so tiny. How many officers are there? Three hundred officers? I guess – something like that. Then the sister organization is the public health service, and that's a very small organization made of medical people. Then you have these behemoths like the Army, the Navy, the Marine Corps where there are thousands of people. Nobody's ever heard of us – almost nobody's ever heard [of us]. There have been administrators of NOAA who have tried to do away with the Commissioned Corps. I have so much of my body and soul in the NOAA Corps that I feel so loyal and things like that about it that I don't know if I could be objective at all. But I do think it's strange no matter what. I don't understand why it was created, except a ship is supposed to have somebody, an authority, who says, "Turn right twenty degrees," and there's no argument – you do it. You need that. I've needed that aboard a ship. If that person hadn't done that, we would have crashed. So it's a real thing; it's not imaginary. But these two services – there are five armed services and then two uniformed services. The seven have things in common, but these two are outliers. So I'm not quite sure what I think of it yet today. That probably shouldn't be told in your report probably because that's my thinking about it.

MG: Well, that's what I'm interested in hearing.

JB: [laughter] You got me.

MG: What did you know about the Coast Survey before you came on board?

JB: Well, what my father had told me back in the surveying days working in Pennsylvania.

MG: Can you tell me more about your time on the *Cowie*?

JB: We were stationed in Norfolk, and we surveyed the Chesapeake Bay primarily, believe that or not. I don't know why there weren't better charts for it. Seems like it will be a logical place – a lot of sea traffic out of there, too. It goes the whole way up to Baltimore and then out into the ocean. I don't know why it wasn't surveyed ad nauseam if you like. I don't know. But for some reason, they wanted it surveyed again or updated. So I spent two years on the *Cowie* doing that. That was fun. I liked the work.

MG: How many people were on that ship?

JB: Probably about six officers and maybe ten civilians. Very few. It was very small. It was a yacht. It was Andrew Mellon's yacht.

MG: When you were on these field teams throughout the country, how big were those teams?

JB: They were just five people, including me. So four others.

MG: Can you tell me about when you first met Charles Burroughs? His is a name I hear quite a bit when I read about NOAA's history.

JB: He's a history buff. I first met him at the beginning of the Hawaiian job; he was in charge of that job. That was because he was in the Corps before I was. So he outranked me by a year. He came into C&GS a year before I did. We split up the work. We worked together on surveying the Hawaiian islands. He has a book store, actually – a little book store.

MG: Currently, he runs a bookstore?

JB: Yes.

MG: Where does he do that?

JB: I don't know. [laughter] Ask him.

MG: I've not been in touch with him before.

JB: He's a nice guy, yes.

MG: You mentioned doing some work for Helmut Schmid. Can you remind me what that work was for?

JB: That was the Coast and Geodetic Survey. Helmut Schmid and Wernher von Braun – does that name ring a bell?

MG: Yes.

JB: Well, they were all over in a little town in Germany called Peenemünde. In Peenemünde, they learned faster than the U.S. did about missiles. They had V2 rockets that would take off and bomb England. The V2s were getting very solid and controlled. It was very scary. Von Braun and Helmut Schmid and about twenty other German scientists created this weaponry. Thank God the war ended when it did because if they had had this fully operational, why, it would have been bad – I don't know who would have won what. Anyway, when the war ended, these German scientists went various places; Von Braun went to Huntsville, [Alabama], and was very instrumental in the Space Program and everything else, and Helmut Schmid went to the Ballistic Research Lab [BRL] in Aberdeen, Maryland. He dealt with and was knowledgeable in analytic photogrammetry, which is different than taking a picture. When I went to work for him, fresh out of my master's degree at OSU, that's what I did. I worked on what was called the Satellite Triangulation Program, using photogrammetry. I was not as smart as my peers in our laboratory. That was one of the reasons I wanted to get a PhD because I didn't like that position of not knowing as much as my buddies. One of them, the last one of them that I worked with – not the last, there's still one alive. Does this name ring a bell: Bernie Chovitz?

MG: No.

JB: No? Well, he lives in Chevy Chase. He must be a hundred, but he's still alive. He worked with me there in that laboratory. But the other guy that just died, Bud Hanson, he lived in Rockville, Maryland. He was a very good friend of mine, a very good friend. We worked together for years in that lab, and I know him on a social basis. People are dying all around me here.

MG: That's so tough.

JB: Well, where were we? I don't know.

MG: I'm not sure either. [laughter]

JB: [laughter]

MG: You eventually came to Washington, D.C. What brought you there? The work with Helmut Schmid?

JB: Well, after my master's, I went back to Washington, and started working with Helmut Schmid. I was there for a long time. I got back there in '64, and I left there in '68 or '69 – probably '68. At that time, I went to a NOAA ship in Seattle. C&GS has this notion that you have to do sea duty, and you have to be on a ship for a certain period of time. I was punching tickets in my career because this was something I didn't care about and didn't want to do – the ship work. I wanted to do more geodesy. So I went from the lab of Helmut Schmid's and my buddies that I just talked about to Seattle, where I got on ships and stayed there and worked in Alaska all the time that I was there. We were there two and a half years, I think, in Alaska. That's when I went back to school to Ohio State to get my doctorate.

MG: Tell me a little more about your education at Ohio State, the classes you were taking, and any professors that stand out to you.

JB: Well, actually, in the lab I talked about, I learned a lot. So when I went back to Ohio State, I was knowledgeable about geodesy – however, when I went there the first time, I had been out of school for four or five years. This geodesy discipline was totally different from civil engineering, and I was feeling – "Oh my gosh, what have I done? I can't do it." But I did do it. It was a struggle. The other leaf is that when I was done with the geodetic lab, I knew more than some of the profs at OSU. So I was a leader at OSU. I got several awards there for what you get awards for. [laughter]

MG: As a graduate student?

JB: Yes. There's a famous man, a geodesist, a Finnish man called [Veikko Aleksanteri] Heiskanen. He has two awards in his name, and I'm the only person that I know of that has both awards. One, I think, is a student award. The other one is after you're not a student anymore. Anyway, I got both of those awards. That was in '73. I came back, and we started the big job of – these are words that might be hard to understand – the readjustment of the North American Geodetic Datum. Allen Powell was the Director of C&GS. He said, "You're in charge of that." It was a big, huge job. Huge. But, it was a hoot. That was great. I loved that. I hired a whole bunch of really, really good people. We were the best in the world. That's not a small statement because Europeans, they're older, so to speak, and their country is, and so forth. Their heritage is from men like Carl Friedrich Gauss and [Isaac] Newtown. We didn't have many Gausses and Newtowns here, at least at that time. In any event, we were number one, in my opinion. There's no doubt about it. I'm very proud of that. NGS [National Geodetic Survey] has me come back every once in a while. They had me back here a couple of years ago. I gave a talk. Anyway, I was the head of that, and we finished that North American Datum [NAD] task. Then I became the head of the Coast Survey. I was there only three years. I was beat up by government work. There was nowhere to go upwards, except in a very political kind of a career – chief scientist of NOAA or something like that, which didn't appeal. I had a lot of job offers at that time, one of which was to go back to Ohio State and run a new center that they created. They offered me a full professorship with tenure, which is – that's a big honor because they don't hire people and give them tenure at the same time, but they knew me because I had been a student there two times. So that resulted in an eleven-year career at Ohio State. I taught and ran a research center for those eleven years. Then that was forty-some years in the workforce, and I said, "That's enough." Now I just mess around. [laughter]

MG: How did things change organizationally for the Coast Survey when NOAA was formed in 1970?

JB: A lot! There were two changes in C&GS. One was with ESSA [Environmental Science Services Administration]. We were ESSA, E-S-S-A, three or four years before NOAA. I thought each of those diminished the role of C&GS. Let me think of a good example. C&GS back in, say, 1950, reported directly to the head of Commerce. In '70, NOAA was created. In '70, you went through NOAA – the C&GS guy reported to the head of NOAA, and there was a bunch of people in between, not organizationally maybe. What was next? There was something

else stuck in there. The head of NOAA reported to the head of Commerce? I think so. But at least there was one more organization between the Coast Survey and the head of Commerce. That was called NOAA. So I think it did diminish. Plus, in honesty, it's what I told you before – you could write this in a way that wouldn't be negative, but it might take a little doing. There isn't a need as much as there was for the products of C&GS. Okay. Let's take that one by one. First of all, a very important thing is a nautical chart. You have to have a chart, and you have to have the bottom – the topography of the bottom of the water because in Alaska, for example, the bottom may be a hundred feet deep, but right beside it, ten feet away, there will be a spike in the underwater that will go up to only ten feet deep. So if your ship draws twenty-five feet, you're going to crash into this peak. So those things, even though, they had been determined and are still determined a lot; they're still improved upon. But I think that the need for nautical charts is not as great.

MG: Is that why it's wrapped under National Ocean Service now?

JB: Yes, that's probably correct. That's probably why it is. I really actually didn't have that thought, but that's probably right.

MG: I get confused with the different office and agency names. There's Coast and Geodetic Survey, and the National Geodetic Survey. Were those two separate organizations, or did one turn into the other?

JB: No, that's a hierarchy. In other words – do you have a piece of paper that we can use? The back of this? Okay. Here's DOC [Department of Commerce].

MG: At the top.

JB: Yes. Then there's a bunch of big organizations, one of which is NOAA. Then there's a bunch of different organizations. One is NOS [National Ocean Service]. Does NOS still exist?

MG: Yes.

JB: Is it the Coast and Geodetic Survey?

MG: The National Geodetic Survey became part of NOS. [Editor's Note: The United States Survey of the Coast was formed in 1807 and renamed the United States Coast Survey in 1836, and performed geodesy, nautical charting, and topography for the United States. In 1878, the Coast Survey was renamed the Coast and Geodetic Survey, and then became part of NOAA in 1970 when the agency was formed. In 1983, the National Ocean Survey came under the new National Ocean Service, one of NOAA's six main line offices, and renamed Office of Charting and Geodetic Services. In the 1990s, the Office of Charting and Geodetic Services was renamed to the former Coast and Geodetic Survey. In the mid '90s, the Office of Charting and Geodetic Services divided into three separate offices within the National Ocean Service: Office of Coast Survey, National Geodetic Survey, and Center for Operational Oceanographic Products and Services.]

JB: Yes, but that's going down another layer. We're here. The question is – at one point, they flip-flopped about this a lot, and it was during my time, and it was stupid. C&GS, the old Coast and Geodetic Survey, was NOS.

MG: National Ocean Survey.

JB: Yes. I don't know if that's true today or not.

MG: Now they are the National Ocean Service.

JB: Well, that's okay. That's just a name. Where is C&GS?

MG: Under NOS?

JB: No. Under C&GS is NGS.

MG: That helps me. Thank you.

JB: Well, we're not sure of this, at least I'm not. I was in charge of this [Coast Survey], but I was in charge of this [National Ocean Survey] in a way before that. Right. I was in charge of this [National Geodetic Survey] long before that. NGS was the organization I thought was the best in the world of its kind.

MG: The National Geodetic Survey. Can you say more about that and how you made it the best in the world?

JB: Yes. That was interesting. I had just read the book called *In Search of Excellence* by [Tom] Peters [and Robert H. Waterman, Jr.]. What a really great book. It's fascinating. They studied all of these great organizations – Procter & Gamble, General Motors, General Electric – and they said, "There is no recipe, and almost all the excellence comes from the head guy." You should read that book.

MG: Yes, I'll write that down.

JB: *In Search of Excellence* was very popular, and a very famous book [published in 1982]. Now, it occurred to me that, at this level, the responsibility of doing that was mine. There was no way out of it. I valued bright people. I just really, really valued them. So the first thing I did was convince Admiral Allen Powell that we needed to – there had been no hiring here for years and years. Just a bunch of old guys. I said, "We need fresh blood, new blood, new mathematics, new everything. If you don't give me that, it won't work. If you give it to me, it will work." So whatever sales ability I had, worked. He said, "Okay. Here's fifty positions or whatever you need. Go get them." So I did. I got guys like Richard Snay – you don't know these people probably – Dennis Milbert, all these PhDs in math and a whole lot of fine science. They came. Most of them are now retiring about as fast as you can name them. The Europeans were way ahead, way ahead. So I created a visiting scientist program, where we would pay them a salary and their travel over and their room and board. They would work for us for a year. I knew

enough at that point – I had a PhD myself. I knew enough to get the best of the best. We did that. So we had this visiting science program and they came, one at a time. They would come over, and they were – I picked them – highly specialized in this and this and this. So they dumped their knowledge, gave lectures, wrote papers. Generally speaking, they absolutely loved it – all of them. That, combined with the hiring of the new people and a sense of urgency and revitalization, we did it. We marched right to the completion of the NAD83. We'd create conferences. We'd do all kinds of things. It was "fun days."

MG: Was one of the visiting scientists Peter Meissl from Austria?

JB: Yes, how do you know him?

MG: He came up in my research for this interview.

JB: I should have known that. You're a smart girl. In what context?

MG: You gave a talk, and you mentioned him as one of the visiting scientists.

JB: He was a brilliant mathematician. We had a problem that I thought was a problem but really didn't turn out to be. He proved that it wasn't, which was really what we wanted him to do. But he was at our home many times. I played a little game with him. I would beat him every time. He was so upset. It was a little game – Sandy would know. Anyway, he died. He and his son got killed on a mountain, a hiking trip.

MG: I read about that. It's horrible.

JB: What a loss. What a loss. Well, many like that, but few like him. Peter was a superstar. He was very quiet, didn't say much, calm, gentleman, good guy. But there was also Helmut Moritz. The best of the world in geodesy, and he came to our door, and our employees were thrilled with the chance to work with him. By then, this program grew. So finally, the last guys that came in, we were better than they were. That was really great. [laughter] I think it's still very well known in the world.

MG: Oh, yes. Peter Meissl had written a seminal report, but I can't remember what the topic was.

JB: Well, that was the problem that I thought we had, which we didn't. We were solving – if you have two lines of equations like X plus 3Y equals four. The next line is 2X plus 7Y equals six. That's two equations with two unknowns, X and Y. So you can solve this set of equations, and then you come out with the answer that X is three or something. We had a million equations and a million unknowns. In those days, computers were just starting. I was worried since there's a thing called roundoff error. You can get a garbage answer, totally wrong answer if the roundoff error increases with every step you take, and it moves – in other words, if X is – the example is too easy here, but it's 2.831. Okay. If this one should really be a two, but you rounded it off because the next number was a five, so you didn't know whether to make it a two or a one, then that's roundoff. If you pick the wrong one, and that accumulates, and the number

of equations that you have really makes it tough to do, then these answers, these numbers get wrong. They grow wrong. I thought, "Man, we're solving all these equations. When we're all done, the answer won't be right, and we have wasted these years. It took years to do this job." I thought, "Well, Meissl could probably tell us with statistics," and he did. He said, "No problem. Just do what you are doing." It was great. He was a wonderful guy. I was really depressed when he died. That was terrible. He wasn't old.

MG: And to lose a son and father at the same time.

JB: Yuck.

MG: What was the application of all of these equations? What did they correlate with?

JB: Right. You were solving for the latitude and longitude of every point there was in the database. If you go out here, and you and I go for a walk, I can show you a monument in the ground. I will know the exact coordinates of that monument. You need that for all kinds of things. You don't maybe, but people do, people who make charts or fly airplanes. They need to know what the coordinates of those points are, and that was our job. But as I say, it's now become very easy to do because you have GPS, which is a fabulous instrument.

MG: It's revolutionary.

JB: Absolutely. I once did this, and it was really a fun day – I had a lot of graduate students in the Center for Mapping. I had a big conference room, real nice. I grabbed all the students I had. It was noontime. I said, "You go in the conference room, and you come out at five o'clock. You tell me at least ten ways, but if you can make it fifty, that's great, that you could use GPS. But you can't use applications to measure things because that's what we do, and we already know those things. We know, and we created it to do that, so those applications are out. But you can do other things. Tell me other things." Oh, what wonderful, wonderful answers they provided. It just shows how wonderful the minds of young aged people are, and how creative. Here's some of them. "We'll make a bomb that won't explode unless it hits the exact target." "We'll be able to track our sons and daughters at night to see what they're doing." That was hysterical because they were all the age of the people that should be tracked. [laughter] They said, "We won't ever have to measure for a first down again." They were just beautiful. I published that somewhere. I didn't keep a copy of that, I wish I had Almost all of these things are true today. You can do all those things. [laughter] That's why it's revolutionary.

MG: And GPS uses all the data that you helped gather and assemble?

JB: Oh, yeah. All the time. Every day.

MG: You mentioned the North American Datum, NAD. That was a really big part of your job.

JB: Yes, most of what we have been talking about relates to the NAD.

MG: There was also a 1927 datum.

JB: Yes.

MG: What was captured in that?

JB: Well, the same stuff, but we didn't have GPS. Second, the number of points that were involved were far less. There's something like a million triangulation stations today. I don't think in the '27 datum there were more than sixty-thousand. I'm guessing. I used to know those numbers, but I don't anymore. But that's the difference. The country was only – well, it was a – well, now it was almost a hundred years ago. [laughter] So there wasn't as much data.

MG: So, your datum was to capture 1927 to 1983?

JB: Yes. Plus, we included all those old points too. You'd have to do that.

MG: Is there another datum that captures 1983 to the present?

JB: Oh, yes. That's NGS's favorite hobby now. I think it's silly. The reason I think it's silly is that not that – I did the '83, and I don't want anybody else to do it anymore. That's not at all the story. But GPS again – it annihilates the need for all this old-fashioned stuff. It is a monument. If I put my phone down here – here it is. It has GPS in it. I know the coordinates of this point right here, almost perfectly. So what do I need a stone in the ground for? [laughter] But they still do it, and they do related things at NGS. There's a bunch of bright people still.

MG: I know you hired a number of folks, but I also read you used prisoners to help with the data.

JB: Yes, that was cool. I once got an award for that early on, way back. Remember, I told you I was on the ship *Cowie* in Norfolk. Now, what you did in the good weather is you went out on the small boat, and you had a thing called a sextant, which just measures an angle. You had a leadline when I first started work, but then finally a fathometer, a "sound device" that measured how deep the water was. You went up a row, turned around, and came back in a new row. So you had a basket of information about the depth of the water and where that depth was.

MG: I had asked you about prisoners. First, that was a job you did when the weather was inclement. You began on a piece of paper that was hard and strong. It's called a boatsheet. But it went out every day and water got on it, coffee, and whatever. So it looked kind of ugly, and it wasn't accurate because you were doing it out on the water, and the boat's going like – so after you did that, then you made something called a smooth sheet. You had the boatsheet, and then came the smooth sheet. [laughter] The smooth sheet was real nice and pretty. The soundings that you took – if you took a sounding at this point, right here, for example, at two o'clock in the afternoon, and you did it at three o'clock in the afternoon, would it be different? It would be quite different because the tide makes the water higher or lower. So at 3:00, it would be higher. A chart has a common datum in it, not one at 3:00, one at 2:00. Can you imagine? "Well, what time is it?" So you have a common datum, usually something like mean low water, which has a fancy definition – doesn't matter – and you "reduced" the sounding. If you measured the depth

and it was two-whatever – feet, meters, fathoms – doesn't matter. Then you measured it at 3;00, you reduced it and other sounding at two o'clock or whatever time that was to mean low water. Well, now in Norfolk, in the winter, this group of handsome, smart civil engineers sitting around subtracting numbers – that's what they did. They subtracted numbers. Well, I had about two weeks of that. I said, "No." So I thought, "What can we do? There's got to be people who would really even like to do this, but there would have to be something wrong with them, maybe 'smaller brains.'" Who were they? So I figured this thing out; certain handicapped people, mentally retarded, would be good at this. Well, I asked the captain who was there in Norfolk – Red "Emmett" Sheridan was his name. Wonderful man. Committed suicide later. I have no idea why. I said, "Captain, can we try something? This is really terrible stuff for a graduate civil engineer to do all winter long. I don't want to do it, and none of those guys want to do it. We'll get some handicapped people, teach them how to do it, see if they can do it." We did that, and it worked like a champ. If you used a different tide reducer at different times, and you had to, at two o'clock, for example, you'd subtract one foot. At 2:15, you'd subtract one and a half feet. So you had a scale that showed you how to do that. Well, when these retarded men came to a tide change, a tide reducer change, where you subtracted a new number from the numbers you were using, they were intensely excited. "Wahoo, we got a new tide reducer!" [laughter] It was hysterical. To us, it was: "Oh, god. Okay. You have a new number." This became real successful. Everybody wanted to come over and subtract numbers, and have the reducer change on you so that you had a new number. Anyway, it worked. Now this related to what other story?

MG: Using prisoners as a workforce to help with the datum.

JB: That's it. That's it. Yes, very good. I never put those two together until now. But they are together. I probably remembered that. We were typing data on a keyboard to get directions to a monument, so you had to have a description of where the point was. We called it a description; it showed how to get there. So it would say, "Start off at Seven Lakes guardhouse. Go south down 41 ten miles. Turn right. Blah, blah, blah, and you'll get there." So you just typed this. It wasn't in computer-readable form; it was just written, so you couldn't use it in a computer, but we wanted it in a computer because sometimes the mark changed. So somebody said to me, or I figured it out, that we could use prisoners to key in these descriptions. We did that, and it was great. They did fine. Would you rather sit in jail on a stool and look at the wall or type in a description?

MG: Type. I might borrow your idea and have some prisoners help transcribe these oral histories. It's a great way to learn about history.

JB: You've got something there. No kidding. Anyway, that was that. It was a wonderful program. Everybody loved it. The prison loved it. The prisoners loved it. We loved it. I don't think we paid them much.

MG: And didn't you screen some of them to make sure their work was accurate?

JB: Yes.

MG: How did that process work?

JB: I don't remember much about it at all. Yes, we did do that, though. I don't know. We came up with a process to do quality control. I don't remember how it was, but we filtered them so that we wouldn't have trouble with them.

MG: I think you checked their work and would retain the ones whose work was accurate, and let the others go. For the folks that were handicapped, were they institutionalized somewhere?

JB: Yes, down in Norfolk, they had a place for them. Mind you, that was – oh my. Let's say I was twenty-five – close to sixty years ago.

MG: Did you get a sense of the conditions where they were institutionalized?

JB: I remember it wasn't good.

MG: Did you want to say anything else about that?

JB: No.

MG: Which facility did the prisoners come from?

JB: There was a guy in charge of that description conversion from hand typing to computer reading. His name was John Spencer. He may still be alive. He used to go there, and he was the key guy that told me about that. It really wasn't a big, big thing, but it was a good thing.

MG: Did you get to know any of them and hear their stories?

JB: Not that I recall.

MG: I learned about this from the transcript of a talk you gave. In the same talk, you outlined the different challenges you encountered with the datum. You broke it down into technical problems, data management problems, and user problems.

JB: I'm scared of you. You may know lots of things about me. [laughter]

MG: [laughter] Something you said about the data management problems was that you would wake up in the middle of the night and worry that the building would burn down with the data inside.

JB: I did do that. So what we did was we put the data in different people's houses, which wasn't really perfect.

MG: What if their houses burn down?

JB: [laughter] Yes, that's right.

MG: I think you said Gary Young and Libby Wade kept data in their homes.

JB: Yes, absolutely.

MG: They were on the team?

JB: Yes. They were NGS employees. Two good ones.

MG: All of this work was being done out of the Rockville building?

JB: Yes.

MG: Where were you living at the time?

JB: In Olney. You mean my personal home? You're not from that area? No. Okay. There's a suburb called O-L-N-E-Y that is not too far from the building where I worked.

MG: There's a quote from this talk you gave that I don't understand. You said, "Your new paradigm for interrogating the CORS stations and computing velocities and positions 24/7, 365, and being able to pass that to the users is the neatest thing that I have seen in my career in geodetic science."

JB: Well, there is a recent retiree by the name of Richard Snay. He's really a neat guy. He had a PhD in math. He solved one of my biggest personal problems with these little soap derby cars. You have a son?

MG: A daughter.

JB: She wouldn't know, but they had these soapbox cars that the kids made, and they raced each other. Anyway, we wanted my son to compete in this race with his car. Anyway, it became very complicated. I came in to work near the time of the race and asked Richard Snay to chat. I said, "Richard, I got a problem. Somehow, I know this can be solved." He took it away. He came back in about ten minutes. He said, "Here it is." I thought, "Oh." Velocity is not the perfect word for describing movement of the points on the surface of the earth, although they do move. They move because maybe there's an earthquake, and that shoves the land somewhere. Maybe there's a tsunami, or maybe somebody moved them – dug them out for some reason and moved them. A farmer may not want them where they are. So when it's moved, it's theoretically a velocity, but I don't like that word. That's probably my word, too. It's not really appropriate. Anyway, Richard developed algorithms, formulas, whereby the movement of monuments was part of the information we stored. You would store its coordinates today, and then ten years from now, when you measured again, maybe it had new coordinates because of an earthquake. So you could say, "That thing moved at two feet per year," or one inch per year. So that was its velocity, one inch per year. Instead of sixty miles an hour, it was one inch per year. He did that in an area where they were moving, which is California primarily because of the land motion, San Andreas fault area. So I really loved that. We had a new parameter, a new thing to say

about that point. It had these coordinates at this time, but now it has these coordinates, and the velocity is this. I think that's what I was saying there.

MG: Why was it so "neat" to you?

JB: It was so neat because, years before, there was no such thing. We had the coordinates originally, and that's it. We probably didn't realize they moved, nor could we ever tell, and now we can tell.

MG: This was a couple of years after you left, but there was also the National Geodetic Vertical Datum of '88.

JB: That was the same one when I was there. It didn't get as much publicity and prestige, if you like, as the horizontal datum, but it was finished. Charles Whalen was the person who was most important in it. He was the champion of the vertical datum project. A vertical datum is easier to refurbish, so to speak. It only has one coordinate – height. A horizontal datum has two or three, depends on if you're in the 3D world or 2D world. There's many more vertical points. Why wasn't it –? I don't know. I had a hard time. The scientists in the organization, in NGS, at that time, didn't want to give poor Chuck any money to do that. "We don't care about that. That's vertical datum stuff." We did care about it. It's very important. That's interesting. I don't know the answer to that, why it took second place, so to speak.

MG: I don't know if this is useful, but I have a list of historical milestones of the Coast and Geodetic Survey. [Editor's Note: The source for this next section of the interview comes from the following National Geodetic Survey webpage, "Milestones of the Survey," found here: https://www.ngs.noaa.gov/web/about_ngs/history/milestones.shtml.] Instead of listing them one by one, could you look over this list and see if you have a story or reaction to any of them?

JB: You do good work. The first couple are the things I talked about, the astronomy.

[Telephone rings.]

MG: You're getting a phone call. Do you want to take a quick break?

[Tape paused.]

MG: You were talking about the first few items on that timeline.

JB: Right. You were saying you didn't know about astronomic – this refers to that. That's all. Is your history covering what organization?

MG: This is for the Coast and Geodetic Survey.

JB: Well, that's appropriate because the Coast and Geodetic Survey includes geodesy; hydrographic mapping, which is called hydrography; and aeronautical charts, which are called

aeronautical charts – that's all. Now, we made those three products, but they split in the organization about 1984, and they called it the Coast Survey.

[Telephone rings.]

[Tape paused.]

MG: We're back on.

JB: I was just thinking about something I wrote. I just got a Christmas card from my coauthor. There's a guy in the Canadian Geodetic Survey by the name of Mike Pinch. Mike and I wrote a treatise on geodesy – I think the title was *Geodesy in the Twentieth Century*. It covers the important things – only in geodesy – for that period. But it's a pretty good piece of work. But it does not cover C&GS. It would only be NGS. But I think maybe you should get that and you should take the geodesy parts of that, and put a framework down. Then, add to that the hydrographic and aeronautical – major technical changes. You would have very good stuff there, but how would you get the hydrographic data. Really, the aeronautical is nothing more – it sort of doesn't count in the big picture, even though you don't take soundings with an aircraft. There's a guy by the name of Bill Hazelton. Does the name ring a bell? No. He was a professor at OSU, and he and I wrote the first all-digital book on leveling, and it's for sale. You can buy it for nine dollars. But it doesn't have really anything to do with C&GS, except that they're a formidable organization in the milieu.

MG: I thought this timeline would give us some contextual institutional history.

JB: Well, you have to be careful with some of this stuff, too. Really, we were using GPS long before '85. For sure, I think you should – it's required reading that you read this history by Pinch and Bossler, or Bossler and Pinch. That is in a book called *The History of Cartography*.

MG: Okay.

JB: Yes. Fool around with that on Google. I'm not sure that name is perfect. It really just came out not long ago. But the authors' names are Bossler and Pinch. That should do it. [I see the name] George Lesley [on here]. That's funny.

MG: Who is that?

JB: George and I worked together out in the field about 1963. Here it says, "George Lesley installed a ten milliwatt laser in an EDMI [Electronic Distance Measuring Instrumentation], creating 'Big Red,' able to routinely measure distances in excess of fifty miles."

MG: What does "Big Red" mean?

JB: He just called it "Big Red." They took a commercial geodimeter, and they added a more powerful laser. I thought we were using lights back then. The addition just added a very powerful ten milliwatt laser. At that time, that was a big deal. That's what made it "Big Red."

because that's what made it the light source. I worked with him out in the field a lot. We did fun stuff, testing out EDMI, Electronic Distance Measuring Instrumentation. I don't know whether George should get his name in here, but that's fine with me.

MG: There's a lot of terminology that I'm not familiar within this timeline, which is why I was having a hard time formulating questions based on it.

JB: Yes. I might have a different opinion about what's really an important milestone associated with these different events, and a different list. I might have a different list of what's important. But that would take a long time. Basically, rewrite this. I suppose if somebody said to you, "Molly, can you give me a list of important events, not the list, but a list of important events associated with C&GS from the period 1950 to present, you could say, 'Yeah, I can do that, but I don't guarantee you that these are the ultimate important things, but just important things.'"

MG: Let me give you an example. It says, "In 1963, the first operational multibeam sounding system was installed on the *USS Compass Island*." So I want to know what is a multibeam sounding system, what else that ship did, where the ship went to, and who was involved. But you're right; we could be here until midnight.

JB: Yes, that's a lot of stuff. Each one of these is something pretty important, if not ultimately important. There's a lot of stories associated with these things. Plus, prior to 1950, I don't know anything.

MG: So, my list started in your time.

JB: I see. Well, that makes sense. That's probably something I can do. Unless this is a really important part of your work, I don't want to do it. [laughter]

MG: That's all you need to say. Okay.

JB: It's a long deal here. Let me try to get one here.

MG: Maybe one that relates personally to you and your work.

JB: Prior to about 1980, bench marks were made of – about four-inch – brass disks which had a three to four inch stem attached to the middle of the back of the disk. The disk and stem were usually set into wet concrete, and the concrete was allowed to dry. The concrete was usually a three-foot-deep block about twelve inches by twelve inches. A level rod used by surveyors, both federal and others, was placed on the top of the disk, whose elevation was known or was being determined. A problem, throughout the years, was that the entire block could move, being subjected to earth movement, frost, etc., both natural and manmade. I asked a young officer, LT Rich Floyd, to design a new mark that did not move or was much less likely to move. After doing significant research, he produced a much better design composed of a stainless steel rod, about 9/16 inches in diameter. A surveyor drove this rod to refusal – say, about a eight feet, and could be attached to identical "extension" rods. NGS still uses these rods today.

MG: I think about someone listening to this interview in a hundred years and wanting to understand how the technology and techniques developed and changed. The next item on this list is about the transition from analog to digital processing, and that sounds like a significant advance.

JB: Oh, yes. That is. Just that one thing, let me show you what it's all about. Prior to the (NAD?), there was a brass thing, a disk this big around literally, that thick.

MG: A half an inch?

JB: A little less. Around here, it said, "U.S. Coast and Geodetic Survey," the date – 1932, whatever – and this was true for – there are two kinds of mark. One is a horizontal control mark. The other is a vertical control marks. These are also called benchmarks. These benchmarks didn't really have a pointed thing to put the – you put a rod, a wooden rod or stainless rod on this thing, and measure – it was like a ruler, exactly like a ruler. So you measured the height of this tiny little point by putting the rod on. It didn't have that. You just put it on this brass disk, which was very bad first of all because there wasn't a definitive point. Second, these things were, like we said, thin, and they moved. You could put this in – it wasn't supposed to, but you could put it in a rather large rock. What Rich did was he found that a long stainless steel rod could be driven, that means hammered down until it stopped. You hammer, and nothing would happen. So it hit a rock down here or something – "driven to refusal" – that's what that phrase means. The end is rounded, so that particular point was useable. It probably should have been a little peak, but this was good enough. There couldn't be a tenth of a millimeter difference if I set the rod on there or if you set the rod on there. So it's okay that it's rounded. But this is a new benchmark. I guess that's important. It's in your list. I'm just a little confused about this thing, but I think you will get unconfused and be better off if you read that. That thing is written – *The History of Cartography*, which is a bad name for it really. It's written like, "This thing happened." Some of the same things you have there, but an explanation of them and not as many of them.

MG: That sounds helpful.

JB: Yes.

MG: Something else on this list that I wanted to ask you about was about when, in 1972, women joined the Corps. How did that come to be? And what impact did it have on the NOAA Corps?

JB: Well, there was a big push to have more women join the commissioned corps. It was a bad thing to me, not in civilian life, so to speak, or the commissioned part, but where it was – and it was not the fault of the individuals. It was management probably. I sailed on a number of ships. I sailed on a ship called the *Davidson*.

MG: In Alaska?

JB: Yes. In Alaska. There were about seventy-seven people on that ship. What they did was put one woman on it.

MG: Was it Maureen Kenny?

JB: Yes, that's very good.

MG: I interviewed her.

JB: It might not have been her then, but it is no good to put one woman with seventy-seven men. Well, I could tell a story that would make your hair stand up on end about that if it's the same person. That name rings a bell. So that was an implementation error. That was a very bad thing. The overall idea is fine. In some jobs in the old C&GS, women were far better than men in doing them. I didn't have any trouble with the concept. I had great trouble with the goofy implementation. You understand what I'm saying, right?

MG: Yes.

JB: That was the only part that I remember really poignantly that, "My God, why would you ever do that?" Women are good at things, in general. They would have been very good managing these guys at Norfolk, who were not quite right. It took great skill and empathy to not hurt them. Do you know what I mean? When they came to a tide reducer change, [women] would never laugh at that, at their excitement, and say, "Yeah, that's great, Jim." Sometimes men don't get that stuff.

MG: Can you tell me about wrapping up your career with the Coast Survey? Was this in '87?

JB: Really, the end of '86. Well, again, I had twenty-six or seven years in. The next job for me at that time, as I saw it, was the head of NOS, which was highly political. Who was my boss? Paul Wolfe.

MG: I don't have that in my notes.

Sandy Bossler: Was he head of NOS?

JB: Yes. Anyway, I had a choice to make. In the C&GS world, that was it. I was at the top. Really, I saw a lot of – we had trouble because, at that time, it was not a pleasant environment to work. At that time, Jim Winchester was somebody above me and above NOS. The focus was to put out everything we did, out on contract. Let's contract everything out. Well, this was very destructive to the morale of the government worker. I had a lot of good opportunities, Molly. I was offered the job of head of research at a company called Synercom, which was an up-and-coming GIS firm. Also, OSU established a new research center, the Center for Mapping at the Ohio State University. I was offered a full professor with tenure. I spent twenty-seven years in the Coast Survey, and about thirty-five years in the workforce. I thought it was time for change, and it was. Paul Wolfe was the head of NOS. He liked me a lot. He wanted me to stay in NOAA. I didn't really want to. His job was a political appointee, and everybody above him were political appointees. That's not fun because when the election comes, you don't know if

you have a job or not. After twenty-seven years, I'd say I was tired of NOAA. I was excited about a change. I was offered good exciting changes, and so I left.

SB: You were offered the job at Ohio State, which was a wonderful job for you.

JB: Yes, I was head of the Center for Mapping at OSU.

MG: I want to ask you about that. But, first, did you have an association with the NOAA Map Library?

JB: No.

MG: Okay. So you were at OSU for ten years. Tell me more about those years.

JB: Well, the first thing that I learned was that in NOAA when I said to somebody, "Okay, Molly, how about giving me a writeup on what makes bananas grows, and on Friday, I'll expect that," I got it. The bananas write up came, and it was good stuff. At OSU, when I said, "Now, Jim, let's share this write-up on bananas. You take when they're growing. I'll take when they're ripe. We'll meet on Friday," well, mine was there, but his wasn't because there was no Admiral Bossler at OSU. I was so shocked that nobody ever did what they said. The communications at the university were awful. However, having said that, it was a great time to be the head of the Center for Mapping because we made things that were wonderful for mankind, things like – I was telling you about what I was having the kids do and some of the things they said. In my opinion, we saved Caterpillar Company. Caterpillar, you know, is a big equipment company in the United States. The Japanese firms had moved in and were taking over. They were building better equipment and being very aggressive price-wise. We found that we could – this is the faculty and bright students at OSU – that we could use GPS to have the bulldozer operator, with his joystick, move his blade up and down and grade the earth to a quarter-inch, without having any stakes or ground points to reference him. We were all in – we put a computer onboard, put a digital map in there, put the existing earth in there – go. I went and briefed the Board of Direction at Caterpillar. I said, "We can do this. If we can do it, you eliminate all this surveying on the ground. You can just turn this over, and you will revolutionize it." They said, "We don't believe that. This thing is only good to ten meters." Of course, they didn't have a clue what they were talking about. I said, "Well, you come down, and we'll show you." They sent a guy or two guys down to OSU. I'll never forget that day. We had a local contractor, Bill Igel in Columbus, Ohio. He gave us his dozer, and we had a computer. I said, "Move the blade up a tenth of a foot. So the operator complied. Right there, it was .1 foot. Their eyes got this big. This is, in a way, a sad story, and in a way, a good story. So that was that. About two weeks later, they sent some more people down. I said, "Great. Come on down." We showed them. This went on for six times, and I said, "I don't like this. You guys must start signing agreements that if you build this and produce this on your bulldozers or graders, you have to give OSU a royalty. We invented it. You didn't even believe it worked at first. You're going to have to pay for it." Well, I went to the head of technology transfer at OSU, who was even a friend of mine. I said, "We got to stop dealing with Caterpillar or make them sign a royalty agreement now." He said, "Do you know how much Caterpillar gives us each year?" I said, "No." He said, "A hundred thousand dollars." I said, "A hundred thousand dollars? Do you know what the money

associated with what we're talking about is? Billions. What are you saying?" He said, "Don't you mess with this, Bossler. That's a hundred thousand dollars we don't have." I couldn't believe it. That's the way it went, and Caterpillar got the whole thing, and it saved them because the American company, Caterpillar were the only ones to have that technology for a long time, about five to ten years. Now the Japanese have it; everybody has it. But unbelievably, OSU lost the whole thing. I was never so mad at anybody. That was so frustrating because it was like you can't see the forest for the trees. Hundred thousand dollars was peanuts. So we would run into one commercialization trouble after another. But here's the good part. The United States built that technology, and for a long time, they were the only ones to have it. It created a pathway for the great success of Caterpillar in the midst of a very dark time. We did a lot of good work at the Center. We built an airplane that had an inertial system, GPS, and a digital camrera on it.

SB: The cameras on the vans.

JB: Well, the digital cameras [inaudible] in the airplane had never been done before. You could just fly right over, fly over something, and, in theory, come down with a map in digital form. Yes, we built the GPS van technology, a lot of things that have been, since then, really tremendous assets to the nation. I had a lot to do with that. I'm very proud of it. I liked my time at the university, except that I felt OSU was a little slow – "Don't take that a hundred thousand away, John." Pass up a billion. Anyway, it mostly worked out good, and I had fun doing it.

SB: You did teaching.

JB: Yes, yes. I liked my students. It was fun.

MG: Then, when you went on to form your own private consulting business.

JB: Yes. I had some small jobs, not too many. The one that I did have that was large was – now I wish I hadn't done it – with Saudi Arabia. I actually helped design the whole country-wide program of mapping, charting, geodesy, and photogrammetry in Saudi Arabia. They paid me good money for doing that. If I would have gone over, they would have paid an unbelievable sum of money, but Sandy didn't want me to do that because my neuropathy, which is a handicap, and I was not really able to do things I might have had to do there. But I sent a lot of friends over there. They all hated it. They made hundreds of dollars an hour, but they all hated it. They wouldn't go back, none of them. They lived in a luxury hotel. In the morning, a driver would take them to work in a limo. They'd eat the best meals. Nonetheless, they said they were in jail. And I guess they were. I guess I'm glad I didn't go, but there was a lot of money at stake.

MG: Another interesting case you worked on involved drug dealers coming over the Canadian border.

JB: Where do you get that stuff?

MG: I don't know. [laughter]

JB: [laughter] That was something else. That was really interesting from a technical point of view. They were using the astronomic position of a point to determine the boundary line. It should have been the geodetic position – the 49th parallel in the days in which it was placed and monuments marked was done by astronomy. It's complicated, but the two things – astronomy and geodesy are not the same. That was the difference of how they were on the other side of the border. But the smuggling part of it was really interesting. Girls would put narcotics in their bras, slit the bra, and put narcotics in there. They had canes, a walking cane, and put it in there. We couldn't figure out all the ways in which they could smuggle it over there. But I loved that thing because it was so – "What's going to happen next?" It was scary and fun. I loved it.

MG: What was the ruling in that case?

JB: We won, and that was very tough because the judge – I had to explain that to him. I'd say, "Well, an astronomic position isn't the same as a [geodetic position]." "What's an astronomic? What's a geodetic?" It was like, "Oh." I don't know how I ever did that, but we won the case.

MG: I also wanted to ask you about your work outside of work and NOAA. How did you meet your wife?

JB: Well, Sandy and I are from Johnstown, Pennsylvania – same hometown. She was four years behind me. I dated her girlfriend when I came to Johnstown. I was with the Coast Survey, working all around the country. I would come home to see my mother and sister and everybody. There was a girl there, and I dated her. One time, I came home, and she had found a guy while I wasn't there that she wanted to date. I said, "Let's go out Saturday night," and she said, "Well, I can't do that because I'm dating someone, but I have a friend who lives across the street, and her name is Sandy. She would probably like to go out with you."

SB: We went to the same church. That was how we knew each other.

JB: Yeah, but when you're four years different at that age – I mean, she seemed young. And I was in the working world. [laughter] But that's right. She saw me at church and liked how I looked, I guess. Anyway, we went out on a date, and it was a big date. We went to dinner, and then we went to a Mountain Playhouse. Then, on the way home, after those two things, we stopped at a night club. We danced until late.

SB: Well, it was a wonderful date, and that cinched it.

MG: That one night?

SB: Yes.

JB: Pretty much. I got home, and my mother said, "Well, how'd that go?" My dad had passed by then. I said, "It was a really nice evening. Really great. By the way, I'm going to marry this girl." I did that – one night.

MG: When were you married?

JB: ’63.

MG: How long between your first date and the wedding?

SB: About a year.

JB: Yes, she went to Penn State, and she was still in school in her senior year. So I said, “Well, we’ll wait until you’re finished.” Neither one of us wanted to wait, but that seemed prudent. So we did. Then, after she graduated, we got married.

MG: Can you tell me about your married life? Do you have children?

JB: We have one son, David, who’s in Germantown, Maryland. He’s a flipper of houses, and a rehabber of houses in a fast-growing market there. We moved a lot with the Coast Survey, which is a problem usually. Although it really didn’t seem so. We didn’t move as much as other people, and it didn’t seem to bother us. We moved to Seattle from Washington, D.C. That was a big move – different for us. I went right to Alaska and started on a survey ship, and Sandy stayed home. But it seemed to be okay. I don’t recall being horrified with the separation. [To Sandy] Were you?

SB: [laughter] That’s a funny thing. Horrified that you were on the ship, and I was at [home]?

JB: Yes, that’s what I meant.

SB: No. We had a lot of support from officers’ wives club and the NOAA Corps. It was a very close community.

JB: There were lots of other people there because there’s a ship base there. There were lots of commissioned officers and other people. It was fine. I liked Seattle, too. I thought it was a really nice place. Have you been there?

MG: Yes, I like Seattle, too. Is there anything I’m missing? Anything I’ve forgotten to ask you about?

JB: No, I think we’ve probably – that *History of Cartography* book, though, I think that that will be good for you. I’m not exactly sure why I think that, but I think it will be very helpful. First, it is the history of geodesy for a century, not necessarily C&GS. But pretty much because we’re the government agency responsible for that. There’s a bad thing in this country for – that doesn’t exist now, for example, in Saudi Arabia, a lot because we fixed it – is that in the [Department of the] Interior, there’s a national mapping organization U.S. Geological Survey, and that shouldn’t be there. That should be with us, or vice versa; move us over, them over, but they should be together. There’s been, I don’t know how many attempts through history, starting way back in [J. Edgar] Hoover’s time of people trying to get that together, and yet, nobody’s succeeded because each guy who’s in charge of NOAA or USGS – “You’re not going to take my turf away

from me." That kind of thing. Petty things that really are too bad. So that didn't work. That hurts us.

MG: Any other reflections about NOAA as an agency?

JB: Too big. Really too big. I don't understand these mergers. Explain to me the connection between the Bureau of Commercial Fisheries and NGS. You can't do that. Neither can I. I don't really understand these organizational marriages over the past few decades. They don't make much sense to me. ESSA didn't make any sense at all. Of course, it was really short-lived. NOAA doesn't make much better – although, some sense is there. Bob White and Jack Townsend were very competent people. [Bob White] was the head of the Weather Service, and Jack Townsend was the associate [administrator] of NOAA. He's one of my favorite people, Jack. I briefed him on the new adjustment every quarter, I think. That was fun. I liked to play who's quicker with him. [laughter] That was great fun. He's a smart guy. He went to work as CEO of Fairchild.

MG: I think I've gotten to the end of my questions unless there's anything else.

JB: No. [laughter]

MG: Well, I really appreciate all the time you spent with me today. This has been a treat.

JB: It's been fun.

MG: Good. Thank you.

----------END OF INTERVIEW----------
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