David Bella Oral History Interview, July 9, 2014

Title
"The Illusion of Prediction and Control"

Date
July 9, 2014

Location
Bella residence, Corvallis, Oregon.

Summary
In the interview, Bella describes his upbringing in Connecticut, his undergraduate experience at the Virginia Military Institute, and his first jobs with the United States Public Health Service. From there he recounts his return to school as a master's and Ph.D. candidate at New York University, his early experiences with computer modeling, and the development of his environmental consciousness.

Bella next recalls his move to Oregon State University as a new faculty member of the Civil Engineering department. He discusses the status of the department upon his arrival, his memories of campus during the 1970s, the impact that his colleagues Scott Overton and John Goldman made upon him, and the shift in his research away from computer modeling in favor of systems theory.

Much of the session is devoted to an in-depth discussion of Bella's work with systems theory and the scholarly outcomes that emerged from this research. Specifically addressed among these scholarly outcomes are Bella's investigations into space-based weaponry, the destruction of chemical weapons, and the idea of salmon parks. Bella also details his involvement with the local environmental movement, the creation of the Swallowed Camel Club, and his connection with a handful of Corvallis-area church groups.

The interview concludes with additional reflections on Bella's time at OSU, including his memories of being isolated from many of his peers; his perspective on institutional change at the university; an idea that he is helping to foster concerning a clustered, no-car community in Corvallis; and his hopefulness for the future.

Interviewee
David Bella

Interviewer
Chris Petersen

Website
http://scarc.library.oregonstate.edu/oh150/bella/

Transcript

Chris Petersen: Okay Dr. Bella, if you would, please introduce yourself, your name, and today's date, and our location.

David Bella: I'm David Bella, and today is July what?

CP: July 9th.

DB: July 9th. Okay, July 9th 2014, and we're located at my place on the porch of a little cabin.

CP: Terrific. Let's start at the beginning. You were born in Greenwich, Greenwich Connecticut?

DB: Greenwich Connecticut in 1938.

CP: And were you raised there?

DB: I was raised there pretty much my whole life, until I went to college.

CP: Can you tell us about sort of your experience in Greenwich growing up?

DB: Greenwich is an interesting place. It's a powerful place, a lot of millionaires. We weren't one of them. My dad was principal of a high school, and I went to the same high school. And I think I really learned about leadership; he was very good. He said, "If you spend more than 50 percent of your time in your office, you're not doing your job." So as a student, he knew what was going on. I was amazed! None of the students ever gave me any hassle. They said, "He was tough, but he's fair." And he learned all sorts of things, and he did this by getting down in the trenches. I mean, he'd go down in the boiler room and just talk with the maintenance people. He'd talk with the people serving up food in the cafeteria. And he wouldn't ask them for anything; they would just tell him, because they were part of the team. So I learned that kind of leadership from him. Unfortunately, we don't see that kind very often.

CP: What were your parents' backgrounds?

DB: My dad was a physicist, went to Yale. And he became a high school principal and physics teacher. And my mother was a pianist, a concert pianist. She died when I was four, but I can still remember sitting over at the piano while she would practice. We did quite a bit of camping. And my dad ran summer camps for churches, a Lutheran church. And I learned a lot about nature then, and a respect of nature from—these were big camps, and they had a lot of these. And their idea for helping kids was to get them into nature, and that's what they did. So I had that background. And my beginning of environmental concerns came out of the church background in these summer camps. Very good.

CP: Did you have any siblings?

DB: I have three sisters, and an older sister, and two younger sisters.

CP: So how was the household managed after your mother passed?

DB: Well, my father remarried several times. And I just treated it as a normal household. He was a very good mentor, and he had male friends who ran these summer camps. And I had an Aunt Olga who was—she was quite a doer. I never thought that women couldn't do anything men could do, because my Aunt Olga obviously could. So it just never occurred to me. And so, you know, that was the household. We lived sort of in the country, not quite like this, but spent a lot of time outdoors. That was good.

CP: What were your interests as a boy, besides being outdoors, I suppose?

DB: Outdoors, building tree huts. I guess that was it. I wasn't into—I played sports, but not really that much. So just hanging around outdoors, and doing stuff, I guess.

CP: Did you enjoy school?

DB: Yeah, I enjoyed it. I was not particularly, in high school, a great student. Like most kids that age, I enjoyed seeing my friends and seeing my friends, and that's what I did, so.

CP: What were your first inclinations towards science or engineering?

DB: Oh, I don't know. I think I was always—I wanted to do something. So I don't think I really—I mean, I was pretty good at science. It was interesting. And engineering seemed more like you were going to do something. So I just sort of—it wasn't any big decision. I did decide to go to the Virginia Military Institute [0:05:01], which if anybody knows, is a pretty tough place to go, particularly that first year; you're a rat. [Laughs]

CP: Well, take me through the process of making that decision. Why VMI?

DB: VMI, like I say, it's tough. I looked around a lot. When you're growing up, kids, boys at least, "What's the matter, can't you take it?" They play sort of those games. You think, "Well, when I get older I don't have to play those games." As I got older, though, I saw a lot of men were playing those games, the same thing. I mean, I see it all the time at Oregon State University, people getting coopted and afraid to speak up! So I said, "I'm just going to go there. Then it's tough, and if anybody says [laughs], 'What's the matter, can't you take it?' I'll just laugh at them." You go through the rat line. It's pretty tough. So I think that was the way I thought of it, and it generally worked that way. It was tough.

CP: So you just saw it as a challenge you wanted to take on?

DB: It was a challenge, that's right. And I saw it as a challenge to take on, and I wasn't planning career military. I wasn't looking for a disciplined life. It was a challenge, and I think VMI nurtured that. It always had a maverick spirit. Very rigid and tough discipline, but there was always a tension there, a creative tension. So I thought of the word challenge as a positive word. And if something's challenging, my eyes light up. Okay, what are we going to do about it? So, and it was a good education. Class sizes were about 20 or 22, and they had some pretty remarkable people there. Jonathan Daniels was a martyr in the Civil Rights movement. And he was a seminary student when he left VMI to become an Episcopal priest. And he got killed there. That really jolted the South. Unfortunately, Jonathan had to give his life for it. So, but he was quite a person. He was the valedictorian of our class.

CP: Well, what was the environment like at VMI, especially that first year?

DB: Oh, that first year, you're a rat. That first, and you're on the go all the time. It's physically and mentally demanding, psychologically demanding! But all your classmates are in the same boat, so it's not like they are picking on you. I mean, you're all in it together. And there are times when, man, you'd say, "Well, they can't kill me, and this isn't going to last forever." [Laughs] Somehow that would get you through. And I thought of that years later, in terms of racial prejudice. Because people can't say that; they couldn't say that. And when I went back to one of my reunions, one of the most impressive things that happened to me—there was an older guy there that was a maintenance person, and he was black. And I told him what year I was there. And I think he says, "Oh, that's when he began!" And he comes and he gives me this big hug, and we're celebrating together, and it felt really good. It really did. And they've integrated down there, because it was not integrated when I went there, and they've done a really good job. There's men and women down there now. And so—

CP: Not integrated as in it was whites only, or there were white classes and black classes?

DB: It was almost all white. I think it probably was all white. And just in the South, people just didn't even think of it. And Jonathan did. He gave his life for it. Well when they decided, at VMI when they figured, "Wait a minute. This is a serious problem," they really set out to correct it, and they really did, and we've had some remarkable graduates, white and black, and Asian. So it was really, I would say, a turning point in my life, I mean, to see that change. It was wonderful. [0:10:00]

CP: What else was expected of students there besides the course work?

DB: Well, it was physically demanding, and of course, your first year, you're harassed. [Laughs] You're in the rat line. You're a rat. And you're on the go all the time. And so it's hard to describe. [Laughs] I mean, the Marines respect it, and

I've had several Marines say, "Yeah, it's tough." And for a Marine, that's probably about the best compliment you can get. And it's mutual, I mean.

CP: So a lot of physical training and military drilling, I assume?

DB: Well, there's not particularly a lot of drilling. You had parades that you did, that you marched, and you wore uniforms. But the academics were very good, and classes were small, and there were— they were academically very good. So it's just a tough schedule [laughs], and physically demanding. I mean, if you've got a chance to take a nap, you would lay down for fifteen minutes and go to sleep, and wake up and start all over again. But during the day, you didn't even have your beds down. I mean, you rolled up the mattresses. They were up against the—you know, rolled up and we called it hayrack. That was leaned against the wall. I mean, it was pretty rigid. But it always had sort of a maverick spirit to it, you know. One night we put the evening guns, I don't know, 90 millimeter howitzer, in the PX—you know, snuck out there. I mean, there would be things you'd sort of do that way. And things would happen.

So you learned some things like, pulling rank, that's really bad. I mean, if somebody does something? Yeah, you've got rank, and of course, the dean or president has to do things. They have responsibility; we all know that. But if they do something and it's only because I've got the rank, that's pulling rank. And that's not looked on very well. In fact, they'd have a parade, and in the parade there would be flanking movement, the troops or companies or platoons going in line, and then the officer—it was a cadet officer, but—would be in the front with a saber, marching in the front. And there would be tack officers grading the lines. Well, if he had pulled rank, those lines would just go like this. [Laughs] And then he'd get chewed out. So you know, if you pulled rank, we'd throw lines. So I mean, it was just—pulling rank was not considered a particularly good thing.

Now, I see more of it going on at Oregon State University [laughs], and people sort of accepting it. That's the part that drives me nuts. If someone says something or does something that doesn't make sense, be polite or courteous, but tell them. A lot of times they may get upset, but really, the best ones know they need to hear that. But I've seen just too many people with just blank faces, don't say anything! Can't do it.

CP: Well, tell me how your academic life sort of evolved while you were at VMI.

DB: Well, I actually got better grades in college than I did in high school, and I ended up with a civil engineering degree. And I don't know whether I had any career aspirations on that. It was like you're entering a big opening space; you're entering the future. So I didn't have an agenda of what I wanted to do, or what I wanted to be. I wanted to do something, do something interesting. I was more a scout; I sort of explored. So I guess—and I think at VMI they encouraged that. You would ask questions in class. I thought it was a good education that way. And there were bad teachers, yeah, but there always are, but you learn from them, too. So, yeah.

CP: Well, you took that education, and your first job was with the Division of Indian Health? [0:15:00]

DB: Yeah.

CP: U.S. Public Health Service.

DB: U.S. Public Health Service, right. U.S. Public Health Service, Indian Health, and I went to New Mexico, and I loved it. And I was a sanitary engineer, they called them. And we put in water and sewer systems in Indian pueblos, and they'd bring in translators. And then I got transferred to State of Washington, and it was kind of funny because they said, "Well, there's a project that has a bit of a problem." Any time a government agency says, "We have a little bit of a problem," that means it's a disaster. So when I got up there, the project engineer wasn't even there. And it turns out that some woman had punched him out. [Laughs] And after listening to the stories, I began to understand why.

But we got the project lined up. But even there, there were some things you had to do, like they didn't have enough parts to keep the crews busy. Well, if you look at the government procedures, it takes months to get the parts. Your budget's going to be gone. Either that, or you have to lay off the crew. And so I just went out and told them, wrote a memo and said, "I'm going to go and buy some parts wholesale, and if this is a problem, please call me." And I stayed away from the phone. [Laughs] So I got the parts, you know, and they were upset because they could have saved probably 30 dollars by

going through the GAO or now GSA, but the loss of money for the crew. So I mean, you did things like that. I loved the crew. I loved the construction. A lot of funny stories they would tell me. I had a good time. It was good.

CP: What sort of an impact did living in Indian country make on you?

DB: Well, I actually, in Albuquerque—I was living in Albuquerque, and I'd go on a reservation. In the State of Washington, I didn't. I'd live off the reservation, but it was more in the State of Washington, more like rural—rural country. And I loved the culture, loved the dances. And it was a really good experience for me. So I sort of participated in it, and I even broke my wrist riding in a rodeo, so. [Laughs] So I had a little bit of a—you know, I had some good stories to tell. So, that was good.

CP: What did you think of the Pacific Northwest? I assume that was your first exposure to it?

DB: Yeah, and I was up in the State of Washington, and I did drive through Oregon and went over to the coast. The thing that impressed me, the coast—it was hard to get down to the beach, there were so many logs. I mean, there were just logs all over the place! And of course, now there aren't, and I think there were a lot of wasteful timber practices back then, and the logs would just drift out. So I really didn't—I was in eastern Washington, and so it's quite different in Corvallis. I mean, I liked it. I liked the beautiful country, so.

CP: Well, after a year or two, I think, with that job, you went back to school?

DB: Yeah, I spent a little over a year, or two years, in the public health service, then I went back to New York University, right in the middle of New York City. What a change! I mean, holy mackerel! I'm out in the sticks, and my arm's in a cast from a rodeo accident, and I'm ending up in the middle of New York City. But I did get a good education there at New York University. And I got into computer modeling, and this was back in the mid-sixties, so I got into that. Fortran was pretty new then. And I did sort of learn machine language, which was awful! Fortran, though, was great. I had a very good major professor, and I got into computer simulation long before most people. There were no PCs back then. There was no internet. [0:20:00]

I used to take cards down on the subway to Greenwich Village. That's where the Kron Institute of Mathematics was, and they had a big computer then. You'd give them the cards, and they would run it, then you would plot, by hand, the results. But you got to understand what a model does, because you plot them by hand. You did them yourself. You could actually see what was going on in the computer. And now, a lot of people don't see that. They really don't understand that. And consequently, I think there's a lot of misuse of computer models now.

CP: What sorts of things were you modeling?

DB: Lakes and estuaries. And the thing about estuaries is they're a part of the river that is influenced by the ocean. And the tides come in and out, so they're very dynamic systems of waters, and changing. And so before the digital computer, you had to make mathematical assumptions of steady state. Sanitary engineers have been doing this since 1925 on rivers, building mathematical models long before the scientists were doing it. And actually, the rivers got better. They did a lot; there was a lot of good, and that's sort of been airbrushed out of the history.

I may come back to that later, because there was a lot of environmental improvements, on rivers in particular, that occurred there, and I was part of that history. But the sixties, things were changing. We knew things were changing. We saw lakes were having problems. We saw all sorts of problems. So that was a real era of transformation when I got here, the computer, and a pretty exciting time.

CP: Was this also your first experience of teaching?

DB: Yeah, my first experience in teaching, formally. I used to help—I used to do some help sessions for some of my classmates back at VMI, and my family has a lot of teachers. So I loved it. So I loved the students and the teaching, and I liked the research. I don't like proposal writing. We'll come back to that later. [Laughs]

CP: Tell me about living in New York City in the sixties.

DB: Oh! Well, you know, I was mainly involved in graduate school. There were some protests. I generally was not part of that. Part of the protests—I was part of in a sense of, "Let's do something about the problems," and mainly pollution. And certainly Martin Luther King, Jr. had a profound effect on me. This was a huge transformation, and that was a good time. I think that what happened a little bit after that, the drug scene and other things, I just felt like that was very different, very self-indulgent, and often destructive. So really, I had mixed feelings. I really identified. "Yes, let's make the world a better place," but there also seemed to be sort of a self-centered naiveness that was associated with this, and maybe the tendency to blame other people, rather than saying, "What can we do?" So it was a mixed feeling, mixed bag.

CP: Is it fair to say this was sort of the beginnings of your environmental consciousness, or did that come before?

DB: Oh, environmental consciousness came before. It came largely through churches. And again, that's been a whole history that they don't talk about. You probably have never had that. You probably took the history of environmental from Bob McDermott, and that's just not included. Well, it was huge! I mean, here my father would have 300 boys out in these cabins out there, and they had nature counselors, and across the river, the lake, was a girls' camp, and then another teenage camp, a young adults' camp there, and this was a big thing! [:25:00] And so I was always taught that respect, and it was also sort of a technology—well it's got some good things, but it's got some limitations, too. So we also had that.

And when I got here at Oregon State University, it was the campus ministries that were challenging higher education. There's a guy, John Conner. You ought to just do a separate history on John Conner, because he probably did more to change Oregon State University than any other person here. He was the campus minister at Westminster House. And we would have classes there on environmental problems, and appropriate technology was a big thing. And there were some economics theories, Kenneth Boulding, and Herman Daly. Dick Clinton, if you interview him, he'll tell you about Herman Daly. And academia just sort of closed that stuff off. But at the time, in the late sixties and early seventies, it was pretty exciting! I mean, there was a lot of interesting things that were happening.

But that movement died out, and again, it's sort of been airbrushed out of the history. And I think this is one of the things that is probably important for oral history, because a lot of historians, they study the archives. Well, the stuff that may be most important didn't make it into the archives, because the big institutions basically don't fund that, and so it sort of disappears. And so we need to have people take oral history, and say, "Look, here's some good stuff!" And it makes a lot of sense. Kenneth Boulding, Herman Daly—I mean, you go back. E.F. Schumacher, *Small is Beautiful*.

I mean, these were books that came, books of writings and speeches, that were amazing. I mean, Kenneth Boulding—he's one of the best speakers I heard, an economist, and he stuttered terribly! And you'd sit there, and you'd first be nervous, and then you'd realize that it doesn't bother him, so it didn't bother you. It was amazing! And he came up with some really good stuff. I think if you wanted to know how to deal with some of the environmental problems we have now, go back and look at then.

And Kenneth Boulding, he was a Quaker. Herman Daly, I think, was a Methodist. E.F. Schumacher, a Catholic. This was a spiritual movement, but it was certain—it had nothing to do with intelligent design, or evolution, or anything like that. That was never an issue! And so that's a part of the history. If people want to understand where we're at now, I think they can go back and say there were some opportunities that were missed that happened then. I'll go back to some of those.

CP: Sure. Well, tell me about the decision to come to OSU. 1967, you graduated from NYU and you came here.

DB: Right. Yeah, I don't think I singled out OSU for any reason. In fact, I had applied to EPA, and they were going to hire me. Don Baumgartner was at EPA, and hired me on eutrophication study of lakes, and also estuaries. Don was estuaries. Anyhow, aquatic ecosystems. And somehow that position fell through, so he sent me resume over to Fred Burgess, who was the Dean of Engineering, and I got this notice, "Would you like a position here?" So I said yeah. So I took it.

CP: What was your first impression of the university and the town?

DB: I liked it. It was a beautiful campus, and it still is. I mean, there's a few ugly buildings, but generally I think it's a fantastic campus. The people were good, friendly, so I enjoyed it.

CP: What was the department like?

DB: Department? It was a good department. It was a traditional engineering department, but I did have some—a certain amount of freedom. I started a course on mathematical modeling, computer simulation. [0:30:00] And you look back, and that was a pretty big jump for a lot of the people back then, because the digital computer was fairly new, except in the military, of course. And so I had a course there. I also had a course, a graduate course got on the books that was something like Philosophy of Technology. So they were receptive to this. I think my education at VMI helped a little bit, because if I felt strongly about something I told them so. I think most people appreciated that. At least they knew I wasn't going to back off because I was afraid of raising something unusual. It didn't even occur to me.

So I did get some courses taught then. And at that time, I had the Midas touch. I could get research grants. I mean, I was just, I couldn't believe it. They weren't big grants like you get now. But I had—on estuaries I had one. And then I had eutrophication, as in lakes, what happens to lakes, and it was computer simulation. I got that. And I had another interesting one, and I'll talk a little bit more about that, and that was Environmental Strategies Under Indeterminacy. I think that's what the title was. And they even funded that one. It was a small grant. But then, the strange things happened. As my awareness started to expand, the funding agencies started to go narrower. And by the end of the seventies, things had changed; things had really changed.

CP: What do you think happened?

DB: Well, that's a good story, and that's the one the historians have to look at. Now, there are some historians here, *Arming Mother Nature*, Jacob Darwin Hamblin—great name, Jacob Darwin! I love it. He's written a very good book. It's about how the environmental movement, or environmental science, more, environmental science, and particularly computer models, came out of the military. And I didn't know that, at that time. But my background was out of sanitary engineering, so it was a whole different background.

And what happened is their way of doing it took over, and the way we were doing it shrunk. And so what they were saying was, "Well, we'll build big computer models." I'm simplifying it, but, "And that's how we'll approach the future." Well, I was into computer modeling, and I said, "You can't do—yeah, build computer models, but you cannot have environmental strategies based on prediction and control. The world is too complex." And so what we did during this study, what I did during this study, on environmental strategies under intederminancy, I said, "Look, we have a strategy that's very simple. You don't need big models. You can build big models, but you need a strategy. And the strategy is, we'll make mistakes. Okay?" That's called confession, okay.

And so what you have to do is learn how to make good mistakes. And a good mistake is reversible. Good mistakes are ones you learn from. Good mistakes are ones where you don't get painted in a box. So we came up with strategy like this. And it all made very good sense, and it does to this day! I mean, you take carbon dioxide, the greenhouse one. People still are trying to predict; the models all over the place if you go far out. But the CO2 impact is almost irreversible, and it's just shooting through the sky! So under that strategy, we would have said, "You've got to stop. You can't wait until you find out what the impacts are. It's too late. The world is changing faster than you can develop your predictions." So I thought it all made sense.

So when I write my final report in '78—and I've got a copy of it, if you want it, in the file—they send a guy out there to look over my shoulder while I'm writing it. And I thought, "This is strange. That never happened before." [0:35:00] And I thought maybe it was because of one of Senator Proxmire's Golden Fleece awards. He would ridicule scientific projects. But I realize now, after some of the history books coming out, the paradigms were changing. They were saying, "We want bigger scale computer models." And I was into modeling, but. So, the guy looked over my shoulder, and he said, "Okay." And I thought he was pleased with the report, and he was.

But when he left, he said, "We'll never fund anything like this again." I go, "Why?" I was shocked! "We don't have a box to put it in," was his answer. Now, I didn't realize at that time that that's what transformation was occurring. You're building big boxes, so you have all of these specialized areas to do certain tasks, to feed them to the models. And we weren't looking at this. Now, one of the guys I worked with on here is Scott Overton. Did you interview Scott?

CP: No.

DB: It's a shame. He passed away. But there is a website. You really ought to take a look at it. Very impressive guy. And Scott and I, probably at Oregon State between the two of us, at the time, we published a paper in '72, and we probably had more environmental computer modeling than any other two at the university. And we basically came up with a strategy that was not based on prediction and control, and avoided large-scale irreversible change. You have to do that, because you don't know what the consequences would be! So when you make a mistake, you want to make a good mistake, which means you can reverse it! CO2 doesn't reverse. I mean, it's up there for centuries. It's sad.

CP: Tell me about Overton.

DB: Overton, Scott Overton—Statistics and Forest Management. And Scott, he was very disciplined. In fact there were people in Statistics, I think, were afraid of him. And a good guy. Very thoughtful person, very rigorous, very rigorous. And he was a few years older than I was. He was a scout in World War II, I think. Anyhow, you can look up his background. And Statistics and Forest Management, and he just was good. So we got together and we started talking about this, and we said, "Let's write a paper on it." And it was published in the American Society of Civil Engineers Sanitary Engineering Division.

There really wasn't—you know, environmental science was just sort of, well, was it really out there? Scott had a student, Larry Hunt, and I think in the early seventies he did his Ph.D.. And he had to do it in Forest Management, because there was no Ecology, but it was an ecology Ph.D.. We had a graduate faculty of Ecology; we were sort of fighting the system. And during one of his last meetings, in marches a group of faculty from Forest Management, complaining that he didn't take the road design courses, and the cable design, all of the stuff about logging! And well, he had a powerful committee, and there was a Dean of Forestry; I think his name was Stoneburg. And I have to give the guy credit. He picked up the body language of our committee, that we were going to fight for this guy. [Laughs] And so he was very diplomatic, but he says, "Well, this time, but we'll arrange this."

So we got him through. So Larry Hunt was probably one of the first ones to actually get a Ph.D. in Ecology. So there were other people who had done things in Biology, but it was generally—it's not like it is now. So that was interesting.

CP: I'm interested in knowing a little bit more about the climate on campus in the late sixties. Vietnam obviously was raging. There was a lot of tumult nationwide. What was your sense of the environment on campus itself?

DB: I think relative to other places, there was probably less. But I think some of the inquiry sort of maybe lasted a little longer. [0:40:00] So it's like some other places burn out quicker. My contact was largely through the Campus Ministries. And they were really active all the way into the seventies, and in fact even beyond that. I can remember having a course over at Westminster House, and so I knew the colonel, ROTC Colonel; Kurt Rossler, I think, was his name. And he—this is probably late seventies, I'm guessing. I may have the date off, but you can look him up. His picture's up there. And he was a tank commander, and so this is the Cold War. And during the Cold War the Soviet tanks were—I mean, the armored divisions, they were powerful! This was a major concern.

So I brought him over to one of these classes, and there were a whole lot of what we call hippies in this class. And he just wore a sweater, casual civilian clothes, and he started talking with them. And they didn't want to like him, but they did.

CP: [Laughs]

DB: He was a good guy. And I remember asking him the question, "What is more danger to American society, the Soviet tank, or the American gas-guzzling car?" And he said, "Oh, that's easy. It's the car." And so, I mean, we had those kinds of discussions that were going on. They sort of ended late eighties.

Late eighties, we put on a conference on Eisenhower's farewell address, and he warns about the military industrial complex. But people don't realize, he also warned about the university. The danger is that the pursuit of government grants and contracts will be pursued so much that intellectual curiosities will be given up, and we must guard against the scientific technological elite. And then later, after that, he says, "Only an informed and knowledgeable citizenry can prevent this from happening." I mean, he has some powerful stuff! So we did a whole conference on that.

And one of the things we did in that conference—Craig Walker, you can interview him. He's still there. And I can give you a copy of the book we did on it. He and I wrote a chapter at the end, and we said, "Suppose George Bush gave this

conference," because George Bush, the first George Bush, was President then. Not George W; that was George W's father. And so what we did is, we took portions of the speech, and we just said, "Suppose George Bush wrote this, and the only thing we'll change is his warning is not about the military industrial complex, it's the oil industrial complex." And so we changed it, and it's really radical! It comes across really radical. Well, you can take that, and take it for his son. You can take it, and give his speech now! And he was warning. I mean, it was remarkable with Eisenhower; his whole life was in the military industrial complex, and his final warning is warning about it. I was very impressed by that.

CP: Yeah. And your sense was OSU was falling prey to these warnings?

DB: Oh, yeah. I think pursuit of the research—it's not just OSU, but I think higher education in general, the pursuit of research grants. I mean, we were graded, when I was there, on research. I don't know if anybody read the papers, but you sure had to put a list on how much money you brought in. I think that's pretty common now. And so you bring in more money—and I said, "This is strange." We're being paid, rewarded, for spending more money? Why don't we say, "Look, gee, I did all of this interesting stuff, and I didn't spend very much of the taxpayer's money." I mean, it seemed to me that would make sense. But it didn't work that way, so.

CP: Was the paper with Overton in '72—was that sort of the beginning of the systems theory work?

DB: Well, the systems theory work—first of all, in the computer modeling and ecosystems [0:45:01], I was doing ecosystems, so I was involved in systems. And I was involved in—oh, some ecologist or limnologist, G. Evelyn Hutchinson in there, and so there were a number of people in sort of Ecology, the beginning of Ecology. So I had used some of their work, met some of those people, and I was coming at it. But I began to realize that the rivers aren't the problem, the trees aren't the problem, the fish aren't the problem. It's the human systems that are the problem. So I began to realize this in the seventies, maybe even a little before that.

And so what I started doing was studying human systems. Now, if you're going to be studying human systems, it's kind of, you make a choice. I'm into computers, okay? So I can sit behind a computer—of course, they didn't have the computer screens, but now, of course, they do—or I can actually get out in the organizational systems, and see what's happening. I chose that second route. And that was actually a conscious choice—I'm going to collect experiences. I'm not going to be sitting—eventually, once they got computer screens, I'm not going to be sitting behind a computer screen. So I never had email on campus. Never, okay?

CP: [Laughs]

DB: Okay? Never. I have some at home, now. Will Gamble, you can interview him. I don't know whether you've met Will, but he didn't either, so we were probably the last ones. But I'm working with these computer systems. When you work with these computer systems, there's a whole level of mathematics that you can do, nonlinear dynamics, emergence, that you can't do with traditional mathematics. And I could explain it; it would take me about three or four minutes to explain it, because I would have to explain differential equations, but basically you couldn't solve the equations.

And what you would do with differential equations, you would start out with an initial condition; you would tell the rates of change, and then you can make a prediction, okay? But with certain equations, nonlinear, particularly if they're, say, three-dimensional, so you're going to see in space what the predictions are, you end up with the things going around like this! It's called chaos. And you end up with essentially, the world is just not that predictable. And then you throw in complexity! And so Overton and I were on to that in '72. If you look up the references, one of them, I think the title had "One Plus One Does Not Equal Two." That is, the whole cannot be reduced to the sum of the parts. And the other one was a paper by Warren Weaver that basically said, "Science does not know how to deal with problems of organized complexity."

So I was into the math, okay? Because with the digital computer, you can approximate the solution to equations that you cannot solve. So you don't solve them; you get finite difference, numerical methods, approximations. That's what all of the computer systems are doing now. They don't solve equations like they do in differential equations. They can't. And they can't even come close! But the nonlinear behave in weird ways! I mean, the nonlinear world is bizarre, and it's only bizarre because for several hundred years, we've been taught to think linearly. And when you're taught to think linearly, then when something non-linear comes up, it seems bizarre!

So I would meet with a guy, John Goldman. If you ever get a chance, he would be a good one to interview. He was the campus minister here. And the best description of John is, he's a medieval monk transported by a time machine.

CP: [Laughs]

DB: So he never passed through the analytical age of, say, Newton and Galileo, the analysis, breaking it down into parts. He thought holistically, you know? And he didn't have any trouble with this. We had these discussions for years! Students would just come, and people would come, and we'd have these discussions. And so the nonlinear world is a strange world. [0:50:00] It's a world that requires you to think more with the right hemisphere of your brain.

Ian McGilchrist has a great video—people should look that up, *The Divided Brain*. And he says the left hemisphere is sequential, linear, and we have become dominated by left-brain thinking, okay? I think that's true. And he describes what would happen, what kind of organization would you get if it was dominated by left hemisphere? And he describes it, and as far as I'm concerned, it's a university. So the right hemisphere is just—the world is so amazing! Things emerge.

So anyhow, that's the stuff I got into, but I wanted to get into it from the human perspective, big organizations. I didn't want to stay in the mathematical modeling. I kept teaching. I had to make a living. I kept teaching the computer modeling, and I enjoyed it. I enjoyed teaching. But when I teach, even engineering mechanics, I almost never brought in notes to class—almost never. You interact with the students. And the best classes occurred when the course, the class went in a direction I didn't even anticipate! And it just [phew]. You've got to keep them alive, and then their eyes light up when they get something. It's great!

CP: It strikes me that your placing an imperative on getting away from the computer screen, and getting out and interacting with people, follows the same model your father took in his work.

DB: Yeah, I think that's probably true. Yeah. He really did, and he majored in physics at Yale, which at that time—physics? I don't know how he did it. That's tough. I mean, because physics at that time was going through a huge change. And I brought him, when he retired, a pendulum, and it has several magnets, so it's nonlinear, and it doesn't just swing back and forth, it just goes in this [laughs]—and when he looked at that his eyes lit up, and he just laughed, and he says, "That would have driven my professors crazy." Yeah, so I did that.

CP: It also sounds like there's a divergence between the curriculum that you're teaching, or being compelled to teach, and your research interests, sort of being in opposite directions.

DB: Oh, the opposite! If I take my career at Oregon State, I can put all of my accomplishments in two piles. A: That got me promotion and tenure, as full professor, tenure, all of the rest of this, A, right over here. Pile B, over here, didn't go anywhere within the organization [laughs], or not very far. The most important pile is B. You can throw out all of the rest. Now, I learned a lot by, say, teaching Engineering and Mechanics, and you learn a lot there.

For example, in mechanics courses, the way we teach, the math isn't that important; you have to teach students how to sketch. Make a sketch! It's called a free body diagram. Ask any student that's taken it. You have to draw. So how do you make a sketch? How do you think? How do you do that, you know? And you engage the students in that, you know, making the simple sketches. So when I went to study human systems, I said, "I'm going to make sketches." Because, see, a sketch is two-dimensional, okay. You know, it goes, two-dimensional sketch. Now, you can make a three-dimensional—that's not too hard, to go to three-dimension. But going to one-dimension, which is a written text, to two dimensions, is a huge difference. It's just a huge difference!

I mean, you can talk about something that's perpendicular in two dimensions. And that means this dimension cannot be reduced to this dimension. They're orthogonal. Well in one dimensional-lines of reasoning, you can't do that. I mean, you can sort of say it, but just, you don't see it. So the average book, typical book, is what, a half mile long? It's all one line. It's only arranged on pages for convenience. And so that shapes the way we think. We think in lines. And the world does not behave in lines. The world is much more this way. [0:55:00]

Now if you go on a construction site—I learned this my first job—they give you a set of specs, all lines, written, and a set of drawings. I almost never looked at the specs. I was all over those drawings. And if you go out on a construction site,

watch construction on campus, and you'll see people using body language. You'll see them taking out diagrams. They're not sitting around studying texts. Professors do that. They can never build a building like that.

CP: [Laughs] Well, I'm wondering if the systems theory, I mean my impression anyway—and I can be wrong about this—but it was sort of the spine of your work, and then that went off in a lot of different kind of more topical directions, or kind of current eventsy-type directions. Is that true?

DB: Well, my work, I finally—a lot of the work in systems now is going to highly sophisticated mathematics, and the study of emergence, for example. One of the best people, biologists, is Stewart Kaufman, and he's done the randomized Boolean networks. He did some things, that's mathematical, and it's pretty good. So I'd done some of that, but I'd go, "What's the point in all of the math?" I mean, if we're trying to understand the world that people are living in, then we ought to be able to communicate to them, because they know more about that world than we do.

So what I do is I make sketches, okay? And you make sketches, and now I'll do like ten statements on a sketch and simple statements, connected by arrows, so they, loops, okay? And I'll get people, if I can get them to read it, the people read it and they'll go, "You just described my life. This is what's going on." So one of them that I did is how information gets distorted in organizations. The classic example, explanation, we give is blame. Look at the Veterans' Administration. Okay, information was distorted. So what do they do? They fire Eric Shinseki, I mean he's got to be one of the most honest, straight-forward guys you can imagine! I mean, he's an honorable person, and I mean that in the best sense of the word. And you listen to Congress, and everybody's blaming everybody!

So what I did is I made a simple sketch, and how organization, there's a system. And it provides a context within which everybody finds reasons to behave in their own particular way, but the system as a whole distorts information. Okay? That's what I do. And that everybody inside of it has a good reason, and they're ordinary people like us. So I'd done that original one in the late seventies, and first I didn't publish it, but the model sort of circulated, and people would send me, "I got a Xerox of a Xerox. Can you send me a copy?"

And so then in '86, I think it was, the shuttle blew up, and I'm watching television, and I see Richard Feynman, and he's trying to explain what's going on. And I go, "He's describing my model." I never studied NASA. So I send him a copy of the diagram and this table, and I didn't know he was dying of stomach cancer, and I think it was stomach cancer at the time. I wish I would have. I would have thanked him. So if you want to thank someone, thank them quick, because when they die you can't. I'll do it now; thanks Richard. Okay, and he read it, and he wrote me back this letter, and he said, "I read this table and I'm amazed! Perfect prediction." Now I don't use perfect prediction, but if you're Richard Feynman, you can use perfect prediction. And he says, "I didn't realize that NASA was part of a general phenomenon." Now, technically, if I said that, we'd say that's a grammatical error, a phenomenon. If Richard Feynman says it, it's brilliant, okay? So then I started publishing it.

Now, next month, August, I'll be going to Quebec City for the American Fishery Society to present this model, okay? And I've got to figure out how to do it on a PowerPoint now, because there's going to be 2,500 people and I've got half an hour. So that's a little—I like to interact, but you don't interact with 2,500 people. [1:00:00] So anyhow, I draw all of these models, and when people can understand them, and they see it, then they can start telling you. Because they know more about the experience in the world than I do. They can start telling you.

And to a large extent, what I'm doing is I'm providing an alternative to blame, looking at these larger systems. Now, it's consistent with a lot of the mathematics that's going on; it's just that you can experience it in life. And if the world is nonlinear and emerging, we are experiencing it, because we have to open up our eyes. Yeah.

CP: When one looks at sort of an abstract of your vitae, there are issues that are mostly in the past now. I'm wondering if what you've just described, if these are examples of that model having been applied in the past to things like space-based weaponry, for example?

DB: Yeah. Well see, it's interesting. About the 1980s, somewhere in the 1980s, I was really getting frustrated with the environmental—because that's about the time they started the global warming, "We will make predictive models," and scientists may say, "Well, we really weren't." No, that's the way the objectives were written. And I went back and looked at the original documents, and, "We'll develop predictive models," and I said, "No you won't." So I got frustrated.

So I wanted to learn more about large-scale computer systems, and then can I understand organizations by just observing? So I went, and I spent six years, Ronald Reagan's Star Wars program, and I had no funding. So I could go to the meetings, and I didn't have to hustle any money. And, oh, you'd go to these meetings, and you know, these consultants, they always have to hustle money. So I could ask these questions. I said, "I want to see if I can, as a citizen, if I can find something, make a contribution here, to something that they don't see." And I did find that I did, I could.

And that's a whole 'nother story, and it involves some interesting characters, including Richard Cheney, who was Secretary of Defense at the time. So, and Richard Garwin, who designed the hydrogen bomb—interesting, really interesting guy. So I met some interesting people, and I did some interesting things. But I was mainly interested in these human systems, and how—and then the large-scale technological ones, and how we can lose control. Control is sort of often an illusion.

CP: You referenced earlier John Conner and Westminster House.

DB: Yeah.

CP: And the local environmental movement. Do you want to talk more about him, and that period of time?

DB: Yeah. John Conner was a campus minister. He had been a minister in New Mexico. It turns out, I found out years later that he knew my cousin in Raton—I think it was Raton, New Mexico. And anyhow, John was—he wasn't very tall and he had this long beard, and he just would raise all sorts of questions. He'd raise all sorts of questions. He'd just be bouncing around, and he'd sort of stir up the pot.

And at that particular time, there was a whole national movement where theology or mainline churches were challenging higher education. There's a book on it, Douglas Sloan at Columbia University, it's called *Faith and Knowledge*. And probably out of print now, but it's a very good book. And they were challenging higher education, and what Sloan writes about is that went on for about two decades. And Eisenhower's warning was sort of right in the middle of that, so there was a time in there when people are looking at the problems of technology: yes, it has good things, but we have to recognize its limitations too. And there was sort of this attitude there.

And so John played a key role in that, and he was mainly the facilitator of it. He became moderator of the Presbyterian Church, which is I guess their highest position. And he would—he did a lot of interesting things. [1:04:59] But for me, it was like he was sort of at the focal point or center of the whirlwind [laughs], where all interesting things were happening. And so that was a very important time.

And there were concepts that came up then, very, very important. I wrote a paper, published it in 2006, on evil—evil. Say, oh, evil, what are you talking about? Well, this was a secular journal. I mean, it's on "Emergence of Evil" is the title of it. And I used concepts from theology in there, and no on raised any concern. They were helping us to understand this phenomenon, and basically I was saying that evil, large patterns emerge, and ordinary people like you and I get caught up within them. And in biblical language that would be bondage and blindness. You're caught up within it, and you can't transcend it, transcend the context of system you're caught up within. And horrible things can be done. And the example I used was the Soviet biological warfare system, horrible, horrible things, and by some top scientists. So scientists can get caught up in it just like anybody else. Anyhow, that probably goes back in some ways to John Conner.

CP: It's interesting how often you've been working with church groups.

DB: I'm on the fringe, the fringe of church groups. You know, I don't go regularly to services, but see, part of it, I'm studying models. Well, I learned models as a kid. They were called parables. A parable is a model. All models are simplifications, and what they do is help clarify some matters of importance, not all, and they expose their limitations. Okay? So a parable is a story, and what you do is you get engaged in the parable you learned as a kid, and you don't think much of it, you engage in it. And then as you're going through life, you begin: oh! You begin to see something. And that's what the purpose of a good model really is, that you play with it, you engage in it. And it allows you to become aware of something. That's very different from having a big computer that no one knows what it's doing, and it spits out data.

So, in that sense, what I was involved in had its roots in parables. But also, in engineering, scientists act like all the stuff we build here, and all this stuff comes out of science. Okay? And well, I would say yes, but I taught engineering

mechanics. This is Newtonian mechanics. When engineers build, like the buildings on campus, just go watch them. They're amazing. They build them on campus, okay? We also use safety factors, and we don't talk about—students don't know about this. And where do safety factors come from? They come from confession and repentance! You know, confession and repentance isn't "ain't I awful?" It's not self-blame. It means you've done something, and there's a failure. What are you going to do? You admit the failure, and you change your ways.

And that's how you learn. That's how you learn to ride a bike. You don't study bicycle riding, the theory of bicycle riding, and pass a quiz, a multiple grade, you know, multiple choice quiz, and say, "Now I'm a bike rider." You get on it, and you fall down! That's how life is. And so in engineering, civil engineering in particular, if you look at the history, you see all of these pictures of bridges that fell down. You begin to say, "What's going on here?" That's how we learn. And there's a historian of engineering, and he has some statements. I read one the other day: "Behind almost every success is a history of failure," or something like this. Well, that's probably pretty good theology, too.

So there's been a whole part—it's not about belief systems, and even churches get that wrong. You know, the word belief is a modern word. [1:10:01] The word religion even. I mean, it's a new word. I mean, new in the last several hundred years. As a system of beliefs, it just doesn't make sense! So what you learned were stories and parables, and you went out into the world, and you made mistakes. Guess what? So, that's how you learn. So when I come back to some stuff that I learned in church, and stuff that I learned in engineering, and then stuff that I learned in environment, there are some common themes. Now, what's absent is some of this foolishness like intelligent design, or things like this. This is just a big distraction. I mean, you know. John Conner had no problem with evolution; my father didn't. Now, maybe his father maybe did, but a lot of people did. Things change.

So I've sort of been off on the fringe of some I guess you could call theological insights that are pretty cool. There are some interesting ones. And they're not about belief systems. One of the things you find now, for example, is how Buddhism and Christianity have—parts of it just sort of come together and rediscovered each other. You take a guy like Richard Rohrer, who's a Franciscan Catholic, and he will talk about the Dalai Lama, and Thich Nhat Hanh. I mean, it's just like the boxes we put people in, it just doesn't make sense. So, anyhow.

CP: Tell me about the Swallowed Camel Club.

DB: Oh, the Swallowed Camel Club! Okay. Okay, the Swallowed Camel Club. We had a group that just spontaneously met many years ago; I don't know how many. First at the library, and we were making a little too much noise, and so we started meeting over at Saint Anselm's—it's an Episcopal Campus Ministry—because John Conner, or I'm sorry, John Goldman, it was John Goldman, and he's the guy that's the medieval the monk. And people were—we raised certain questions, and I say, "Well, are you getting this in your classes?" I go, "No."

So if you really want to find out what's being taught, you have to ask the students. Ask the students. So the stuff on complexity and all of the rest of the big-scale systems? Those, they're not addressing those things, not really, not in a way that registers with the students. And the students—okay, so we've had these discussions. So what are we going to call our group? Well, there is an ancient criticism of university professors, "You blind guides, you strain out a gnat, and swallow a camel." Okay? It's the Gospel of Saint Matthew, okay? And it's right-hemisphere. It's got a metaphor, blind guide. You strain out a gnat, and swallow a camel. [Laughs] Three metaphors that's right in, and he puts them together in irony and humor. And yet, people go, "Yeah." So obviously, the camel is not the sum of a lot of little gnats, so it's nonlinear.

So anyhow, we would laugh, and sort of as a joke we called it the Swallowed Camel Club. And we're not meeting this summer. And it's gone on pretty strong. The last several months, thought, we've sort of dropped off, and part of it I've been working on some other stuff. And part, John Goldman is retired, and the Episcopal Church is going through some changes, so I'm not sure where it's going to go. But it has gone on for years, and there's still, I've got an email list of thirty or forty people who belong to it, and I send it out.

CP: Did you have any contact with Katharine Jefferts-Schori ?

DB: Yeah, a little bit of contact with Katharine Jefferts-Schori, and Dick Schori; he was in mathematics, her husband, in non-linear dynamics. But not much on this, not much on this. She's done an outstanding job, and certainly on making

the Episcopalian—I'm not Episcopalian, but on making the Episcopal Church certainly more open to gays and lesbians [1:15:00], and she's really done that, and had to fight some battles, and she does it very, very graciously—very graciously.

I would say, I would love to get—she also has a Ph.D. in Oceanography. I would also, it would be fun to have a conversation with her, and, say, Marcus Borg, I don't know if you know Marcus Borg? Because I would be a little more questioning of science than I think they are. I'm not saying it's bad. It's just that there's a lot of specialization, and a lot of claims it does wonderful things, but not everything. And we can have an interesting discussion on that one.

CP: I want to ask you about a couple kind of bullet points from your vitae, of past research interests that I think have particular applicability to people in this state. The first one is an issue that's been important to folks on my side of the state, in eastern Oregon, and that's the destruction of chemical weapons.

DB: Oh, yeah, yeah. That is an interesting story. So I got invited on this one. I actually got paid for this one, you know, not a whole lot, but a lot of the work I did I didn't get paid for, I just did it, and I make my living teaching. The United States had millions of, literally millions and millions, of chemical munitions stored all over. And I mean, they say they're weapons but [laughs] most of them are not usable. And one of them for example, the M55 rocket, they made half a million of them. It's about a seven-foot rocket, I don't know, six or seven feet. Anyway, it's not guided, and they don't even have launchers. And the thing, I think, tended to go like this! [Laughs]

So they've got all of these rockets. Well, what are you going to do with them? And they had the warheads with the chemical agent inside of it. So you've got like a liquid, and you've got a burster, because it's an aerosol, it's not really a gas, and you've got the solid booster rocket. And they riveted the warheads on, so they can't just unscrew them! So they have to get rid of them. So I was part of the independent team that reviewed the risk analysis, because they wanted to know whether they should ship them offsite, or destroy them on-site, incineration, and all of the rest of this.

Well, one of the things I looked at was the M55 rocket. And they had these big steel insulated containers to transport them in, okay? And they had them on wood pallets. So I don't know, they might have like fifteen on a pallet. I think two pallets might be thirty, so either fifteen or thirty inside one of these big—and they had tests, so they could drop it from twenty feet, and if there was a fire it could insulate, and they went through all of these accident scenarios.

Well, the way they do risk analysis is they break it down into different little, what's the probability of this? And they sign somebody to this job. What's the probability of this? And they put them all together to find the probability of an accident occurring, which requires maybe three or four or five different things happening. Okay, so it's a low probability, and a lot of this stuff they have to pull out of the air. Like, what's the probability of the airplane crashing into one of these igloos, these storage spaces? Well, they have to figure out how many planes crash, and pull them out of the air.

So the one I came up with is: okay, what happens to the rockets if there is a train wreck? Well, don't worry, it's a warhead. We've checked the warhead on this thing, and the warhead won't go off. I said, "I'm not worried about that." "What are you worried about?" "I'm worried about the rocket igniting inside." And it turns out that when they set up the system, they didn't put a box for that, because, "Oh, that won't happen. That won't happen." That's the: that won't happen. So you go over to a meeting, and they say, "Oh, that won't happen," wait for the coffee break. Wait for the coffee break, because then somebody comes up, "Why don't you go check? I've heard this. They say this."

So anyhow, I end up in Tooele, Utah, and they're going to go in on a tour of the incineration [1:20:00], but you have to wear gas masks, and they wanted me to shave my beard. I said, "Aw, I don't want to shave my beard." So, "We'll leave you out here, and we'll just leave you with this guy." That's good. They leave you with somebody. This guy tests these warheads! Very ingenious design of a warhead, with the fuse, the fuse. But in the process, I learned that—what I was concerned is if you have a crash, and all of these rockets start smashing around, then you take steel and you bend it, it gives off heat. So is it possible in the twisting of the metal, you'll get enough heat to ignite the rocket? Because all the rocket really is is solid booster inside a steel tube, and it's a slow explosion. [Imitates rocket] The gas goes out the bottom.

So, I'd done some calculations, rough calculations, you know, on how much heat would be given off if you punctured a steel casing, and then how much the temperature would rise in the steel right around it, and compared that to the ignition temperature of the rocket, and it was higher. So, so it was, "Oh, there's no data on that." Well, when they say there's no data, just sort of ignore it. That may be, "We've never seen the data," or, "We've never collected the data." It doesn't mean

that there shouldn't be. Anyhow, I find out through this guy, and I get the field notes, that they tested these rockets by dropping twenty of them, and three of them ignited. [Laughs] Three of them ignited!

And I heard some stories about them trying to test the warhead, you know. So they get a guy to shoot a rifle at the warhead, and sometimes he misses and hits the rocket, and [imitates rocket] the rocket takes off. [Laughs] But they didn't have a box to put this in! So they get the number three out of twenty. So you get a probability, three out of twenty; you divide three by twenty. And I said, "I've seen that number before," because I go through all of these calculation sheets, and I come and I find that number. And they say, "Oh, that's the probability of a warhead going off on that rocket release." It gives a reference, so I look up this reference. And what happened is, everybody started referencing everybody else, and what started out as a rocket ignition ended up as the warhead going off. And of course, if it's the rocket igniting, and there's fifteen or thirty other rockets inside a steel container! You've got a bomb, okay? Because they can only hold like three rockets igniting.

So we pointed out that to them, and so that was kind of interesting. It illustrates that the science that gets done depends to a large extent on how the organization of it is structured and funded. And if everybody says, "Gee, that's an interesting idea, but it's not my job," that means it's not being done. Everybody has a good reason why they're not doing it, but what happens is the organizational structure, in a sense, can direct us to ask certain questions and not to other questions, and then when those questions come up occasionally, people can just dismiss it. "It's not my job." So, you better change the organization. That's not my job. The organization is too big. I can't change it. And so what happens is the problems continue.

Now, fortunately they've managed to get rid of all of the M55 rockets. They did not transport them, so we got the right decision; we brought that. And how much of my response they—we wrote it up, and how much of it survived through the bureaucratic process? Some of it did, and some of it didn't. So I don't know, but it was a fascinating—I learned a lot about risk analysis and organizational structure. So they're doing a good job. I mean, they had to get incinerated, because these rockets, they put a stabilizer in them, but if that stabilizer degrades, and I think it does, I mean, then those rockets go off. And they're all stored together. That's not good. [1:25:00]

They had literally millions and millions of ignitions, so when you read in the paper of the Soviet Union and the United States arguing about who has the weapons, and so forth, what they should have been saying was, "Here, you take them." "No, you take them." No, I don't want them. You take them." I mean, [laughs] they were a billion-dollar problem, okay, potential disaster! And anyhow, that was interesting.

CP: Yeah.

DB: So what other bullet?

CP: [Laughs] I want to ask about salmon, the idea of salmon parks.

DB: Oh, yeah, salmon. Well, I've worked a lot with fisheries biologists, and largely because once I started studying these human systems, I didn't get research grants, so I didn't have travel money. So salmon's a local one, and we had some very fine people here in salmon. So the American Fisheries Society, back in 2005—they published it in 2006, but somewhere before then—they basically said, "We've been trying to protect wild salmon, and we spent billions of dollars, and it's not working. So we want to select thirty-three people from the country, and maybe even outside the country, but mainly Canada and the United States Northwest. What would you do? You're totally free to say. What would you do?" And so I was one of them, okay?

So Bob Lackey, he's over there in Political Science and Fisheries, he was the director, and Denise Locke was on it. So they framed the problem. The problem is: how do we have significant numbers of wild salmon by the year 2100? And then he had four policy guides. And one of them—or four policy drivers, okay, something of that name—and one of them was: people are going to have to change their preferences, or their values or preferences. So I went through the whole thing, and I basically concluded that the way they framed the problem, you can't solve the problem. Okay, you're not going to solve the problem. And besides, the problem of numbers of wild salmon, that's not the real problem. The problem is: what kind of world do we want to leave future generations? And the whole business about preferences, I said, "No, we're going to get outcomes that no one prefers."

So what I did is I reframed the problem. Now, that's kind of like you're being given a test, and you go and you decide, I can't answer this question, so I'm going to change the question. You're not supposed to do that. So, but I did it. And I've got to give them credit; they kept the paper in there. So basically what I had to do is—I thought it would be real easy—I'll just say Wild Salmon National Park. That's what we need. But in order to do that, I had to challenge horrible ways that we were thinking, which were linear ways of thinking. Now, Wild Salmon National Park is doable. We have all sorts of agencies doing all sorts of things, like the Corps of Engineers, that's mitigation sites. We don't even know where they are, okay?

If you pool that money together, you can buy up particularly high flood-prone areas, which are the best habitats, all the way throughout the whole northwest, and you'd have distributed Wild Salmon National Park, okay? Even through cities, people want their waterfronts. So you know, it wouldn't be total natural systems. And there are all sorts of flood zones, and you look at the Willamette River, and you see all these different twists and turns. The farmers have trouble farming there because they flood and they plant all these weeds, what they call weeds, which are what biologists call the natural flora, okay? [Laughs] It's really funny. And if you look at the people who are studying floods, and they map out high flood-prone areas, and, "Gee, we've got to prevent development, do something about that." And then you go over to the wildlife biologists and take their maps of ideal habitat [1:30:01], and they almost overlap.

So it's a no-brainer, okay? Why don't we just buy some of this land, and pay the people, you know, not to build there, rather than putting concrete or rock rip-rap along the banks because it might erode? So I went through a whole bunch of those things, and I basically found that we could have a Wild Salmon National Park if we did that. And it would run right through different parts of the Pacific Northwest. And I'm trying to let the salmon come back, let the salmon guide us. The biggest resistance seemed to come from the science, and it wasn't about the science. Everybody agreed we had to protect habitat. But they would say, "Nobody's going to support. The people don't prefer that."

Well, I took that, and said, "How do you know?" Okay? First, it's not about preferences. The amount of money is a pittance. I compared the whole National Park budget for that year, so I don't know, I may get the numbers wrong, but five billion, let's just say, okay? And then I compared the bonuses given to Goldman Sachs, one bank, and it's like 20 billion! Okay? It's much bigger. Here's a national park, the whole National Parks. Here's the bonuses given to Goldman Sachs the year before the whole system crashed! I don't think the people even in Goldman Sachs think that that makes sense. But you say, "Oh, people won't." And then the same year that we finally published this, PBS did a special, "National Parks, America's Best Idea."

So, basically I conclude that the reason we don't have that is because the institutions have framed the problems in pieces, so everybody can say, "It's not my job." And then everybody can blame everybody else. And then everybody can focus on their little job. Now there is a guy it would be interesting to interview, I don't know, David Lane. Because he did his Ph.D. dissertation on reframing, and he used the Salmon 2100 as a test case.

CP: Hm.

DB: And he's got a brilliant idea. He basically said, "If there are environmental problems we have not been able to solve, we've probably framed the problem in the wrong way." It's like, if I give and exam question to my engineering students, and at the end of the exam period, all of my smart students are still trying to solve the problem, I'm in trouble, because I framed the problem in a way they can't solve. So what he wanted to do is to look back over the history and find reframings. Because we will lose them because the institutions framed the problems in a particular way. So if someone comes along and reframes it, everybody may say it's a good idea, but it gets lost in the institution.

So he developed software to get indicators of reframing, and he could have his software search through, with these indicators, to try to find a radical reframe, and identify it. And he used Salmon 2100 as an example, and his indicators go like this, and then my paper came out like this. [Laughs] So that's how I got to know him. So he's working over there with international students in English, teaching English.

CP: I'm going to ask you a couple more questions about OSU. Your research interests and your contacts, primary contacts, it seems, were pretty far afield from traditional civil engineering.

DB: [Laughs] Yeah, yeah.

CP: Did you ever feel isolated, or like a man without a home, on some level?

DB: Yeah, you do sometimes. The hardest thing over the years, people act like, well, if you do this, somebody's going to fire you. Nah, that's not the problem. I mean, I've never had the problem. Now, I was fortunate maybe because of my family, but I could teach, and so I get real high course evaluations. So that sort of protected me, because if you're not bringing in research dollars, it's going to be pretty hard to survive. But I was able to do that, sort of. There are some interesting stories on that.

I'll tell you the one story. [1:35:00] It's on the Columbia River Study, Estuary Study, okay? And a guy, Daniel Hancock, and I were—we were subcontractors for it. I said, "This is a dangerous project. I don't even want to be a subcontractor," for the interactions, the biophysical interactions. How does all of this stuff interact? And so, we're looking at the project, and they made all these grants, and they're out there, and none of it's going to interact, because people are just doing their own thing. So we come up with a scheme, where we develop hypothesis systems.

So, we'll have an annual meeting, and Dan and I have put up these hypothesis systems about a problem. And we'll present it to the whole group. And I said, "We'll follow the Bella cooking rule, and anybody who doesn't like it gets to do it the next time, anybody who complains." So you end up with these—you know, everybody interacts, and we end up with these hypothesis systems, and then you reallocate the funding based upon whether you're going to actually be able to address these hypotheses. So it's sort of a learning process.

So in Astoria, there's going to be a workshop there. And so the manager of the project, he says, "Okay, you will meet for the first half of the day, and I'll do the second half of the day," or vice versa, but, "You'll do half the day, I'll do half." So we said okay. So we prepared. This is for the Citizens Advisory Group. And there are people in there who are fishermen, and local people there. I mean, they know a lot about the estuary; they know a lot more than I do about it. So we present this to them. Oh, when we get down there, the manager says, "You do the whole day. I'm not going to do anything." So I think he was thinking he was going to drop something on us, but actually we said, "Great!"

So we do the workshop, and they loved it, because these fishermen have—I mean, they had ideas on this, and we're sketching them out! And they said, "Now we can be involved in this, and we can actually—you can come to these meetings!" And so the meeting ends, and we go out to eat, and the manager's there. And I didn't realize, we didn't pick up on his—we're usually pretty good at picking up on body language, but Dan and I are still talking. We don't realize how angry he is, because this means our approach, he has to reorganize the boxes, and he's got them all lined up.

CP: Hm.

DB: And I didn't realize how angry he was until we're eating, and all of a sudden he loses it, jumps up, and throws his briefcase at me! [Laughs]

CP: [Laughs]

DB: So, which I catch and throw back at him. And he storms out. Well, needless to say, we didn't get funded.

CP: [Laughs]

DB: But the whole project crashed. But the interesting part is apparently, if I remember right, my promotion committee was meeting like the week before, so on the record, I had this grant. [Laughs]

CP: [Laughs]

DB: So I was able to squeak by, I guess. I don't know, but I made it, so. But now you were getting back, I lost track of the question. How do I feel at Oregon State?

CP: Well, just—yeah.

DB: The hardest thing to deal with are the stone faces. You bring up an interesting idea, something that you think is important, and you get a blank—a blank. And I noticed this when David Lane would go with me, and he said, "You got

the stone face." And I think what happens is, I'm not sure what's really going on here, but people become so focused on their little field, that the grooves in their brain get so deep that it just doesn't register. Or, they may say, "Oh, you'll just have to read our literature." Which, it's just not there. So it's been sort of a lack of exciting discourse. I think that that's probably been the hardest thing to deal with, and that takes a toll.

And there is a story on this, David and Goliath, okay? David, and big Goliath, the huge guy, okay? [1:40:00] No one wants to take him on, so David the shepherd boy comes up and says, "I'll take him on." So first thing, he puts on the king's armor, and he can't move. Okay? We put on a lot of armor and we can't move either, like academic citations, and references, academic language, and mathematical equations, and you can't move. So he takes off the armor, goes there, picks up and gets some stones. And of course, the stories goes, he slays Goliath. Yeah, but what about the other stones? They don't tell you that. See, they leave parts for you're supposed to fill in.

So I'll tell you what happened to the other stones. This is the first stone. He missed. [Laughs] That's what life is about. You miss! So then, okay, second stone. Well, he hit him, made him really mad. [Laughs] Okay? Okay. Third stone, he said, "This is the one that's most painful." What's worse than hitting him and getting him really mad? I don't know. Get it, make your shot, hit him right between the eyes, and he doesn't even notice. [Laughs] And he says, "That really wears on you for a long time." So I'm at the end of my talk. Someone said—someone who knew the story better—"There's another stone." "What?" "Yeah, there's a fourth one. What did that one do?" I said, "I don't know. I don't know."

So my wife was there, and I just leave; I come home. She comes back and she says, "I know what the fourth stone was. It's the holy rolling stone." I go, "What?" She put on this music, and it was from a TV show, *Joan of Arcadia*, or something, where God appears to people as the janitor, or somebody like this. And it's like a holy rolling stone. So I said, "I still don't get it." She says, "He dropped it and it became the holy rolling stone for someone else to pick up." And I said, "Whoa! That's cool." So, but anyhow, the painful part often is seeing that there are some really big, challenging problems, and then just not being able to sustain the discourse. That's the hardest part. That's the hardest part.

CP: Well, you've seen a lot of change at OSU, and this is a season of change for the university as well. I'm wondering, I'd be interested in your perspective on kind of where the university's come from, and where it's heading?

DB: Yeah. Well, they've done a very good job in the campus and the landscaping. I think the campus and landscaping is just really remarkable. I think they've pretty much given up on the idea of educating an alert, knowledgeable citizenry. You have to have discourse in order to do this. I think there are really very close ties to industry. I think Ron Adams, who is the Dean of Engineering, has very close ties to industry. He's now, I guess, a vice president or something, now. And it's not that that's bad, but it's sort of like it's unbalanced. And there has to be some other role, where the university does some unique things that no one else can do.

And I think they've forgotten that, and I think they're good people. Ed Ray's a good person. Steve Clark's a good person. So, but what I find in the systems is systems adapt so that people are very successful in them, in a sense, become part of the system, far more than they realize. They become not just in the system, but of the system. And it's just too easy to start believing your own hype. And that's a sort of danger. And you need scouts. You need somebody—I used to tell presidents that Custer's biggest mistake at Little Big Horn was that he didn't listen to his scouts. [1:45:01] And a scout's somebody who's not bucking for a higher position. And the only time you really need a scout is to tell you something you don't want to hear, that you're going in the wrong direction. You don't need someone applauding in the direction you're going in, okay?

So I think there's an absence of scouts that are out there that are willing to do that. And I consider myself a scout. And I'm not a leader, in the sense I don't have lots of people following me, and I'm not a follower. So I go out and explore. And that's important. So we are testing with—I'm always trying something, but with one idea. And working with Charlie Vars, a former mayor and economist, and of course, an anthropologist, and it has to do with global warming.

And we have many, many, probably thousands, of students from places, particularly China, coming here, very conscientious, and then going back. That's a given. So, the question is, what are they really learning when they come here? I mean, this place blows their mind! This is totally different! And first of all, they're wealthy, they have a lot. So it's not the peasants coming from China that I grew up with. I mean, they buy some pretty nice cars. And they're living in a place

that in any place else in the world would be called car heaven. Corvallis, I mean, we talk about our parking problems! [Laughs] I mean, compared to the rest of the world, this is nothing.

So they're learning something by being here, and I think they're learning the wrong lessons. Okay, they're learning: this is how things are done. And if they're in Civil Engineering, they're probably being taught how to do it. So we came up with a proposal, basically that Oregon State University and the City of Corvallis and the county would develop some no-car communities, served by rail line. We have an existing rail line. That existing rail line goes north, it goes right through the middle of town, goes through the southern end of campus, and right through a piece of property bigger than the campus. The university owns most of it. And then further, okay? You build a clustered, no-car community. I don't know the scale. You want to get a scale that is viable neighborhood scale, so that if you were building a mega-city, that would be sort of the scale of the neighborhood. Okay? So I don't know, 1,500 to 3,000, or something, all right?

And what you do is you involve the students in the design of this. And in doing it, we are telling them, "The way we have developed this has been a mistake. Okay? This cannot continue. And we are going to do it for ourselves. We're not lecturing you that you ought to do something that we've done, that you shouldn't do what we've done. What we're doing is we're asking for your help to help design a viable community here, in Corvallis that would involve students, involve faculty, and some citizens from town. The rail line is all the way through there, it's already there. How could we use it? What could be the way to do it?"

What we would do is involve the students in lessons learned. They go look through all over the world. What were the successes and failures? There's a couple of cities in China that—one city that is pretty much a walkable city. But there's also some disasters in China. So you'd learn from those, okay, lessons learned. And then you get some of them to start building virtual examples of this, so they can take tours. There is a program where, it's a construction program; I don't know whether you're familiar. I'm not into video gaming. But Atlantic had a magazine—and of course, it's an imaginary world, you know, with monsters and all of the rest of this, but they build stuff. Well, why not make a real one? They have a hundred million participants in this thing! That's more than all of the university students in the United States, okay?

So what you would do is, you make this part of their effort, and what they would do is to say, "You want to understand the local culture. [1:50:00] This is a university town. We have a campus and some good examples. How can you build on the architectural success of the campus?" So that when they went back, they'd say, "What's the local culture? How do we build on the success of that local culture? How do we do this? No, we don't need to have automobiles. And you can serve it in different ways, and have viable communities." So anyhow, we've written up a proposal. It's one page, both sides. And then we've written a memo, which we gave to Steve Clark, okay?

And I doubt whether it went anywhere, but we're going to start spreading it out, and we've been meeting on this for about a year now, every week, over at Imagine. So where it's going to go, I don't know. But it's doable. It's doable. When you look at the satellite photographs, take Google World, or whatever it is, Earth, Google Earth, and you look around and you see this rail line, it goes right by a parking garage. I mean, how ironic! Right by a parking garage, and then right on through to this piece of land. You could have open space, farm space, all around it. Then there's another one just near Hewlett Packard. And then you look at the site of Hewlett Packard; it's about half parking spaces. Mostly empty now. Anyhow, that's some of the stuff we're working on.

CP: Well, my last question for you is: as you think about the future, are you able to stay optimistic?

DB: Okay. This is a good question. There's a big difference between optimism and hope, okay? And there's Cornell West, a theologian from Yale, and he's black. And he says, "I cannot be optimistic, but I am eternally hopeful. Hope requires courage to act when doubt is warranted." Okay? Now, David Lane found that when he did his thesis. And when I was in the class, his honors class, and David Lane presented that to that class, their jaws dropped. And they said, "Why hasn't anybody told us that?"

So, optimism, it's hard for me to just be optimistic. But optimism involves what the Buddhists call attachment. You're attaching to the outcome. So you don't want to attach to the outcome. And I realize engineering is supposedly attached to the outcome, but an engineer can't deal with the big problems; they deal with a lot of little ones. The little ones don't add up—the little ones may be good, but it doesn't mean that the whole is good, okay. If the world were linear, that would

make sense. If the world were linear, I could be a great musician, because I can play great notes on a grand piano. But when I add up all the notes, it's terrible music. So the world is non-linear. So I am hopeful.

I am hopeful, and what you do is you don't attach to the outcomes, and you do something creative, you try to make a contribution in there. And you don't—you know, of course sometimes you feel bad if it doesn't work. But I look back, and if I look at all the failures, if you wanted to say that they didn't go anywhere—some of them did. And if I had to do it over again I would do it the same way. So there's no regrets. So I guess if you approach—you know, I'm 75 now. If you approach that age and you don't have regrets, and you say, "No, I wouldn't trade what I've done with anybody else I know," that's pretty good.

But if I ask me, "Okay, well, why don't you list all of your accomplishments?" No, I don't think that's the right question. Now again, that gets to be something theological, that in Cornell West, "hope is the courage to act when doubt is warranted." And then hope also comes as a gift, freely a gift. That's what they call grace. So I don't know how it's going to turn out, but I don't have to know, okay? And the idea of prediction and control is just an illusion. Yeah, if you're building a cabin, maybe that's okay. But we're talking about the future of the earth and societies—just don't do it. [1:55:03] So we need to tell that to the students. Our generation needs to tell that to them. Anything else?

CP: Well, Dr. Bella, thank you very much. This has been a lot of fun, and I appreciate you—

DB: A lot of fun.

CP: —being so generous with your time, and welcoming me into your home.

DB: Sure. Well, I would—again, anybody who looks at this, the oral history is extremely important, because there are a lot of things that didn't make it into all of the documents that they're studying, and they may be the important things, is kind of what Sherlock Holmes, the dog that didn't bark, okay? The stuff that you don't find, why didn't you find it? Well, that can be, you can learn a lot from that. You can learn a lot from that.

CP: Well, we're doing what we can.

DB: OK, well good. I appreciate it.

CP: Thanks.

DB: Thank you!

[1:55:41]