The American Association of Immunologists
Oral History Project

Transcription

Kristin A. Hogquist, Ph.D.
May 12, 2019
San Diego, CA

Interview conducted by:
Brien Williams, Ph.D.

Transcription: TechniType Transcripts
Transcript copy editors: John S. Emrich, Ph.D., and Charles L. Richter, M.A.
Final edit by: John S. Emrich, Ph.D.

Williams: This is an interview with Dr. Kristin A. Hogquist for the American Association of Immunologists Oral History Project. Dr. Hogquist is David M. Brown Professor and Vice Chair for Research in the Department of Laboratory Medicine and Pathology at the University of Minnesota Medical School. She is also the Associate Director of the Center for Immunology at the University of Minnesota. Dr. Hogquist was a recipient of the AAI-Thermo Fisher Meritorious Career Award in 2019. We are at IMMUNOLOGY2019™ in San Diego, California. Today is Sunday, May 12th, 2019, and I am Brien Williams.

So let's start, Dr. Hogquist, with you talking about your family background and your background.

Hogquist: Well, I grew up in a small town in rural Minnesota. My father was a teacher, my mother was a nurse, and I would say growing up in a small town, I really had no meaningful understanding of biomedical research, that you could have a career as a Ph.D. researcher. Of course, I knew a lot about the impact of medicine, but more from an on-the-streets level, because my mother was a nurse.

So when I went to college, I thought I was interested in occupational therapy, and there were two places you could study to be an OT in the state of Minnesota—and I never considered going outside of the state for higher education—and that was the University of Minnesota and the College of St. Catherine. The College of St. Catherine, now it's St. Catherine University, but at the time, it was, and it still is, an all-women's educational institution. It's Catholic and I grew up Lutheran, so I was like, "Oh, I don't know if a Lutheran girl can go to a Catholic university or college." [laughs] But I knew I didn't want to go to the University of Minnesota because it was too big, which is interesting, because now I'm at the University of Minnesota.

So I went to the College of St. Catherine and I started studying occupational therapy, and part of the curriculum is an anatomy course. I was so fortunate that the person who taught that anatomy course was an immunologist. Her name was Jan Serie. Jan went on to inspire a lot of people to go into immunology, but she was a fresh assistant professor at the time. When I was taking the anatomy course, I realized that this was so much more deeply interesting to me than occupational therapy [laughs] that I really switched gears.

I think what was so inspiring to me was at the time, this discovery about the immune system was just fresh, and it was that the immune cells undergo somatic recombination. That means that the DNA, which is inherited in a very precise way, would, in lymphocytes, undergo this switching around. That was such a radical idea, and it completely blew me away to think about somatic recombination. Of course, Susumu Tonegawa got the Nobel Prize for that about ten years after he made that discovery, so I wasn't the only person who was really excited about this, but learning about that really turned me on to immunology.

But I have to say that even knowing that I no longer wanted to do healthcare delivery as a career, that I wanted to know more about biology and immunology, it still took me many years to figure out what the path was for me. So I finished my degree at the College of St. Catherine in biology, with a teaching certificate, so I thought the best way for me was to teach biology when I left college. So then after graduating from the College of St. Catherine—I did that in December, which is an unusual time to be looking for a job as a teacher, and that was a piece of good fortune for me. Because I was graduating in December, I needed to get some kind of job until the next September, when I could begin a teaching position, and I got a job as a technician in a lab, and that, again, really changed the course of my life.

So the technician job I obtained after graduating was in the lab of Dick Lynch, who was the Chairman of Pathology at the University of Iowa, and being in his lab and then seeing how research was done at that level—and then that was the time at which I met people who were graduate students and who were going to get a Ph.D. and really could embrace science research as a career—opened up a whole new world for me. When I was in that lab, I saw, "No, this is what I really want to do. I want to get my Ph.D. in immunology and really go deeper in the science." So it wasn't until after I had worked for a year and a half in that lab that I really could imagine what the career of a Ph.D. scientist looked like and go that direction, so I had a very roundabout way of coming to this career. [laughs]

Williams: Very interesting. Just before I move on, do you have any comments on how your family got to northern Minnesota?

Hogquist: Well, my mother is the daughter of Norwegian immigrants and my father is the son of Swedish immigrants, and Minnesota was a very popular target for immigrants from Scandinavia. So my maternal grandparents actually homesteaded in northern Minnesota, and that's how a lot of Minnesotans of Scandinavian descent came to Minnesota.

Williams: So tell me the perspective as you looked out from the University of Iowa, where you were going to go next to pursue this career.

Hogquist: I think I got a lot of personal advice from other members of the Lynch lab at the time. Tom Waldschmidt was a postdoc in Dick Lynch's lab who had a very big impact. He was a mentor to me and he really helped me through the process of applying to graduate school, interviewing, discerning what kind of graduate programs would be a good fit for me, what were the best graduate programs in immunology at the time, and I ended up deciding to go to Washington University in St. Louis [(WashU)].

Williams: And so you—tell me about that.

Hogquist: That was such a remarkable, enjoyable, expansive time for me. At the time, Emil Unanue had recently arrived at Washington University, and he really started a period when immunology—it was always strong at Washington University, but it really flourished after Emil was recruited there. So I believe I was maybe the second or third year of the immunology track of the graduate program or maybe I was even in the inaugural class. I can't remember, but I was very early on in the initiation of that immunology graduate program.

So there were a number of really good immunologists at WashU. It was very hard for me to decide what lab I wanted to do my Ph.D. thesis research in, and I was very fortunate that, in the end, I actually had two mentors, David Chaplin and Emil Unanue, and I was allowed to work on a project that both of them were interested in, working on a cytokine called interleukin-1 [IL-1]. I was in David's lab physically, but I was co-mentored by Emil, who had a great interest in IL-1, so I had the best of two outstanding labs sort of in my environment as a graduate student.

I was just telling somebody this morning, my thesis project was try to understand how this very potent, important cytokine in the immune system, IL-1, was secreted from cells, an apparently simple question, and I made some progress in my thesis research, but I was not able to answer that question. But it turned out to be a really tricky question, and we're still trying to understand today the exact mechanism by which the cytokine is released from cells.

Williams: What's the impact of that on the human condition?

Hogquist: Interleukin-1 is also called endogenous pyrogen. It's a cytokine that is released during infections and creates fever, the fever response. Not directly from the result of my work, but sort being initiated particularly in the lab of Bob Schreiber down the hall, who made antibodies to IL-1—and, actually, as part of my research, one of the things I did was make an antibody to IL-1 as well. Well, now antibodies that target that pathway are important therapeutic agents. At the time, we were making them so that we could study the molecules more readily, but they became clinically important therapies, so now finding ways to inhibit interleukin-1 release during inflammation is important.

Williams: So what was the length of time you were at Washington University?

Hogquist: I was there from 1986 to 1991.

Williams: And then how did you formulate your next step?

Hogquist: I knew that I wanted to continue and do a postdoctoral fellowship, although I did not, at the time I left graduate school, have a very strong sense of whether I was going to continue in academia or go into biotech. I didn't have a really strong understanding of what I was going to do with my Ph.D. I just knew that I really

liked doing biomedical research and I wanted to continue it, and one way to do that was to do a postdoc. So I sent letters to a number of immunologists whose work I respected, around the country, and in the end, I decided to go to the lab of Mike Bevan at the University of Washington, so I went from Washington University to the University of Washington. So I moved from St. Louis to Seattle and then I started a new phase of my career. At the time, I didn't have a strong sense of I wanted to work on a particular area or a particular molecule or a particular process. I knew that I wanted to work with someone whose papers I read and that inspired me, so for me, it was more important who I trained with next rather than what process they were working on per se.

Williams: So was it Michael Bevan that steered you towards a particular direction or what happened?

Hogquist: Yes. So when I came to Seattle and started my postdoctoral fellowship, Mike was working on a number of different things, but some papers that his lab had published that really intrigued me were on how T cells in the immune system are selected in the thymus. I was really intrigued about how the thymus works, and, actually, I've continued to work on the thymus my entire career.

The thymus is a really interesting organ. We've, of course, known about the thymus for a long time, but we haven't understood what the thymus does until the last sixty or seventy years, so in terms of the long picture on biomedical history, the thymus is a real newbie [laughs], understanding what this organ does. And, of course, we couldn't really appreciate what this organ does until we knew more about the immune system, which research on the immune system, of course, exploded in the late half of the 1900s. It turns out that this organ is the dedicated site where T cells develop, and a basic question that has really driven all of my research since: why do T cells need a dedicated organ for their development whereas other lymphocyte populations don't? That is an endlessly fascinating question that I've continued to work on.

But in Seattle at the time, Mike Bevan had published papers on the role of the thymus and, in particular, the expression of MHC molecules in the thymus in selecting T cells, and positively selecting T cells, so enriching for T cells that could react with this molecule. It's difficult to appreciate how central a concept that is in immunity, but, in fact, the entire function of T cells in the immune system is really focused on the way they interact with these molecules on neighboring cells, and that's because the purpose of T cells is to survey the cells of the body for infection. B cells in the immune system, of course, survey solutions of the body and they make soluble molecules, antibodies that can bind to foreign pathogens, but T cells survey other cells, and so their ability to interact with these MHC molecules is really a fundamental aspect that underlies all of their biology.

So a question at the time was how you could select for T cells that could recognize your own MHC molecules, but not in such a way that it would allow your immune system to attack your own tissues, right? So how can you select for useful T-lymphocytes, but not dangerous ones? During my work in Seattle, we made observations that really solidified a particular theory at the time, which was the affinity hypothesis of how T cells are selected, and it's kind of like a Goldilocks model. If the T cell has too weak an interaction with these MHC molecules, it'll die by neglect; if it has too strong an interaction, it'll die via a different type of death; but only if that interaction is just in the middle or just-right affinity would you be positively selected. Those were exciting times, generating the kind of data that definitively allowed us to say the affinity hypothesis is the way T cell development works.

Williams: Were there other labs around the country that were moving in the same direction at the time?

Hogquist: Yes, and that adds to the excitement of science, going to meetings, reacting to what other people have discovered, having a sense of urgency to complete your discoveries so that you can publish them in a time. Yeah, that really added to the excitement of things.

Williams: It also is somewhat competitive, isn't it?

Hogquist: Yeah, but the competition in science is a double-edged sword. I think especially for trainees, it can be anxiety-provoking. Having competition sometimes doesn't make sense because you're duplicating or triplicating resources to answer the same question, but it's also very healthy and it's an engine that drives science forward at a faster pace. So competition is something people have to sort of navigate in their professional careers. It's not all bad, it's not all good, and it's a reality of science.

Williams: Talk about what kind of an environment Michael Bevan created at the university. What was it like to work in the lab?

Hogquist: Mike is a really unique individual and an extremely good mentor. In fact, when the AAI organization, in the early nineties, I think, created an Excellence in Mentoring Award, Mike was the second [Ed. third] recipient of that award, and, actually, I was one of the people who nominated him for that. Mike had an extraordinary impact on a lot of people in the field. It was really exciting to be in his lab. I look back at that now and at the time, of course, they're just your friends and peers and benchmates, and now the trainees of Mike are a who's who in immunology list.

When we were nominating Mike for the Excellence in Mentoring Award, David Raulet and I came up with a list of all the people Mike had trained who could have advanced to a point where they would have their own lab at that point and it

was something like thirty-one individuals, and the majority of them, maybe twenty-six of them, did have their own lab. [laughs] I looked at that, I was like, oh, statistically I've had a really good chance of doing well in Mike Bevan's lab. Of course, I didn't know that at all when I applied to work in his lab.

But Mike had a great environment, and I've often reflected on why that was the case. Why was it special, and how could I replicate that in my own lab, and I think it was just his love of ideas, his absolute commitment to science and doing it well that just inspired us all. We all just sort of followed in his footsteps. He was very hands-off in his mentoring style. He sort of let the research unfold organically, and so it was wonderful. It was fun.

Williams: Did he spend much time in the lab or was it mainly at meetings and during the week that you discussed the progress of your research?

Hogquist: No, Mike would walk through the lab every day, and all of us would be at our desk waiting for him to stop by our bench or maybe sometimes quickly going to the bathroom so he wouldn't stop by our bench [laughs], but mostly hoping that he would stop by our bench and talk to us about what was going on. The amount of time he spent was completely dependent on what was happening in your project at the time and whether that was really sparking curiosity for him, and he had a way of seeing things in the research, in my research, that I didn't see, and then we would talk about that and it would open up sort of a whole new way of looking at something. That was really healthy for me to see, and I try to do that in my own research as well.

Williams: What words would you use to describe him as a personality?

Hogquist: Mike was brilliant as a scientist. He also had the utmost integrity, and he was also very devoted. So, brilliant, high integrity, and devotion.

Williams: And devotion to what?

Hogquist: Devotion to people in his lab, but also to the process and the science that was happening in his lab.

Williams: So did you sometimes look upon the prospect of staying at the University of Washington for the rest of your career?

Hogquist: I never once considered that, actually. No, I knew that it was healthy for me to go to different intellectual environments in my career. The environment at Washington University in St. Louis was wonderful, inspiring. It involved a certain way of looking at the immune system. But then moving to Seattle, it was a different intellectual environment and also inspiring and energizing, but in a different way. So I knew that I needed to go to yet another place to experience a new intellectual environment.

Williams: So talk about that selection process.

Hogquist: So, moving to begin my own lab as an assistant professor was a little bit complicated decision for me because at the time, I was in a relationship with another postdoc in Mike Bevan's lab, Steve Jameson, and it was pretty clear that we were going to spend the rest of our life together and get married. So we made the decision to look for positions together, and couples in science, that's just a complication. It's an opportunity as well. But Steve and I were looking to start two labs together, so we needed to look at jobs together, and I remember having a conversation with Mike about that and he said, "Well, you're going to get married, aren't you?" [laughs]

And I said, "Well, that's a personal thing, and, yeah, probably, but maybe not right now."

And he invited me to think about what an institution would think hiring two people in science if they weren't married versus if they were, and that was really interesting. So Steve and I discussed that, and we did get married a year before we left our postdocs and were looking at positions together.

So we applied to a lot of different job ads, most of which were opportunities for one person. It was a kind of awkward process to sort of explain, "There's two of us. We're both looking for positions." In the end, we were sort of really seriously considering three different situations, one where we were in the same city but at different institutions, a second where we were at the same institution but in different departments, or the third option was that we would be at the same institution, in the same department, and that's what we decided to do. So the University of Minnesota had one position, but we both applied to it, and we explained that we would both need a job if we were to come there. And they made that possible, and that was wonderful.

So we're both in the Department of Laboratory Medicine and Pathology. Our labs are adjacent to each other, and it has been one of the most rewarding aspects of my career to work very closely with Steve Jameson. It's just been really meaningful to have that intimate collaboration scientifically over decades with somebody. I highly recommend it. [laughs] Has to be the right person.

Williams: And what was it like as you entered the environment at the University of Minnesota? Was that a happy lab or competitive, or what words would you describe it as?

Hogquist: The environment at the University of Minnesota is a really happy place, and I think that's why we have stayed there my entire career, now as an independent investigator, is really the unique environment that exists at the University of Minnesota. So at the time, immunology—the University of Minnesota has a long

tradition in immunology. Actually, the first issue of *The Journal of Immunology* was published out of the University of Minnesota. One of the co-discoverers of the thymus, which is my love, is an immunologist named Bob Good, was at the University of Minnesota. He was not there by the time I was looking for a job.

So it had a long tradition in immunology, but there was no Department of Immunology. There was no central focus in immunology until the early nineties, when the University of Minnesota recruited Matt Mescher to open a Center for Immunology in Minnesota. In fact, when Steve and I were looking for jobs, the University of Minnesota had just announced that it would create a Center for Immunology, and being from Minnesota, having a lot of family ties there, I thought, "Oh, we have got to apply. This is our job opportunity," you know. So it was very fortunate timing that a Center for Immunology was being created right when I was looking to start my lab.

So Steve and I started our positions at the University of Minnesota in 1995, and the Center for Immunology had opened in 1994 under the directorship of Matt Mescher. Matt was a mentor, was and continues to be a key mentor in my life. Matt Mescher is retired now. He retired a couple years ago, but he really created an environment at the University of Minnesota that was very unique, highly collaborative, very focused on trainees, but through that focus, has really built a very strong basic science immunology research group at that institution. Very fortunate to have landed there.

Williams: So describe—I'm intrigued with the notion of paired immunologists. How have you collaborated, and have your careers or interests diverged or—talk a little bit about that.

Hogquist: Well, the first thing I'll mention is it never felt scary to do this as a couple in immunology, because there are brilliant examples of couples in immunology, for example, Diane Mathis and Christophe Benoist, John Kappler and Pippa Marrack, etc. So I never felt like us doing this, we were trying to sort of break ground in any way and there was no way a couple in science collaborating closely could do well. So there were great examples for us to follow. But, of course, when you're an assistant professor on the tenure track, you need to establish the independence and the strength of your independent scholarship and value, and institutions don't value sets of people together. They really need to see the independent scholarship, so Steve and I paid a lot of attention to never having grants together. We had completely independent trainee pools. We, in fact, did, and still do, operate—our labs are adjacent and we operate them together, so on a practical level, we've been able to save a lot of money not having to duplicate equipment, etc., but we have independent research programs from the funding and trainee point of view.

While we were on tenure track, we paid attention to authorship, because that's what promotion and tenure committees look at, and we made sure that we weren't on each other's papers. Then after we were promoted and tenured, that became

less of an issue, and now we're often on each other's papers because that's an accurate acknowledgement of intellectual contribution to each other's work. So we were able to sort of be more honest about that after being promoted. And it's something I wish institutions would allow, would not be so rigid about, and really acknowledge how important collaborations can be, of course not only between married people, but between all kinds of scientists, how collaboration can really raise the level of scholarship beyond the sum of the parts. Maybe that will change in the future, we'll be able to value that more.

Williams: Well, you set a good example.

Hogquist: [laughs] Thank you.

Williams: Did you get the feeling that your husband being male and you being female, that he had more advantages or easier acceptance, or how did that work?

Hogquist: I think a fair assessment is that I did not feel a lack of opportunity because of my gender. I think that Steve and I felt the same opportunities and pressures. I think people in my environment didn't necessarily expect any less of me than they did of him, and I'm really grateful for that, and I think that allowed me to flourish at the University of Minnesota. I'm not sure that that's the case in all environments, and I've heard a lot of stories from female colleagues about how hard that can be when you perceive a lower expectation of you in your environment. I'm very sympathetic to that and I think that that is an important hurdle that the field needs to get beyond, that our culture needs to eliminate that disparity and expectation, but I feel like I personally did not feel that in my environment. I'm really grateful to Matt Mescher and my other colleagues at the University of Minnesota for that.

Williams: And what about the university broadly? Is it fairly gender-blind?

Hogquist: No, it's terrible, actually. [laughs] The American Association of Immunologists has a Committee on the Status of Women, and they studied the ratio of female-to-male faculty at different immunology programs at institutions across the U.S., and I remember when their report came out and it showed that the University of Minnesota was extremely low in their proportion of women faculty, and I felt a lot of shame about that, that this environment that I was in was not providing equal opportunity to female scientists. I'm happy to say that we have greatly improved since then, but I think we have a long way to go as well, and in my work now at the University of Minnesota as the Vice Chair for Research in the LMP, I'm trying to make institutional changes that correct that and to really invite people to consider the extent to which just biases that we all inherited by the age we grew up in are influencing our decision and to eliminate that, those barriers for women, going forward.

Williams: So did you take a particular proactive role at the university in that regard?

Hogquist: Not a particular role in that it's not an official job of mine, but on search committees, in my day-to-day mentoring activities. I'm the chair of the Promotions and Tenure Committee at the Medical School at the University of Minnesota. In all these roles, I am paying a lot of attention to this issue of bias and how we can overcome the barriers for women advancing in science.

Williams: So in that role, you're dealing with the clinical side of things as well.

Hogquist: Yeah.

Williams: How does that fit?

Hogquist: That is fascinating to me. I don't have a background in clinical science, but I'm in a clinical department, and so I have been and am continuing to learn a lot about the professional training of clinicians and clinician scientists and how it's really different from basic science researchers. So it's good. I'm learning about that, and that's interesting to me.

Williams: Talk a little bit about the distinction between the two.

Hogquist: In the basic research realm, the individual, as I mentioned before, is greatly valued for their individual scholarship. It is my sense that in clinical research, they have figured out how to value collaborative research more, and, in part, that's because clinical research requires collaboration at a greater level. You have multiple parties coming together to impact patients' health in a way that a basic scientist doesn't need to do.

The other thing is that for clinician scientists, staying in the same intellectual environment is often considered a strength, so, as I mentioned earlier, it's very healthy for basic scientists to have trained in different intellectual environments and to have moved around in their career, not as much so for a clinician scientist, and often, for example, an MD/PhD student at a given institution will be recruited to stay at that institution and do their fellowship training or residency and then stay there and do a fellowship training and then become an academic—or on the faculty at that same institution. So those are a couple differences in the tracks of those two.

Williams: Right. So looking at your career broadly, what do you want the public to know about the contributions you've made to the science of immunology?

Hogquist: I think that a complete understanding of how T cell education occurs in this organ, the thymus, I would love to be remembered as part of how that knowledge came into light and how humans acquired that knowledge. And although my research is definitely on how the thymus functions in the healthy state, obviously, the impact of that understanding is that that is the framework for how we understand when the thymus does not function properly, and the extent to which

we know the molecules and signaling processes and factors that are involved in normal thymic development, now we can look at patients with primary human immunodeficiencies, patients with autoimmune diseases, and we can understand then what are the molecular pathways that are perturbed that gives that person a disease.

One other exciting potential for understanding the role of the thymus is that down the road, we can imagine a time where we could grow T cells to use for therapeutic purposes when people's immune system fails, and there's a great need for that, especially in the transplantation setting. So the University of Minnesota has a very old and distinguished transplant program. In the process of getting a transplant, a lot of patients have to undergo ablative therapy. They have to destroy their existing immune system so it doesn't reject the transplanted tissue, and one of the challenges is that that T cell immune system doesn't reconstitute fast enough or correctly and those patients then suffer from graft rejection, graft-versus-host disease, viral and chronic viral infections that they can't control. So one can imagine it would be nice to be able to give those patients a premade T cell immune system for therapeutic purposes, but we don't understand the function of the thymus well enough to do that today, so going forward, that's a great hope, that we're going to be able to develop a comprehensive enough understanding of this that we could do successful T cell reconstitution therapy.

Williams: In a few words, just make clear the function of T cells in the body.

Hogquist: T cells are really the central organizer of the immune response. They recognize when tissues have been invaded by microbial pathogens and then they orchestrate an immune response, and I use the word "orchestrate" because the immune response is very sophisticated and different depending on each type of infection involved, which is one of the great joys of being an immunologist, is understanding how beautifully complex our immune response is to different kinds of pathogens. T cells are the orchestrators of how the immune system is going to respond, and they do this by recognizing these MHC molecules on infected cells, and that starts the whole process.

So I can't emphasize enough how central T lymphocytes are to the immune system and to health in general not only in response to pathogens, but it's turning out that T cells are regulating our metabolic health. T cells are involved in inflammatory processes that involve the brain. I mean, they play a role in so many different aspects of immune health that understanding their function is very crucial.

Williams: The way you describe it, it appears as if they are sort of the detectives that sort of arrive on the scene, but then whom are they calling in to do the actual battle or do they do that themselves?

Hogquist: They call in and they do battle themselves. In fact, one type of T cell that I've studied my whole career is the CD8 T cell, also called the killer T cell. So they have the ability, if they're interacting with a cell and they perceive that that cell, for example, is virally infected, they can actually destroy the virally infected cell. But it's only one aspect of their function, and I think the more sophisticated and interesting aspect of T cell function is all the factors that they make and release into the environment that calls in other kinds of cells, and even at different points in the immune response, will call in the injury repair program. So they sort of initiate the alarm, they call in the soldiers that come in to fight the infection, but then they also regulate the tempo by which the immune system will be resolved and that the tissue will be repaired and that life will go on safely. They're endlessly fascinating, T cells.

Williams: What issues have you dealt with in terms of thymus health, the actual health of the thymus?

Hogquist: So in my research, I use animal models to study the basic molecular pathways, and I have not studied human thymus samples in diseased states. There are many other groups that are doing that, but that's not what my group does.

Williams: Right, right, right. You speak so highly of the thymus, so I thought you were very invested in its well-being. [laughs] Anything else you want to say about the scientific side of your life?

Hogquist: No.

Williams: Okay. Let's talk about the AAI and your associations with the organization a little bit. You joined in 1995, and what caused you to do that?

Hogquist: You probably know from the records that I joined in 1995. I might have thought I joined earlier as a student, but apparently I didn't. Anyway, I joined in 1995 because that's when I was establishing my own lab. I knew, even as a graduate student and a postdoctoral fellow, about the work of the AAI and I knew that that was my main professional association and I wanted to be a member of it.

Williams: So did you attend meetings prior to 1995?

Hogquist: Yes, I did, which is why I'm surprised—now trainees that attend typically become a member at that point, but I guess I must not have when I was a student. [laughs]

Williams: Well, we've been hearing people say that when they were invited to become a member, it was quite an honor, so I suspect that at some point, it was something that the organization bestowed upon people, whereas now I think joining the organization is more perfunctory or normal.

Hogquist: Yeah, I think a lot of people probably do join when they're going to their first annual meeting, and there are benefits if you're a member. The meeting registration is cheaper. You have access to travel awards, that kind of thing. For me, that wasn't necessarily the motivation to join just as much as I knew of the work of the AAI. I knew that was the professional organization that I wanted to be associated with, and I joined because I was then an immunologist officially and that was my organization.

I can't emphasize enough how proud I am of the AAI, how happy I am that our organization is really amongst the best scientific organizations out there. It's extremely well managed. There's a lot of enthusiasm when immunologists come together. We have a big impact on NIH [National Institutes of Health] policy because we organize to communicate to the NIH when policies that they have could be beneficial for ongoing research, for training and education, and for human health. So I'm really proud to be an AAI member and have really gotten a lot of satisfaction out of my activities for the organization over the years.

Williams: Has the AAI had any function in terms of your selecting postdocs?

Hogquist: Early on, I advertised for postdoctoral fellowship opportunities at AAI meetings. I no longer do that because I think I realized that postdoctoral fellows who would be interested in my research were reaching out to me separately and specifically. You know, the postdocs who are willing to come to Minnesota to do their work have a really specific interest and focus on the thymus.

Williams: Right, right. You joined a number of committees while you have been active, and I notice that one you were on was the Status of Women. Talk a little about that. That was in 2002 to '04.

Hogquist: That was a great first committee for me to serve on. The Committee on the Status of Women has always done a lot of good work for the AAI. They maintain a speakers list. They try to nominate women for various awards in the field. But serving on that committee had an additional benefit for me, which was networking with a lot of really outstanding female colleagues, and I still have good relationships with people who I served with on that committee to this day.

Williams: Now, I also notice that from 2018 to 2021, you're on the Public Affairs Committee. Now, that must be an intriguing committee to be on in this day and age. Talk about that.

Hogquist: So over the years, I believe I've served on the Committee on the Status of Women, the Program Committee, the Nominating Committee. I've done a lot of service for *The Journal of Immunology*, which is under the purview of the association as well. And now I'm on the Committee for Public Affairs, and I have to say that this is perhaps the most rewarding committee I've served on at the AAI.

So the AAI has three professional staff members that serve this committee and are very active on Capitol Hill. They know a lot about what's going on with the legislature, at the NIH with policies that are under consideration, and I have learned so much on this committee. I think this is really an important activity of the association that never would happen by any other means because scientists don't get together through any other means to impact policy and politics, so, really, this is our one unique way where we get together to do that, and the AAI has wisely invested in this activity with these three full-time staff people. It's really been fun to go to Capitol Hill, meet with my senators and legislator, and through the work of these staff people, to really have detailed information on what's going on at Capitol Hill and how we can impact that through our advocacy as a scientist in ways I never knew was possible.

Williams: Do you get a sense that there are special challenges in this day and age?

Hogquist: I think there are challenges in every day and age, and there definitely are challenges today. It's a continuing ongoing battle to communicate the importance of science to the public and to our representatives so that they will continue to fund the NIH robustly. I think there's a lot of people who think the NIH is fine as it is and we don't need to keep up funding. They don't sort of realize the extent to which inflation impacts research as well, so if you don't continue to, every year, increase the NIH budget, it effectively decreases the NIH budget and negatively impacts science, and it's a never-ending job to keep that in front of the public and in front of our representatives so that they continue to support the NIH.

Williams: Right. Now, under the [Barack] Obama administration, one had a sense that there was an understanding of and appreciation of science. In the current administration, there seems to be a reluctance, at least, to accept a lot of scientific discovery.

Hogquist: Yeah. That just adds to our mandate to continue to educate the public and our representatives about the importance of it. I think we have less of an impact on the administration per se, but they don't get to decide alone, so the AAI really focuses more on Congress and making sure our legislators know the importance, and they do on both sides of the aisle. We have strong supporters of the NIH. It's a really wonderful bipartisan issue in a day when there's not a lot of bipartisan support for things, but both sides of the aisle can come together and support the NIH.

Williams: So I understand the work of the committee in terms of Capitol Hill. What is the focus on influencing the NIH itself? Or did I misunderstand what you're saying?

Hogquist: No. The NIH, because they are the major supporter of biomedical research, has a lot of impact on how science is done. The way science is done in the U.S. is really impacted by our peer-review process, peer review of the literature and also peer review for grants, and a healthy peer-review system really underlies healthy

science being done in the U.S. The Center for Scientific Review at NIH is responsible for peer review, and there are a lot of policies about how peer review is done, and the AAI has a lot of impact in making sure that peer review is done in the most healthy, open way so that science is done in the most healthy and open way. NIH policies also have a major effect on the next generation of researchers because the NIH provides training grants to institutions around the country, and how they make funding decisions at different levels of people's career also impacts the next generation of scientists. And, of course, because they hold the purse strings, they're able to, for example, ensure that science is done responsibly, so institutions have to assure the NIH that they're responsible for the conduct of the research, or the NIH will pull those grants. So NIH actually has a lot of impact on how science is done because they hold the purse strings.

One area of opportunity I see right now is changing the climate of sexual harassment in the workplace. I think NIH has a great opportunity to help make a healthier climate to do research in because, again, they hold the purse strings, and so that's one thing the AAI Committee on Public Affairs is focusing on right now. So it's interesting how much impact the NIH has.

Williams: At your own Center for Immunology, how much of your budget is dependent on NIH and how much do you dwell on or rely on outside sources of funding?

Hogquist: So I would say the three major sources of funding are federal agencies like the NIH, to a lesser extent, the NSF [National Science Foundation], Department of Defense, another is private foundations, and a third source is biotech companies that are providing research dollars. Especially as research becomes closer to clinical translation, then industry dollars become more important. In the Center for Immunology at the University of Minnesota, because more of us do basic research, I would say the NIH provides the lion's share of support, and foundations, and to a very minimal extent, private industry.

Williams: So has there been much translational activity or success?

Hogquist: Yeah, there's been a lot of examples where the work from the basic research labs at the University of Minnesota is being translated into patient care, and I'm proud to say that the University of Minnesota has a really good support mechanism for helping scientists translate their work into something that can reach and have an impact on the people of Minnesota. Not all institutions do that very well, but the University of Minnesota does that really well, and, in part, because we have a large biomedical device industry in Minnesota, so we have a long history of translating discoveries from scientists at the university.

Williams: Right, right, right. You mentioned briefly *The Journal of Immunology*, and just talk about your reaction to that.

Hogquist: *The Journal of Immunology* is our foundation's flagship journal, and it's sort of the meat-and-potatoes journal of the field. It has a really healthy peer-review process. It is overseen and all steps of the peer review are done by scientists who are active in the field. There are not professionals. Decisions about what gets published in the journal aren't made based on how trendy a particular topic is or not. It's all just based on the integrity and critical nature of the science that's being reported. So I'm a strong supporter of the *Journal of Immunology*.

Williams: And for a while, you functioned as, what, deputy editor, is that right?

Hogquist: That's right. I was an associate editor and then a section editor and then a deputy editor, yeah, so I became more involved in the peer-review process for the *Journal* as my career went on.

Williams: I'm unaware, are there many deputies at any given time or is there—

Hogquist: There's a handful of deputy editors. There's a larger number of section editors and then an even larger number of associate editors.

Williams: So there's quite a superstructure there.

Hogquist: Yes.

Williams: Mm-hmm, mm-hmm, mm-hmm. Big question. What do you see as the future of immunology from today's perspective?

Hogquist: The sky is the limit for immunology research. I mean, one of the most gratifying things over my career has been to see this relatively small field of immunology expand so dramatically. In the early years, it's a great source of pride to me that a lot of discoveries in biomedical research in general were really pioneered by immunologists, and now our understanding of immunity is impacting neuroscience, it's impacting metabolism, it's impacting cancer in a huge way. So because immune cells are involved in so many processes in the body, the field of immunology is really expanding, and that's extremely exciting, but also a challenge in that it is no longer a discipline that is knowable in a complete sense. Like when I was a graduate student, there was sort of a body of knowledge about the immune system that one could be expected to know and now no one individual can know all of immunology in a meaningful way anymore because it's so expansive.

Williams: Mm-hmm, mm-hmm. And what do you see as the field's greatest needs going forward?

Hogquist: The field's greatest needs going forward, I think, are just continued support for research. I think the field needs mechanisms to connect immunologists with other experts in the field where the immune system is intersecting. For example, in

neuroimmunology, we have a need to connect immunologists with neuroscientists in a meaningful way to really understand how those two systems interact, likewise with metabolism and cancer. So meaningful ways to forge and support interdisciplinary collaborations that involve immunologists is one important thing.

Williams: Mm-hmm. And do you recommend to young people that they pursue a career in immunology?

Hogquist: Absolutely. [laughs]

Williams: And why?

Hogquist: I believe it's one of the most exciting things, fields that a young person could go into right now. It offers a lot of opportunities and excitement and impact.

Williams: Mm-hmm. I've been asking everyone in this project, what do you do for fun outside the lab, what recreational activities?

Hogquist: Oh, when I'm outside the lab, I try to be outside in general. I love hiking and camping and biking. I grew up in rural Minnesota, as I told you, and I love to get back out there and be in the woods. [laughs]

Williams: What about family? You've had children?

Hogquist: Yeah, I have two children with Steve Jameson, and, actually, I would say a big part of our decision to come to the University of Minnesota was not only the fact that the Center for Immunology was forming at the University of Minnesota at the time, but that my whole family was back in Minnesota, and having family for a dual-career couple that are around to support you is a really important element and was a big part of our decision-making process. Having family around has been meaningful and advantageous in many ways for both of us over the years.

Williams: What careers have your children followed?

Hogquist: One is in nursing and the other is in engineering. Interestingly, for two researchers, our children are much more practical-minded. [laughs] So they're in more applied fields, nursing and engineering.

Williams: That's interesting that one of your children followed your life's path, in a sense, that you originally thought you would be doing yourself.

Hogquist: That's right, yeah.

Williams: There's a certain circularity there.

Hogquist: So she may come around to doing a more academic aspect of nursing and doing research in nursing in the end as well. Yeah, you never know.

Williams: With a two-immunologist family, tell me what the pillow talk is like with you two.

Hogquist: [laughs] There was a lot of conversation about T cells over the dinner table in our family. Our children knew what T cells were at a very young age. I remember once needing to take them to a retreat that Steve and I were both attending and not having childcare at that particular moment. We brought our children with to this retreat and it had a poster session, and so our kids then were young and they got their crayons out and they created their own poster to show at the poster session that had defender cells and macrophages and their version of the immune system on it. So they got a lot of immunology growing up.

Williams: Do you still have those posters or poster?

Hogquist: I probably do, yeah.

Williams: [laughs] Anything else you'd like to add to this?

Hogquist: No. This has been an interesting conversation. Thank you.

Williams: Okay.

[End of interview]