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Transcript

Gail A. Bishop, Ph.D.
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Interview conducted by
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Williams: This is an interview with Dr. Gail A. Bishop for the American Association of Immunologists (AAI) Oral History Project. Dr. Bishop is Director of the Center for Immunology and Immune Based Diseases at the University of Iowa Carver College of Medicine. She's also the Holden Chair of Cancer Biology and College of Medicine Distinguished Professor of Microbiology at the University of Iowa Carver College of Medicine. Dr. Bishop was President of the American Association of Immunologists from 2012 to 2013 and served on the AAI Council from 2007 to 2012. We are at IMMUNOLOGY 2015™ in New Orleans, Louisiana. Today is Monday, May 11th, and I'm Brien Williams.

So thank you very much for—I'm sorry I had to filibuster there. [laughs] So tell me about your family background.

Bishop: So I grew up in Milwaukee, Wisconsin, in a small lower-middle-class, working-class neighborhood right in the heart of the city. My mom was a homemaker, although she had trained as a high school English teacher, and my dad worked first as an accountant and then kind of worked his way up through the ranks in the Milwaukee Transit System. He was not able to go to college because his own father died in the middle of the Depression when he was a teenager, so there wasn't that opportunity in his family. And my dad was utterly determined that his children would go to college, so although our family income was modest, my dad was so good at saving and being frugal and managing money in our household, that my brother and I did both go to college, and that was a great achievement in our family.

So I've sometimes found in the profession when I first started out that I felt different because I did not come from the kind of background that many in science do, where they went to Ivy League schools from undergraduate years on and really, really had that culture. I did not know anybody who was a scientist until I was in college. So it was a profession I didn't think about during my younger years at all. I didn't think of these opportunities. I didn't have any role models. The expectation for me was that I would marry a nice man and raise intelligent children. [laughs] So sometimes I'm just amazed that I ever had these chances. To be the president of the AAI was just unimaginable to me as a young person. I would never have thought that would happen.

Williams: As a high school student, did you have a sense of where your interest lied or not?

Bishop: Well, when I became really interested in science was, as for so many young people, a really inspirational biology teacher when I was a freshman in high school, and before that, I really hadn't had any very inspired science teachers, so science was just another subject. But this was a young man who was right out of college and he knew how to make it come alive, and I became fascinated with the idea that in biology you can learn how things work, and how cool that was, you know, that it was just wonderful to understand step by step by step how things work, and that's always been what's interested me all the way along. So I thought

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I might want to do something in biology. My other love was music. When I graduated from high school, I still hadn't really decided, so I chose a college that was strong in both biology and music, figuring I would figure it out after I got there.

Williams: What instrument did you play?

Bishop: I played the flute.

Williams: So you went to St. Olaf's.

Bishop: I did. I went to St. Olaf College in Northfield, Minnesota.

Williams: Tell me what that was like.

Bishop: It's a small liberal arts college, and my parents strongly felt that that was a good idea because I was a very shy person and I went to a very large high school. There were 993 people in my graduating class, so you really were a number. You never got to talk to a guidance counselor unless you were in trouble. I still, when I go occasionally to a high school reunion, I don't know that that person's changed or that I never did know them because there were so many people in my high school class. So it was really great to go somewhere where you'd get more individualized attention and where you didn't necessarily have to be highly confident and aggressive to do well.

The one thing that was a little odd for me at St. Olaf is it is a Lutheran college, and I'm not Lutheran, so I had to get used to all the various rituals of the Lutheran church service because I sang in the chapel choir there. So I was raised Presbyterian, and Presbyterianism is a very unadorned religion. So getting used to Lutheranism, where they stand up, they sit down, there's particular responses and all, that was new for me, but I had a very nice experience at St. Olaf. I made friendships that I've kept all my life, and I felt I got a very good education there.

Williams: And at the end of, I guess, four years there, had you decided on the biology side or the music side?

Bishop: I had decided on the biology side, and I wasn't sure what I wanted there, because being a small liberal arts school in those days, there weren't the opportunities for undergraduate research that there are now. I, fortunately, had an opportunity, which was what diverted me into immunology as a science, but it was back home in Milwaukee, and that was kind of a serendipity. So there wasn't a lot of opportunity to do research at St. Olaf. There is now, but there wasn't then. And most of my classmates who are biology majors, the vast majority went to professional school with, of course, medical school being the holy grail, but also dental school, veterinary school, things like that. Very few of us were thinking of graduate school.

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I had been kind of pushed in the direction of medical school by my advisors, because if you have good grades and all that, that's kind of what they were logically thinking of. But when I was a junior, St. Olaf was on a 4-1-4 plan where you have a one-month interim and you take one course for the whole month of January, and I did an independent study where I went back home to Milwaukee and I shadowed an internist for a month. He was a very interesting person who had me come and see his patients if they had surgery, see their surgeries, and then my afternoon assignment would be to go to the medical library and research their disease or their problem, what caused it, what are the current treatments, what are they based on, what are the big questions in that field.

At the end of that month I realized that what I really most enjoyed was those afternoon sessions and that I had kind of a tendency to relate so much to feeling bad for the patients that I felt like it might be difficult for me to be a physician, and so I decided maybe I should think about graduate school. But there weren't a lot of people to advise me, and I was engaged to be married. My husband [Warren Bishop] was a medical student at the University of Wisconsin, and we needed support. So I didn't go to graduate school immediately, I started to work as a technician, and I also had doubt in my mind, "Maybe I'm really not smart enough to go to graduate school anyway. Maybe I should be a technician, and that would be a good career for me."

So I don't know how much of this information you actually want. You do? Okay.

Williams: Mm-hmm.

Bishop: So I started as a technician in the laboratory of William Dove, who is a fantastic geneticist who later became elected to the National Academy of Sciences. Actually, in two weeks I'm going back to Madison for the fiftieth anniversary of his laboratory, which should be really fun. I was able to use the skills that I learned in my undergraduate summer lab, which was working with mice. He had just started working with mice and he wanted someone to manage the mouse colony.

So there were two things that happened to me there that were lucky, that pushed me out of my mindset and into graduate school. So one of them was that as a technician, you could take one course per semester if it was considered relevant to your job, and there weren't a lot of immunology courses at that time because immunology was kind of a new science, but there was a course in immunogenetics, so I took that and I did very well in it.

We wrote NIH-style grant proposals towards the end of the class and turned those in, and then the professor had us come in to talk about them. So I came into his office, and he threw the proposal across the desk, and it said 1.0 on it. And I

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didn't know anything about the NIH [National Institutes of Health] scoring system. That's actually the best score. That's a perfect score. So I said to him, "Is that good?"

And he said to me, "If it weren't unethical, I would submit this grant." And then he said to me, "What graduate program are you in?"

And I said to him, "I'm not in a graduate program. I'm Bill Dove's technician."

And he looked across the desk at me, and he said, "Why?"

And I said to him, "Well, I have to support my husband. I'm a technician. He's in medical school."

And he said, "Didn't anyone ever tell you that they pay graduate students? They pay their tuition and their living stipend, and you could afford to go if you pinched pennies, because you'd get a small stipend."

So I thought, "Wow," and I put that in the back of my mind.

Then the other thing that happened was that Bill had a special mouse colony because of the genetics work that was not taken care of by the regular mouse staff, so he had hired an undergraduate to come in and take care of the mice, change their water bottles, clean their cages, and all this. She developed some sort of chronic illness, so as the technician who took care of the mice, then I wound up cleaning mouse cages and changing bottles, and as I was up there scraping mouse poo out of the cages, I thought to myself, "You know, I didn't get a bachelor's degree for this." And that pushed me into inquiring about graduate school, and, in fact, I started graduate school at the University of Wisconsin. That's why, unlike many of my colleagues, I have a master's degree, because after I'd passed my comps, my husband matched for a residency elsewhere, so I finished up with a master's and then I moved to Michigan where he did his residency, and I got into a Ph.D. program there [University of Michigan, Ann Arbor] and did my Ph.D. there. So it wasn't a straight path.

Williams: Not at all. Not at all. Part of the story, were children coming along at this point or not?

Bishop: No, because of all the complications, we wound up waiting longer than we really would have liked to have waited, but ultimately they did come along. We had our first child toward the end of my postdoc at UNC [University of North Carolina at] Chapel Hill, and then I had my second child as a new assistant professor at the University of Iowa.

Williams: So compare your experience—I'm just curious—Wisconsin versus Michigan. Where there big differences or—

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Bishop: They're both big, successful state universities. Michigan is kind of unique in that it's almost more like a private school. It is a state university, but it has a lot of money. When I was there, it called itself the Harvard of the Midwest, and that kind of says a lot. So there's a lot of great work being done at Michigan. There's a lot of great people. The attitude, the gestalt there was less Midwestern, by which I mean there was more looking over your shoulder, there was more people not talking to each other, there was a higher turnover of faculty. Those were the negatives about Michigan, but I got a great education there. Again, I made lifelong friendships, but it was a bit of a different kind of a place.

Williams: Any particular mentors that you had there that were critical to you—

Bishop: At which place?

Williams: At Michigan.

Bishop: At Michigan I wound up kind of having two mentors. So I started in the lab of Stanley Schwartz, who's a physician, and did cellular immunology. He was a very busy physician who, as it turned out, really didn't seem to have a lot of time. I was his first graduate student, and he didn't really seem to have a lot of time to spend on my project. He was interested, but in terms of troubleshooting, writing the papers and everything, I was kind of on my own.

At one point, I developed an interest that took me to another professor, Joseph Glorioso, who was a herpes virologist. He was a brand-new assistant professor, really eager and interested, and he became a very important second mentor to me. Even though he wasn't my official mentor, the rest of the project ended up being a very close collaboration with him, and he was around a lot, very interested in talking about the project. We have stayed in touch over the years, so that was a very important mentoring relationship for me at Michigan.

Williams: And in your project were you working with mice again or not?

Bishop: In that project I was actually working with human cells, and so I got to see the challenges of working with human cells.

Williams: And in the herpes realm?

Bishop: Yes, yes, we worked on herpes simplex type II. Excuse me. That's wrong. Herpes simplex type I.

Williams: So then you moved to North Carolina, I guess. Is that correct?

Bishop: Yes, and all the way along, I was following my husband, who was three years older than me. So he was a medical student at Madison, which is why I went

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there. He got matched for residency at Ann Arbor, which is why I went there. He had a medical school scholarship from the Air Force because he didn't come from a wealthy family either, and this was a way for him to go and get a medical education without building up a huge amount of debt, but the debt he incurred was his warm body in the Air Force for four years after he finished his residency.

So they sent him to Seymour Johnson Air Force Base in Goldsboro, North Carolina. So I looked around for what's within striking distance of Goldsboro, North Carolina, and that was the [Research] Triangle area. So I looked at positions at Duke and Chapel Hill, and chose to go to Chapel Hill. Then for three years while the remaining time—for one year, his first year in the Air Force, I was in Michigan, so we had a long commuter relationship. For the next three years, he was in Goldsboro and I was in Chapel Hill, which was almost a two-hour drive, and he was on call every other night. So he had a small rental place in Goldsboro, and we bought a small house in Chapel Hill, and then we got together on the weekends. So that's why it took us a while to have a family. [laughs]

Williams: How did you land a job in the Triangle? Did you just apply or did you have people at Michigan promoting you?

Bishop: Well, that was a postdoctoral fellowship, and there, yes, you apply to the individual faculty members. At that time, we didn't have all the Internet access, so people my age will remember going to a library and looking things up in like *Index Medicus* and looking at who was there and what were they doing and which of them interested me, and writing to people and asking if they had opportunities, and then setting up interviews, going to all different interview trip, giving a talk about my graduate work to kind of show what I could do, and spending the day talking to them and members of their lab and then making a choice.

Williams: Well, they're making the choice and then you make the choice.

Bishop: They're making the choice and I'm making the choice. Right.

Williams: You also applied elsewhere than North Carolina. Did you say Duke [University]?

Bishop: No, I didn't because my husband was in North Carolina. [laughs]

Williams: No. No, I know, but I thought there was another school in—at Duke.

Bishop: Raleigh-Durham and Chapel Hill, they call that the Research Triangle, so they're all in fairly close, so you could work theoretically at any one of those places and—

Williams: Did you apply then to more than one in the Triangle or not?

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Bishop: Yes. I looked at one position, or maybe it was two. It's been a while now. I talked to one person at Duke and two people in Chapel Hill, or three people in Chapel Hill before making up my mind, and, of course, they had to want me too.

Williams: Okay. So what was that like?

Bishop: What was?

Williams: Your postdoc at Chapel Hill like.

Bishop: Oh, it was great. I mean, the first few years, there was the stress of the commuter relationship with my husband in Goldsboro and Chapel Hill, but the training environment was wonderful. Chapel Hill is a lovely place, I made lifelong friendships there, and my two mentors were wonderful. I did a couple of years with Geoffrey Haughton, who, unfortunately, is now deceased, and Jeffrey Frelinger, who is another past president of the AAI, was my second mentor and has been a lifelong colleague and mentor, really, and friend. So I had a wonderful time in Chapel Hill.

Williams: And did you feel as if your scientific career leapt ahead over those couple of years or not?

Bishop: Well, it's kind of a continuum, you know. You become more and more capable of being independent. You learn more and more the skills you're going to need to make it as an independent scientist. I think when you're a graduate student, to me, at the beginning it's inconceivable that you could function as a postdoc, but by the time you're at the end of your graduate career, you're ready to be a postdoc. Then when you're first a postdoc, it's inconceivable that could I ever be a PI [principal investigator], and then when you're at the end of your postdoc, you're ready for that next step. It's a little scary, but, you know, it's kind of like any other growing-up sort of thing, you become ready in time.

Williams: Was it unusual for your husband to have four years in one place in the Army [Ed. Air Force], or is that typical for—

Bishop: For that particular program, yes, they typically kept people in one place so that they would develop relationships with the patients and be part of the medical team, and by that time already they were starting a trend of moving people less in the Army than they used to because they were realizing how incredibly expensive it is to move people around so much, so moving every year or two was starting to become less common, and they were keeping people in place for more like four, five years.

Williams: Was there a certain concentration in the medicine at that particular hospital or was it just general?

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Bishop: No, it was a very small military hospital. There were two pediatricians for the whole hospital, and he was on call in the emergency room a couple times a month where whoever was in the emergency room just took care of everything that walked in the door, no matter what your specialty was. So that was, in a way, a really good experience for him, too, because he developed tremendous self-reliance and the ability to think on his feet.

Williams: Did he come from Iowa, too, or not?

Bishop: He came from Wisconsin, like I did.

Williams: That's right. That's right. I keep putting you in Iowa.

Bishop: Iowa's the place we've lived the longest, but we came from Wisconsin.

Williams: As you progressed at these various institutions and then in Chapel Hill, how were you checking in with your family? Were they coming and visiting you and were you—

Bishop: Yes, yes, they visited at all stages and we would go home when we could. When you're in those training years, you don't have a lot of income, so you can't go very often. When we were in Michigan, we could make the drive back to Wisconsin. It was kind of a long drive, but we could do it. Chapel Hill was a bit harder, but then when the first grandchild was born, the incentive became much greater for them to come and visit. [laughs]

Williams: They must have been pretty excited at the successes that you were enjoying as you progressed.

Bishop: Well, that's interesting. My dad, yes. My mother has always, I think, had very mixed feelings. I think she was always kind of hurt that I didn't choose her path. I didn't decide to come an English major, I didn't become an English teacher, I didn't decide to become a full-time homemaker. Sometimes I think parents feel if you made a different choice than they did, that in some way that invalidates their choice, and I think that's based on personality. Whereas my dad was just fascinated by everything, and he would want to come into the lab and see what are you doing and look through the microscope, my mom was never interested like that.

Williams: And what career path was your sibling following at this point?

Bishop: My brother became an urban planner and actually worked for the same transit system that my dad did for many years, and my brother's still in Wisconsin, which is nice, very nice. I see him regularly.

Williams: Right, right. So how did you end up going to Iowa?

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Bishop: Well, after Warren got out of the Air Force, my husband, what we most wanted to do was synchronize, because there'd been all this staggered—you know, one person following the other. So he wanted to do a fellowship, and I decided then to do a second fellowship. That's when I went into Jeffrey Frelinger's lab to learn new skills and new approaches and things. And then we decided when his fellowship was over and my second fellowship, we'd look for faculty positions together, and so that's what we did.

So there weren't that many places that would have a job for an immunologist and a pediatric gastroenterologist, which is what he became. Pediatric gastroenterology was a very new field at that time, so there weren't a lot of them, and institutions weren't loading up on them. It's a much more robust specialty now. So we looked at places that had jobs for both and where we could get offers for both, and there were several, as it turns out, but [University of] Iowa was the one that we chose. And to be honest, we mostly chose it because it was the best job for my husband, and I felt he had the greater wage-earner potential as an M.D., so it would be the best thing for me to just make the best out of the opportunity that was there, and there was a job opportunity. I did have an offer. So we went there, and it turned out to work out really well. We stayed there. We both had offers from other places over the years, but they haven't been able to lure us away.

Williams: Is your husband's practice strictly clinical, or was he also involved in research?

Bishop: So he started out, he did research at Chapel Hill, and he started out with a research lab, and when we first came to Iowa was a funding crunch much like the one we have now, although it didn't last as long, and I think it wasn't quite as awful for people because at the time in academic medical centers there was more spillover revenue from the clinical enterprise. Now that's not the case. The clinical enterprise doesn't make a profit anymore. But there was definitely a funding crunch, and my husband, with only two years of research training, got his first grant, and then the person who hired him in left and took one of the other faculty with him, and he was alone. He was alone for several years, and he had so much clinical responsibility, he had to give up his lab. So he now does some clinical studies, but he doesn't have a laboratory, but he is an academic physician. He's now the head of the Pediatric GI [Gastroenterology] Division there.

Williams: I guess we missed one step in this, where he left the military and then did a fellowship.

Bishop: He did a fellowship at Chapel Hill when I did my second fellowship with Jeff Frelinger.

Williams: So you were both then together there.

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Bishop: We were both then in Chapel Hill, and that's where we had our first child, so that was great to be together at last. [laughs] And we've known a lot of people in our profession over the years who've had commuter marriages. A lot of people do that, where one person just gets a wonderful job offer in, say, New York, and the other one is in Washington, and they do that. But for us, after doing that for four years, we would never do it again, never.

Williams: So when you arrived at the University of Iowa, what was it like?

Bishop: It was awful, because when I arrived, the department chair a few months earlier had been diagnosed with rapidly aggressive pancreatic cancer. I never even saw him after I arrived, and the department was not in good shape in which I had taken a job. There were very few immunologists. I was only the second woman to come into the department, it was very senior-heavy, and they had very bad space, and they didn't have anyone to fight for them. The chair had been a person who was a really great scientist and really nice person, but he never really wanted to do all the bureaucratic things that a chair is supposed to do, and so things had kind of gotten out of hand.

So no one was unpleasant to me, but I was just kind of ignored. When I look at all the programs that are there to help young people now, I think, "Wow." I started teaching my first semester. When I wrote grants, there was nobody offering to read them or help me or anything like that. So it was the big chill, because I came from this really great interactive lab at North Carolina, where I felt like I always had people to talk to and colleagues and peers, and it was very isolating and very stressful, and there were times I thought, "What am I doing here?" But just bit by bit, it got better and better.

I had awful space to begin with. I had gotten an appointment pretty early on at the VA [Veterans Affairs] Hospital across the street, which is nice because then you can get into the VA granting system. The department wasn't willing to provide me with space, and so my space was over at the VA, which was a bit of a walk, and it was in a very old building that had been old apartments for medical students, and to get to my lab, you walked up this very steep concrete stairs and you opened this heavy metal door towards you. So I put up with that for a while, and then I became pregnant with our second child. And I'm short, so there's not a lot of places to grow but out. So one day I was walking up the steps and I opened that door, and I almost fell backwards down the steps. And I think you probably picked up by now, I'm not the kind of person who confronts easily, but that did it. I went to the dean of personnel in the College of Medicine, and I said to her, "If I don't get better space very soon, I will leave and I will take my husband with me."

And things started to happen. So I got some space over there in the department. It wasn't great space. But then they hired a new chair, and the new chair was very supportive of me. By that time, I had two grants, I had been publishing. The

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department was going to be renovated when he came in, and people had to move in order for them to renovate one section, and so he moved me over to a very new building next to two other immunologists. We actually got a P01 together. So then all of a sudden, I had excellent space, made it easier to recruit graduate students. Things just started to get better and better. I got to know people, I started to be able to get leadership positions, I got tenure, promoted, so gradually it became a really good place for me, but those first years were rough.

Williams: Sounds like it. So what was the immunologist community like then as it evolved at Iowa?

Bishop: The way it's evolved, I think, is very nice. I mean, Iowa has quite a few immunologists. We interact very well. It's a very cohesive community. We've had, I think, a very first-rate training program for a long time. Now we have the Center [for Immunology and Immune Based Diseases] and its activities. So I feel that it's been a very collegial environment, and I have a lot of good colleagues to talk to and interact with.

Williams: How much of a force were you in the development of these changes, these beneficial changes?

Bishop: Well, I think I have had influence. The interdisciplinary graduate program in immunology was developed by me and three or four other people when I was an assistant professor. We decided we really needed it. There wasn't enough immunology in microbiology to sustain the training program we wanted to have. So we would meet regularly and we put together this graduate program and obtained regental approval for it, which was quite a process.

And then I was very active in that program, and when the original head of that program moved on to something else, I became the head, and I was head of the program for fifteen years, until 2013, and that was the year I was AAI president. Then also we developed the Center, and I wanted to be more involved with that. So I felt during those years I shaped it quite a bit. I have been head of the training grant that the program's had for twenty years, so I like to think that I have been an influence for good in immunology at Iowa.

Williams: And as you did this, you probably took on more administrative activities.

Bishop: Yes, I also do a fair bit with the [Holden Comprehensive] Cancer Center. I'm Associate Director for Basic Science Research, so, yeah, I have administrative responsibilities.

Williams: And how does that balance out, and to your satisfaction, between doing science and doing administration?

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Bishop: There are two different satisfactions. I mean, my true love is the science, but I think that when you get to a certain stage of seniority, it's almost, I feel, a pull that you should give back in some way. If people who don't care have all the leadership positions, then it's not good for the enterprise, and so while I'm not dissing people who disappear into their laboratories and that's what they do, and, you know, some of the most brilliant people want to do that, somebody's got to step up and do this stuff. So I think I felt, at least personally, a sense of obligation to do some service nationally, locally, what have you.

And there is satisfaction. For example, one administrative thing that we all do is train, and, to me, mentoring and training is really important, and it's a tremendously satisfying thing, because I think, okay, you and I, how many Nobel laureates can we name? Not all that many out of all the ones there are. So if you can't even remember all the Nobel laureates, wonderful though they are, who's going to remember me after I'm gone? Let's be realistic and honest, you know. It's not about me being famous. The way that I can leave a legacy that goes forward is not just in what I do, but in who I train, and then hopefully they pass along some of the important precepts to their trainees and their trainees, and that way doing good science keeps going because we pass it on. So I think that's a very important and satisfying thing to do. If it's all only about your own accomplishments, you know, that's pretty short-term legacy. I think the longer-term legacy is how can you influence what's going to happen after you've shuffled off. [laughs]

Williams: When you and your colleagues were sort of developing the program, did you look at the whole field of immunology and say, "This is the area in which we as a group should go," or was it more individualistic?

Bishop: Well, we were specifically developing a graduate program, so we said, "What are the elements that are needed for a good graduate education in immunology?" So a lot of that is thinking about curriculum and how students decide what laboratory they're in and how will student progress be overseen, and how will we make sure students don't fall between the cracks and what kind of expectations will we have for our faculty in terms of teaching and service in the program, what will be the requirements for the degree, the various aspects. And, of course, that has all continued to change and evolve over the years, which is important. You learn and you change, but that was what we were really focusing on. We, as an interdisciplinary program, did not have the resources to decide to recruit people, so even if we saw, well, we'd really like somebody in this area, we couldn't directly go and get that person. We'd have to see if we could maybe do that through convincing a department to hire someone in that area.

Williams: But as you were developing this sort of pedagogy of the whole situation, where were you focusing your science, your actual work, your grants, and so forth?

Bishop: Oh, me?

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Williams: You and the others that you were working with.

Bishop: Well, everybody has their own interests, and those, of course, change and evolve over the years, too, as new problems arise and you become aware of that. So I'd say there's quite a diversity of areas of immunology at Iowa, so everybody was working on something a bit different.

Williams: Which also is very good for the students, isn't it, because—

Bishop: They get a wide choice, yes, and they can see through the rotation process and through inside seminars that people give and all that what everybody's working on and learn from each other.

Williams: Right. So currently, how big a department or how many students do you have?

Bishop: Me or the immunology program?

Williams: No, the whole group.

Bishop: The immunology program, I think—now that I'm not the director, I don't always know the exact number. I think it's around twenty-five. We have had to cut back in the past couple of years because of funding constraints, so we don't take as many students as we did five, six years ago because of what's happening to national research funding. We worry that they may not be able to find positions if we take too many, and we want to be sure that they have a good choice of faculty labs too.

Williams: Interesting. So let's turn to your scientific legacy. Other than your mentorees, what do you want to be remembered for in terms of science?

Bishop: Well, I guess it's that I worked in various areas of molecular mechanisms of lymphocyte regulation, and particularly members of the TNF [tumor necrosis factor] receptor superfamily and the molecules that serve them. I guess I feel that the most important overall nature of my contributions is I've tended to work in areas that are less studied and perhaps taken the road less traveled to begin with, to work on things that weren't the most popular areas of the moment, at least when I started working on them, and make contributions that are a bit off the beaten path and think a bit differently about things. And then that's enabled me to, I hope, make contributions that are important and novel and creative.

Williams: Are there practical applications for some of your discoveries?

Bishop: I think so, and particularly now, as I'm getting to the more senior stages of my career, I'm seeing some of that, and we're moving into more translational areas, and those have been typically, I would say, in recent years, more in the area of

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applications to cancer immunology and a recent project that may have some ultimate applications to Type II diabetes. So it's rewarding to see the clinical applications, the opportunity for that coming along, and we're trying to make a contribution in that way and move our work in that translational way, which can be difficult when you're not an M.D., to get access to patients and patient samples, but we're trying hard to do that.

Williams: Do you still have a relationship with the VA Hospital?

Bishop: Yes, I do. It's been a really nice relationship over the years. I've really enjoyed the people I've worked with in the VA research enterprise, and the VA at Iowa is an excellent VA, so that's been enjoyable.

Williams: Unlike some others.

Bishop: Yes, exactly. And I think, too, having been in the VA all these years, I also have this kind of insider perspective in that I know the VA is always underfunded and understaffed. So those very congressmen who get up and yell at VA administrators about, "Why don't you do this better? Why don't you do that?" they're not appropriating more money for the VA to hire more people, so they've got to keep that in mind too. The people I see in Iowa really do the best they can all the time.

Williams: What one message would you want to convey to laypeople who have no understanding, immunology is just mysterious? What do you want them to know about your life's work?

Bishop: Wow. I should have prepared for that one. What do I want them to know about my life's work?

Williams: Or the field.

Bishop: Or the field. I could give an elevator pitch about what I'm doing now and why I'm excited about it.

Williams: Don't hesitate.

Bishop: Oh, okay. So one of the things I'm excited about is we've been working for years on, at first, a very unloved signaling protein that now is more popular, called TRAF3 [TNF receptor-associated Factor 3]. That's an acronym, but that's an easy way to remember it. It was difficult to study at first. It wasn't clear what it did, and if you knocked it out of a mouse, which was a very popular way to see what does something do, you can do this genetic technique where you eliminate the protein from a mouse. And for many proteins that do multiple things, if you do that, unfortunately, the mouse doesn't survive, and so then you don't learn

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anything, or you don't learn as much as you'd like. That's what happened with this protein.

So we took a two-pronged approach. We made cells that lacked it, and we studied the cells and started to learn some things. Then smart people—not us—came up with a technique for removing proteins just in particular cell types in the mouse, where the mouse could survive, and we used that technique to make a mouse like that, and we discovered that this protein does very different things in different cell types. In one of the cell types that I've studied throughout my career, the B-lymphocyte, which is the white blood cell that makes antibodies, and it's the only cell in your body that makes antibodies, this protein prevents the cells from surviving too long. So cell survival is something that has to be held in careful balance in the body. Too many cells die, you have a problem, but too many cells live, you have autoimmunity, you have cancer, you have all these diseases where there's too many cells.

And in this case, we discovered in the B-lymphocyte this protein kept the cells from surviving too long, so if you got rid of it, all of a sudden the body was packed with B-lymphocytes. They were infiltrating all the major organs. The mice were making autoantibodies. They ultimately developed B cell tumors. And at the same time we published our paper on this mouse, which was in 2007, a couple of of papers came out the very same month on common mutations in a human cancer, called multiple myeloma, which is a cancer of antibody-producing cells, and it's a really nasty tumor. We don't have great treatments for it. And mutations that damage the function of this protein were found to be relatively common in multiple myeloma. And, to me, that was just like a light went on. Our protein that we're so interested in, that we've been studying, is really important in human malignancy, and we've developed theories about why we think it gets mutated so often, because of its position on the chromosome and it's in an area which is subject to a type of mutation. Frequently, we're now studying the status of this protein in human malignancies. We've discovered a number of the pro-survival pathways. We've discovered a pathway that can explain why it's common in multiple myeloma.

I guess that now that I'm talking to you, I realize that the message I would give to the layperson is if you do basic gaining of knowledge—someone yesterday in a talk said we shouldn't say, "research," because when we say "research," they think of Tuskegee. They think that we're evil and we're doing awful experiments. So I will say "gaining knowledge." When you're working on basic questions that are, in my case and when we started this, driven by intellectual curiosity, the "how does this work" question that's always driven me, you cannot predict where that will take you, but if you do good science, you're asking important questions, you're going about answering them in a rigorous, enlightened, thoughtful way, interpreting your data in an open-minded way, you are bound to find something that is going to be clinically applicable.

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When we look at many of the clinical tests we have now, they're based on basic bacteriology or work that if some congressman had read this, he would be doing what they're doing now, saying, "Look what we're funding. This is just garbage. This is worthless. This isn't curing disease." And that's so ignorant and so shortsighted, because without strong basic findings, it's like a pyramid and you don't have a base to your pyramid. And if you understand something, you can build on it, build on it, build on it until you have a clinical application.

An example is one of the most exciting immunotherapy breakthroughs right now, is something called checkpoint inhibitors. So the immune system has a way of—this TRAF3 protein is one way, but there's lots of ways the immune system has for keeping itself from going out of control, and one way is to increase expression of these so-called checkpoint inhibitors. But when people are looking to rev up the immune system against a tumor, then these checkpoint inhibitors get in their way, so people have now made ways to turn off those checkpoint inhibitors in immunotherapy and make the immunotherapy much more effective. But that took years of work in the basic science of understanding what are these molecules, what signals cause them to be expressed, what do they do and how do they do it. If we didn't know any of that, that would never have been possible. So I think I would say to them, when you see congressmen making fun of research, usually the person who did the research has no opportunity to respond, or if they could, they would tell you why it's important.

It is really important to continue this, or what will happen is we won't have any new discoveries in this country. And it's already happening, because other countries in the world that are investing in science are steadily and inexorably moving ahead of the United States in publications, in patents. And I think science drives a better life for our citizens. It drives cures for diseases. It drives epidemiology, understanding how to prevent disease. It drives understanding how to deal with social problems. So that's why I believe it's something that is important to support in our society.

Williams: How do you handle disappointment in doing scientific research?

Bishop: Well, you sure get a chance to do that a lot, you know. It's like the—I don't know if you took Psychology 101 as an undergraduate, but there's the classic experiment of the pigeons pecking the lever to get the pellet, you know, and they would peck it more times if they got the pellet only randomly instead of every time. Well, intermittent reinforcement is the most powerful kind. Science certainly gives you lots of opportunities for intermittent reinforcement.

So I think that there's a reason that there's no child genius scientists, because success in science needs a lot more than raw talent, and I think character and personality has a lot to do with it. So when I look for someone to hire, I think resilience, a steady nature, a sense of humor, not taking yourself too seriously, all these things are really important, to be able to step back, put disappointment in

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perspective. And I think it's also a reason why our collegial relationships are so important, because it's not like you step out of the building and someone stops you on the sidewalk to thank you for what you're doing, you know. People don't really understand what you're doing, and they may be suspicious of it, even, based on what they see in the movies. [laughs] So I think it's important that we support each other in tough times, because everyone's been through having a paper rejected, not getting a grant funded, having a pet hypothesis turn out not to be correct, or having a big experiment not work. It's part of life.

So I think you have to see the big picture. You have to be comfortable with who you are. I tell students or trainees, when you get a big disappointment, the best thing is often to put it aside for the moment and go take a walk or distract yourself in some way. Remember that you aren't that failed experiment. You're still you. You still bring all the talents and strengths that you have to the table, and that's just something that happened. So tomorrow is another day, kind of thing. I think in science a lot of it is how good are you at picking yourself up off the floor, really. [laughs]

Williams: Let's talk about AAI for a little while. You became a member, I believe, in 1984.

Bishop: That sounds about right.

Williams: Mm-hmm. And what has AAI done for you over the years in your career?

Bishop: AAI has been a wonderful home organization. So, '84, I would have been early-stage postdoc. I think that then I became a trainee member. So even as a graduate student, I was going to AAI meetings, so it was among the first national meetings that I went to. I went to two AAI meetings as a graduate student. So having first opportunities to present your work, to hear all the leading scientists in your field give talks, and even have a chance to talk to some of them at your poster, meeting people, seeing what the opportunities were out there, seeing what's going on at other places throughout the country and even around the world. And then also developing, as I became more mature in my career, opportunities to gain valuable career skills, so opportunities when I became a junior faculty member, for example, to start participating on committees, to serve as a workshop chair, to learn how to do these things, and to meet all sorts of people who could give you suggestions and advice, not just people in your own institution, so to kind of build up a community of colleagues.

AAI, I think, has just steadily increased the things that it can offer its members because of the great financial stewardship of Michele Hogan and her staff, that they've been able to build up AAI's finances to the point where they—it's particularly important now when things are so tough. They can offer travel awards and things like that to the members, and they can also remind members that what they do is valuable in giving out awards and recognition and things like that.

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Williams: Prior to your presidency, you were fairly active in committees. So talk a little bit about committee service in the AAI.

Bishop: I think you learn a lot in committee service in the AAI, so the committee that I served on right before I rotated on to the AAI Council when I was elected there was the Committee for Public Affairs, which was really a fabulous learning experience, because Lauren Gross, the senior staffer who staffs that committee, has tremendous experience on Capitol Hill. She was a former staffer for a congressman, has been going to the Hill for years. It was a great education in the issues, how Congress works, how to talk to people in Congress about what you do, how to do public affairs, really. So that was great preparation for serving on the AAI Council, and it was also really enjoyable. On every committee I've served on, it's been an opportunity to meet new colleagues and work with people I already knew, but always to meet some new people, and that's always great. You're working together for some aspect or another of the running of the profession that's important, so that makes you feel good, and you're also having this chance to build collegial relationships.

Williams: When you were on Public Affairs, that was '02 through '05, I believe.

Bishop: You probably have better data than my memory can remember.

Williams: And that was during early George W. Bush time. What was it like in terms of congressional support and White House support for science?

Bishop: Well, different congresspersons, senators or representatives, have very different attitudes, and their staff tends to reflect their attitudes. So Lauren will tell you when you go and visit various different offices, it's very interesting how different everyone is. Nobody, which is important to know, nobody expresses hostility towards science. So at least there are no senators or congresspeople or their staffs who will say, "Why should I support science? Science isn't important," that sort of thing.

Those who are never going to be advocates for science will say, "Well, science is great, but what I care about is balancing the budget," or, "Science is great, but my top priority is the defense budget." But at least you have an opportunity to get in there and make your pitch. And I think a very important thing I learned from Lauren is no matter what your own political beliefs are, you can't lose the opportunity to make your case for someone. Even if you don't agree with anything they stand for, here's your chance—and usually you're talking to their staff—but here's your chance in these five minutes or whatever to get them on your side, and you can't miss that opportunity. And I think the AAI has been very good over the years about being bipartisan in giving, for example, [AAI] Public Service Awards to people on both sides of the aisle. One of my previous representatives from Iowa, Jim Leach, who was a Republican, was a staunch

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supporter of the NIH, and when he was voted out, that was a real loss for science. So you can't always assume that all the support is going to be one or the other side of the aisle.

Williams: What about the retirement of Senator [Thomas] Harkin?

Bishop: That's a big blow, a really big blow, because he was a tireless advocate for science, and his staff were truly impressive in their level of knowledge about science and the NIH budget, and they were very committed to advocating. Now we have two senators who really—that's not at all a priority for them, for neither one of them, and it's a loss, a real loss.

Williams: Have you had any contact, for example, with Senator [Joni] Ernst?

Bishop: I haven't yet. I have met with Senator [Charles] Grassley's staff several times, but when I have the opportunity to do a Hill visit, because I'm in Washington for something, I get in touch with Lauren, and the next time that opportunity arises, I'll certainly try to meet with Senator Ernst or her staff.

Williams: At some point you realized that you were going to become president of the AAI in its centennial year [Ed. 2013].

Bishop: Yes. Yes, that dawned on me. [laughs] I didn't think about that at first.

Williams: Oh, really.

Bishop: You know, to tell you the truth, I was so naïve at first that I didn't actually realize when I was called and asked could I be nominated for council, I had a sort of vague idea of what council did, and, you know, I knew they were an important governing body, but I didn't even realize that being elected to council meant you would be the president one day. I didn't even realize that till after I'd rotated on, and then I kind of saw how it worked. I thought, "Oh, am I qualified for that?" [laughs] But you have a long time to learn the ropes before you become the president.

Williams: But talk a little bit about the planning then for the centennial, I mean.

Bishop: Oh, that was tremendous, and that could be laid all to Michele and her wonderful staff. I worked with them on certain aspects, but they have it so together. It was more work than a typical meeting, but then it was just a wonderful celebration. I feel that I was very lucky to be the one whose presidency came up in that year, because I thought it was a great meeting and a great time in the midst of a great deal of stress and angst and disappointment and discouragement for people because of the funding situation, to have this chance to get together and celebrate everything immunology has accomplished. And I think that, for example, the timeline was such a great reminder for people of where this field has been, where

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it's gone, all the important contributions that have been made, and I think that was just a great idea.

Williams: You have written about the fact that there's value in studying the history of the organization and that that came, really, and flowered in 2012—13.

Bishop: Yeah, it was a wonderful meeting, and I think a lot of nice extra features in that meeting that were great.

Williams: Were you involved in the selection of Honolulu as the site or not?

Bishop: Well, the way that works, yes. The way that that works is that Michele and several of her staff visit well in advance several potential sites. I don't remember if it's four years in advance or five years in advance of any given meeting, because it takes quite a while to plan, and these things have to be reserved well in advance with the venues. So they go out to all—usually it's three or four—sites under consideration and visit them and see what are all the nuts and bolts. What would it cost at this one for the venue? What are the options for hotel rooms? How expensive are they going to be? What are the logistics of the members getting from the hotels? Where could we have events? What's to offer in the city? How hard is it to get there, etc., etc.

So when they brought that to the council meeting for the year that was going to be my meeting, and they put the options up on the board, it was very clear to me that Michele wanted to go to Hawaii. [laughs] And it was like, "No pressure, Gail, but here would be your suite. And no pressure, Gail, but here's the beach in front of the hotel."

So, yes, it was my choice if I had said, "No, I won't have Hawaii," but why would I say that? So I did have a say, but definitely that was something they wanted, and I think they made a very good case that AAI had never met in Hawaii, and this was a special meeting and a special venue was called for. And also, interestingly, although everyone thinks, oh, Hawaii, what an expensive choice, but the hotel rooms were among the cheapest of the places AAI has ever been. There was fabulous deals on the hotel rooms. The [Hawaii] Convention Center was really—I mean, they wanted us, and the prices were really good. So except for the airfare, it was a pretty affordable meeting, particularly for people on the West Coast. And one nice thing was it brought in a lot more people, members from Southeast Asia, because that wasn't such a huge flight for them.

Williams: Right, right. So what about some of the highlights of the meeting?

Bishop: Well, I thought the timeline, which was introduced there, was a big highlight of the meeting. Now they have the timeline. It's interesting, while I was still on council as past president, there were quite a few people who contacted me and

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said, “Is there a digital form of the timeline that you can send me?” People were really interested in having that to present at different venues.

There was also a special session with some of the greats of immunology giving perspective lectures—Pippa [Philippa] Marrack; Tony [Anthony S.] Fauci came in by Skype; David Baltimore. So that was one of the special events. I’m trying to think what else. I’d have to go back and look at the program. For me, it was this blur of whipping from place to place and presenting plaques. [laughs] So I don’t remember every single thing, but I think people who were there, I think they told me honestly that they really enjoyed the meeting. So I think it was a good event.

Williams: Michelle Hogan told me about the cabana boy.

Bishop: Oh, I’ll never, never, ever outlive the cabana boy. So Michele, you know, likes to pimp the president on the president’s reception night, which was last night for this meeting, and unbeknownst to me, of course, she had hired a very buff young man who at some point showed up to put a shawl around me, dressed in a wreath of some sort of Hawaiian plant and then some sort of Hawaiian plant in a strategic location and very little else. And of course there had to be pictures, and of course more people than should have gotten a hold of this picture. So, you know, I’ll never live down the cabana boy.

Williams: Was Warren with you? [laughs]

Bishop: He was. He was with me. He’s one of those very steady-natured people that doesn’t get upset about that kind of thing, besides which, I have pictures of many of my female colleagues with the cabana boy, which decreases the opportunities for blackmail. [laughs]

Williams: I noted that the University of Iowa’s College of Medicine was the first coed medical school in the U.S.

Bishop: Is that right?

Williams: Yes.

Bishop: I didn’t even know that.

Williams: Well, I picked it up online, so—

Bishop: Well, good for us.

Williams: Yes. Which leads me to a question about your interest in the status of women in the field.

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Bishop: Yes. So that's a mixed thing. Certainly I can see advancements from when I first started in the field, and there certainly have been some dramatic changes in how things are for women now, for the better, than for me, so some of the more overt challenges and problems and more overt discrimination is not acceptable anymore.

The problem, I think, is that women at the higher levels are still not enough of the population to have really changed the culture, and the culture is still one that often disadvantages women—not by the kind of giant, sweeping discriminatory actions that blocked women from this and that in the past, but from what I guess I would call death by a thousand cuts. Lots of little things that when added up over the course of a career can hurt someone, you know, not being asked because it's the guys going out for beer, but they talk science when they're there. If you look at a roomful of women in study section, the men interrupt the women four, five times more often than the women would ever interrupt anyone else. Just little subtle things. I think what makes it particularly hard is I think a lot of them are unconscious, and I think getting people to give up unconscious biases is the worst of all worlds, because you've got someone who thinks "I'm not biased. I'm doing everything I should," and yet they are.

I mean, things like this. I don't know if you've read about this recent experiment that was carried out. I can't remember where it was published, but applications for research technician with exact same application, but in one case a male name and the other case a female name, were given to several male and female scientists, and the question was "Would you hire this person and what would you offer them as a starting salary?" The majority of the participants, or the percentages were that more of the people would hire the man than the woman, with the same résumé, and they would pay the man, offer the man more than the woman to start. And women also. So that speaks to me a lot about unconscious bias, and it says we still haven't solved this.

And how do we solve it? I read a sociology article once that said a minority group can't really change the culture until they become approximately a third of the members of that culture. And I think at the higher levels, faculty and particularly administration and all that, department chairs, we aren't at that number yet. We certainly are in graduate students and postdocs, but then there's a big falloff. So I think we still have work to do. We've come a long way, but we still have work to do.

Williams: I noted that the AAI had an ad hoc Fellowship Committee that they started?

Bishop: Yes, I'm on that.

Williams: Right. So what's that about?

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Bishop: So that's one of the AAI's new programs to help members. This type of fellowship supports the expenses for a member who has no more than a certain amount of funding, so that is people who are at this point modestly funded. It pays for the salary and needs to do research for either postdoctoral or predoctoral trainee for the member for one year, so all they would need to do the experiments plus their salary, their post comps tuition if they're a graduate student. So this committee selects the recipients of this fellowship.

Being on a committee that gives away money is—we all agree—we had our meeting yesterday and we said, "This is a wonderful committee to be on because it's wonderful to be able to give someone something." And the applicants are very deserving. So I think it's been a great initiative of the AAI, and I'm delighted to serve on this committee.

Williams: Right. What do you see now as the future of immunology? You've sort of made reference to it in passing, but what's the future look like?

Bishop: Well, I think what's being slowly but inexorably realized is that the immune system participates in important ways in virtually every major disease of humanity, and we can't ignore the contribution of the immune system. Back in the '70s, for example, cardiac disease was all about how much fat you ate, and butter was bad and eggs were bad, and now it's okay again. But now we realize that, yes, fat intake is an important thing for health, but a lot of major coronary disease has a big inflammatory component as well, and, in fact, inflammation is more of a predictor of a heart attack than your fat intake. It was always recognized that the immune system played an important role in major autoimmune diseases like Type I diabetes, rheumatoid arthritis, lupus, but now we realize even Type II diabetes, which is often associated with obesity and other alterations in metabolism, also has a very important inflammatory component, and that's a new project we're working on in my lab that I'm finding very interesting. I'm really getting a rapid education in the biology of adipose tissue, which is much more interesting biologically than I would have thought, very interesting tissue. It's a force in just about every kind of major disease, of course we know infectious diseases, et cetera.

So I think that immunologists have sometimes suffered in terms of raising public awareness and raising philanthropic funds because people tend to think of giving money to a specific disease, and it's often a disease that someone they loved suffered from. Immunology sort of permeates everything, and so it's hard for us to be recognized as an important entity because there's immunology in cardiac disease, there's immunology in cancer, there's immunology in metabolic disease, et cetera, et cetera. But if you say you're an immunologist, people say, "What does that mean?" [Williams laughs.] So I think that's our challenge, is to get people to understand what we do and why it's important.

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Williams: With the funding difficulties here in this country, people have been telling me over this weekend about the success of science in China, for example, and whatnot. Where do you see the field going, and is it going—flowing overseas more than ever?

Bishop: Yes, it is. It is. I mean, I can tell you that if I look at the papers that are published in major journals, including *The Journal of Immunology*—and I am currently on the editorial board of the *Journal of Leukocyte Biology*, which is a kind of a sister, smaller society; there are many people at AAI who also participate in the Society for Leukocyte Biology—that I see more and more and more manuscripts coming in from Chinese groups, whereas a drop in manuscripts from the United States because the labs in the United States don't have the money to publish as much as they used to. And I think that's very troubling, and I think our national leaders ought to pay attention to that. I've read articles in biotech magazines that have shown the same thing happening for patent applications, which they really ought to pay attention to, because this is economic engine kind of stuff, and we are falling behind.

Williams: Is it just China or are there other major players?

Bishop: There are. China, I think, just because of the size of China and anything China does, I mean, that brings that size to the table. But many of the developing countries are investing more heavily, and even some of the European countries, although they've had their economic woes as well. For example, Germany has been really stepping up to the plate in funding its science. So I think if a country decides that that's national priority, they can do it. I mean, what we invest in science is a drop in the bucket compared to, for example, what we spend on weapons, and I think that's kind of sad.

Williams: You have expressed concern about how older people are going to be replaced in the field. Talk a little about that as an issue.

Bishop: Well, because it's so discouraging for young people, not as many are going into science. For example, you were at the Public Affairs session yesterday?

Williams: I was not.

Bishop: Okay. There were four speakers, three of them were about alternative sources of funding, and then there was a speaker from the National Institute of Allergy and Infectious Diseases, and he presented a bar graph that said, "Well, really we're not seeing much of a loss." And he showed between 2009 and the present number of principal investigators [(PIs)] in immunology, as far as they could calculate, and what it showed was 100 had been lost, and there had been a steady drop every year since 2009. He said, "Well, that's not really that much."

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But when you think about it, that's 100 principal investigators. That's some twenty a year or whatever. But each one of those people represents a team of five to twelve other people, and that whole enterprise is gone now. I mean, 100 people, I think, is significant, but it's not just 100 people. And the fact that it's a pattern of a steady decline, so there will be another fifteen lost next year if we don't do something. I think that is alarming. That's saying that we are not replenishing the supply. It's steadily going down. We're losing more than we're gaining.

Williams: When a principal PI leaves, retires, aren't there others in the team that's been working with him or her ready to step up and become primary or not?

Bishop: Well, the problem is not that the people aren't there with the talent; it's that the money isn't there. I mean, some of it is that people retire. Some of it is that they don't retire but they shut down their labs, so all those people lose their jobs. So they're not there because there's no way to pay them.

Williams: Right, right. You wrote an article called "Paddling Your Own Canoe."

Bishop: I think it was a presentation at an AAI meeting.

Williams: Right. And the subtitle was "Negotiating a Rewarding Path as an Independent Scientist." You were advocating independent science, or what was your thinking?

Bishop: No. I mean, when you move from a postdoc and start running your own lab, then you're considered an independent scientist. You're not working in somebody's lab. So I wasn't advocating isolating yourself from everyone else. No. It was like career skills as you become an independent scientist. And the "paddling your own canoe" came from a quote that I always thought was pithy, which is "Love many, trust few, always paddle your own canoe," which has a kernel of wisdom in it. [laughs]

Williams: Indeed, indeed. Over the years, how have you mixed family with your career, your careers, you and your husband?

Bishop: Well, it takes a lot of different strategies. For young women, I tell them this may sound hopelessly old-fashioned, but I tell them the most important career decision you can make given—I'm just going to say it straight, not politically correct—if you choose to have a partner, the partner you choose. Because what I've seen in other women is if the partner is supportive, that is worth diamonds and gold. If the partner makes you feel bad, that can derail a career because we are genetically programmed to feel guilty about everything. [laughs] I mean, that is kind of true. I don't think it's genetic, actually; I think it's environmental. But if you have a partner, be it male or female, be it a spouse or someone you're just living with, and they're giving you grief every time you have to go in at an odd hour for an experiment or travel out of town or maybe you can't pick up the kids this night, if

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they're making you feel like you're not doing your job, you know, that's going to erode and eventually hurt the career. Or if they say, "I can only be in this one place where there's no job for you, and that's just the way it has to be," and I've seen that happen to young women that I've trained, and that's heartbreaking. So I think that's important.

Then I think a variety of strategies to be flexible. First of all, don't have children as a kneejerk thing to put on your résumé. Have them because you really want them. I remember once sitting at a meeting, and a very high-powered female scientist, who I don't honestly know who it was—it was someone, I think, in an industrial position—was trying to give advice to someone who was about to have her first child, and said, "Well, you get a nanny who comes in at six in the morning and stays till three in the afternoon, and then you can get another one who comes at three and stays till nine." And I thought, "why would you have children then if you don't want to ever see them?" I mean, it's not just something to check off on a checklist, so you should think about that seriously. But assuming you are having children for the right reasons, I think, for me, during those years when they were young it was just, okay, there are two priorities: there's my work and my family. And so I have to realize that I don't have the luxury of standing around the hall schmoozing over a cup of coffee. I need to get in and I need to get my work done, and I have to be very organized. I have to be efficient. I have to not waste time, so that I can be out the door at five o'clock to get to the after-school program and pick up my children.

But on the other hand, I think having that family connection, if something does go wrong in the lab, you have a bad experiment or rejected manuscript or whatever, it reminds you there's more to life than this. You're important for more reasons than this. You're the most important person in the world for these people. And I think that helps you create that balance.

Williams: What career paths are your children following?

Bishop: Not science, although I have many colleagues whose children have decided to go into science, but given my experience with my mother, I would never try to push my children in one way or another. They should do what they want. My older son is a computer scientist and he works for a bank doing computer stuff for them. My younger son majored in marketing and public relations, and he, ironically, also works for a different bank, but in that general area. And they're both kind of in starter jobs where they're, "Wow, I was really happy to get this first job, but I think I can do more than this, but I'll stick it out here for a couple years and really impress them and then see where I want to go from there." So they're both employed and doing okay, so I'm happy and proud of them.

Williams: Are they in Iowa banks or are they elsewhere?

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Bishop: One of them actually lives in a community close to us, which is great. We try not to get too used to that because we realize he's young and he may well move away. The other one is just a couple hours away in Des Moines, so they're both in Iowa, which right now that's great.

Williams: I've been asking people, too, besides science, what do you do for fun, what recreational activities and so forth?

Bishop: I love to read, and I particularly love mystery novels, so I usually have one going at any given time on my bedside table. I think maybe it's the science background; I like that aspect of trying to figure it out, can I figure it out before the end and that sort of thing. My husband and I love to hike, and we're avid what I call slack packers, which means we love to go to a wilderness area, a national park, what have you, and hike all day, but then instead of setting up the leaky tarp, go to a nice little inn or bed and breakfast at night and have a good meal and a hot shower. [laughs] We do that whenever we get a chance, so a couple hiking trips a year.

What else do I like to do? We both love to cook and we like exploring new types of cooking and new dishes, so we love to cook together. That's really nice. And I make jewelry, so that's another thing I do on the side. I took that up about five years ago. And we both play the flute. In fact, that's how we met. So we play duets from time to time. We've talked about when we retire, getting into the community orchestra, but we haven't had time for that while we're both working.

Williams: Are you wearing one of your creations?

Bishop: No, I'm not. This is something my husband gave me. But at the meeting, I have worn several of them. I'm not artistic in the sense that I couldn't draw my way out of a paper bag. I mean, I even make terrible PowerPoint slides. I try to get people in the lab to make them for me. But I enjoy working with color and pattern, and so that's an aspect of the jewelry-making that I really enjoy. You don't have to draw. [laughs]

Williams: Any connection between playing the flute and immunology?

Bishop: Well, you know, there have been a lot of people who've written about the connection between science and music, and I guess it's a notable statistic that quite a few scientists play musical instruments, so I guess they think there's some sort of brain connection. I think playing a musical instrument is just wonderful for everyone. Our kids both played all the way through early college years, and we've really enjoyed hearing them. They both play the piano, so we have a piano at home, so they can play when they come home. But I think there must be some connection. People have written about it, but I don't know enough about it to know exactly what it is.

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Williams: What were the circumstances of your meeting your husband?

Bishop: Oh, now, this is—I'm always kind of embarrassed. We met in high school, and this is really unusual for professional people. So we weren't high school sweethearts or anything like that, because he was several years older than me, but we met in the orchestra in the flute section and we became friends. Then he went off to college and didn't think much of it, and then I wound up at the same college and we reconnected in the orchestra there. And someone said to me, another flutist, "I should introduce you to this guy that I know from the orchestra, because I think you'd like him." And she mentioned his name.

And I said, "Oh, I know him. We went to high school together." But we wound up getting married. [laughs]

Williams: Any last thoughts?

Bishop: I guess I'm not profound enough to come up with a final pithy comment.

Williams: Well, something that you may have thought we would talk about today that we haven't?

Bishop: I guess I'd put a pitch for all those young people out there who are worried about the job market, that I think there are a lot of uses to which you can put a Ph.D. in immunology, and I just wrote an article about this for *Trends in Immunology* ["Yes, we need PhD immunologists!" volume 36, issue 5]. One of the editors asked me if I'd like to do this, and she put together an issue that's going to be coming out—I think it just did come out—where several of my colleagues wrote articles on different career paths, and then I wrote kind of an intro thing on, because I know there've been several articles on we shouldn't train so many people because there aren't these academic positions, but while that's right, there's not as many academic positions as there used to be, I think there's just lots of ways you can use that training, that training in critical thinking, in putting the pieces together. So what we need to do is be sure that we're training people in these programs so that they know about all those paths and that they get the preparation they need to go in all those different directions. But we shouldn't be discouraging them from becoming scientists. I think that would be a terrible thing for our society to do and I think it would take us a long time for us to recover from if we let that enterprise drop.

Williams: Well, you're certainly a strong advocate for that enterprise.

Bishop: Well, I think I'm a geezer now. It's my time to say what I think, you know. [laughs]

Williams: A far cry from that timid person that went off to St. Olaf's, I'd say.

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Bishop: Well, the timid person is still right there inside me, you know. It's just now I've had lots of experience learning how to cope with that. Over the years, you learn.

Williams: Well, you do beautifully.

Bishop: Well, thank you.

Williams: Thank you so much for this.

Bishop: Well, thank you for your time and for caring what I think. [laughs]

Williams: Absolutely. Good. Thank you.

[End of interview]

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