



## **The American Association of Immunologists Oral History Project**

### **Transcription**

Marc K. Jenkins, Ph.D.  
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Interview conducted by:  
Brien Williams, Ph.D.

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**Williams:** This is an interview with Marc K. Jenkins for the American Association of Immunologists Oral History Project. Dr. Jenkins is the Distinguished McKnight University Professor in the Department of Microbiology and Immunology at the University of Minnesota Medical School. He is also the Director of University of Minnesota Center for Immunology. Dr. Jenkins was the President of the American Association of Immunologists from 2013 to 2014. He is a Distinguished Fellow of the AAI and was the recipient of the AAI Excellence in Mentoring Award in 2018. We are at the IMMUNOLOGY2019™ in San Diego, California. Today is Friday, May 10<sup>th</sup> [2019], and I am Brien Williams.

So, Marc, thank you for doing this, and let me ask you to start with a little bit of your family background.

**Jenkins:** I was born in Hutchinson, Minnesota, and my dad worked for 3M Company. There's a tape, scotch tape, plant there, and my dad worked there, and so that's where I was born. He got transferred to 3M Center in St. Paul when I was four years old, and so I grew up in a suburb of St. Paul, White Bear Lake, Minnesota, went to high school there.

My mom and dad are both from farming backgrounds. They farmed in southern Minnesota, or their folks did, and so I have some rural roots. We spent a lot of time on the farm, both farms, when I was a boy, but I was basically a suburban kid.

It was actually in high school that I got interested in science, because there were a very small number of elective courses in science that you could take. The biology teacher was interested in microbiology and she ran an elective course, and we did experiments, which was new to me, because in my other science classes, we did lab exercises, where you knew what the answer was and you were just trying to observe that for yourself, but here you had to identify a question and then design an experiment and test it, so this was very interesting to me.

So at that time, there was—still is—a mouthwash called Listerine, and on TV, they said Listerine kills germs, so I tested the premise. So I cultured bacteria from my mouth and I put that on plates. On half the plate I put Listerine and half the plate I didn't, and I tested three other mouthwashes, and it turns out Listerine *was* pretty good at killing germs. There was another mouthwash called Chloraseptic, which has about 4 percent phenol, which *really* killed germs. [laughs] And then there was one mouthwash in which the bacteria did better because it had sugar.

So that was illuminating to me as a way to understand the world, that you could query it in your own way and not rely on the knowledge of others or received knowledge, and so this, to me, was very powerful, and even as a kid, I sensed the power of it. So, pretty much from that point forward, I knew I wanted to be in science. I didn't really understand how science worked, you know, or what an

academic scientist actually did or how one became one, but I wanted to be a scientist, so that started there.

**Williams:** So what led you to Northwestern? Oh, no. First you—I'm sorry, I'm jumping ahead here. You went to the University of Minnesota.

**Jenkins:** Yeah, yeah, which is what good Minnesota kids did who weren't—I must say, my parents encouraged me and my brothers to get an education, but they weren't academic people, so there was never a lot of pressure for me to go to Harvard, and, frankly, at that time, I'm not sure I was that ambitious, really. I mean, I knew I needed to get a job and have some kind of way to make a living, so the University of Minnesota was a very solid university, so I thought I could get good training there, and I did.

**Williams:** And what was your major?

**Jenkins:** Microbiology. I wanted to be involved in something related to infection.

**Williams:** Right, right. You have, what, two brothers?

**Jenkins:** Three.

**Williams:** Three brothers.

**Jenkins:** Three brothers, yeah, yeah, all younger than me.

**Williams:** And any of them in the sciences?

**Jenkins:** Two of my brothers are in business. One of them works for an insurance company and the other one works for Cardinal Glass, but my other brother is in the humanities. He's at Princeton, and he's a scholar in the Byzantine era. So he has two jobs. He's responsible for a rare book collection there, primary texts from the Byzantine era, which is like the 700s, so these are old, valuable manuscripts, and then he does research on one Byzantine figure, a guy named Michael Psellos, who was credited with being one of the early pioneers in scientific thought, because he was trying to use mathematics to write a mathematical proof to support the trinity, that three things could be the same things, but different. It turns out that can't be done because that's logically inconsistent, but the idea was that you could quantify things in the world, and including things in the Bible. So he's an interesting figure in history, and he had to do that in a subtle way, because that was bordering the line with heresy, which was a capital offense. So he's an interesting guy. I actually went to a Byzantine conference with my brother, registered for the meeting and attended. It was just fascinating. [laughs]

**Williams:** How long ago was that?

**Jenkins:** That was two years ago, because it was in Minneapolis, the Byzantine Scholars of America. So that was really interesting.

**Williams:** And do you have children?

**Jenkins:** Yes, three.

**Williams:** And what stages are they in?

**Jenkins:** Our son Scott is thirty-four. He's a fifth-grade teacher, public school system. Then we have identical twin girls. They're both accountants and they work for a bicycle company.

**Williams:** A bicycle company?

**Jenkins:** Yeah, that makes bicycles and bicycle parts. They make a famous touring bike called the Surly Long Haul Trucker. It's probably the most famous bike they make.

**Williams:** Are these mechanical or engine-run bikes or—

**Jenkins:** Bicycles.

**Williams:** Bicycles. Huh.

**Jenkins:** Yeah, that you pedal.

**Williams:** [laughs] Yeah, right. I remember.

**Jenkins:** Yeah. [laughter]

**Williams:** Good. Well, then let's go on to the question I asked erroneously just a moment ago. What led you to Northwestern then?

**Jenkins:** When I was probably about a junior in college in the microbiology program, my undergraduate advisor was—I met with them and they were telling me this would be a path toward becoming a professional scientist, at least the kind of scientist that would run a laboratory, and that would involve doing a Ph.D. So I knew I wanted to stay in the Midwest, but I wanted to venture out from Minnesota a little bit, and so I knew of Northwestern's prominence as an undergraduate institution, so I chose their microbiology and immunology program, which was a solid program, but, at that time, probably not the strongest program in the world. Had I been more ambitious, I probably would have got better advice, but it worked out. [laughs]

I ended up matched with a good mentor, Steve Miller. I was his first graduate student. He was just starting, so I got a lot of personal attention. Steve was just an incredibly enthusiastic, passionate scientist, and I learned a lot from him about that, because, of course, scientists are kind of in the rejection business, you know. Our grants get rejected, our papers get rejected, and you kind of have to weather that, and Steve had a good personality for that, so that was an important message I got from him.

**Williams:** Were you in the Evanston campus or downtown?

**Jenkins:** I was in downtown, so we would go to Evanston campus for seminars, because, like, the biochemistry department was very strong up there, so we'd go up there, take the "L" up to Evanston. And we lived in Rogers Park, so I actually lived a lot closer to Evanston than I did to downtown, but that's where we could afford to live.

**Williams:** Right. So you get your Ph.D., right?

**Jenkins:** Yeah.

**Williams:** And you looked around, and what did you do next?

**Jenkins:** Well, my Ph.D. was done at a time when—and I was working in cellular immunology, so the immune response of basically T lymphocytes, and this was a very early stage in the field where we just did not understand much about these cells, so the methods I used in my Ph.D. work were methods that were from the probably 1940s, and I wanted to go to a laboratory that was using more the new tools of molecular biology to try to get a deeper insight into what T lymphocytes are, you know, how are they responding to foreign things, how are they protecting us from infections, and things like that. I wanted to get at that problem at a deeper level, and I was working on one particular subtype of T lymphocyte called the CD4 helper T lymphocyte, so I was looking at labs that were using molecular methods applied to those cells. So I think I applied to four different laboratories around the country and ended up at the NIH [National Institutes of Health] with Ron [Ronald H.] Schwartz.

**Williams:** Well, that was a success.

**Jenkins:** Yeah, it was good, because my postdoc went very well.

**Williams:** So talk a little bit about your activities there and what it was like being at NIH.

**Jenkins:** A little bit of cultural shock for a midwestern kid because just the East Coast seemed more intense. Just going to the grocery store seemed more intense, you know. It all seemed more intense. And I was working in a very well-known department at the NIH called the Laboratory of Immunology, headed by Bill

[William E.] Paul, famous immunologist. It was a lot of *very* ambitious people. I'm really not sure I had seen that kind of ambition before, overtly—even stated, almost—so that took some getting used to, and it was a very critical place. Everything you did scientifically was criticized, and this was good to produce scientific rigor, try to get it right, but it was really a very intense place. The particular problem that I was working on, like I said, the field of cellular immunology as it applies to T lymphocytes was just in its infancy, so there were a lot of things to discover, and so I was in the right place at the right time to find out something important about T lymphocytes, so that was good.

**Williams:** So you were there three years?

**Jenkins:** I was there three years, yeah.

**Williams:** And did you participate in some major breakthroughs at that point or—

**Jenkins:** I guess it would be self-serving to go too far with that, but my project, one part of it was to try to understand, basically, the minimum number of kind of signals a T lymphocyte had to respond to something foreign, and a major discovery had been made about the time I started my postdoc, was that there was a receptor on each T lymphocyte called the antigen receptor, and it recognized a peptide bound to MHC on another cell that let that T cell detect whether there was a virus inside that cell.

In the time, the thinking was, based on the model systems that existed, that that signal was necessary and sufficient to make a T cell proliferate, differentiate, kill the infection, and so my research showed that the T cell receptor [(TCR)], although necessary for that process, was not sufficient, and that there was a second kind of signal that was needed for that T cell to become activated. And that signal could be accounted for, in large part, by this molecule called CD28, and CD28 is in a family with other regulatory molecules called PD1 and CTLA4, and that whole idea of signal 2 became known as costimulation, and this became a fundamental tenet in cellular immunology and then was built on by many people, including Jim Allison and Tasuku Honjo, who just won the Nobel Prize. So that was a big deal, yes.

**Williams:** Right, right. What implications does that particular work have on the clinic?

**Jenkins:** Well, that kind of signal 2 and then the regulators of signal 2 are now all part of clinical medicine, so blockade of CD28 is now a clinical therapy for graft rejection and is now used in people who have trouble with ciclosporin A, so inhibition of signal 2 is—and is also approved for rheumatoid arthritis. And then, of course, the regulators of signal 2, which were inhibiting that process, they are now the basis of what's called checkpoint immunotherapy, so inhibiting the inhibitor turns out to be an incredible fuel on the immune system, and that's now created this incredible excitement about vaccines for cancer. Treatments for melanoma, now I think the latest evidence suggests maybe 40 percent of people

can be cured, and with much less side effects than we normally get with toxic chemotherapy. So both those things, not that I personally had anything to do with that, but that fundamental understanding that this was how T cells work was a step in that, a first step toward that later application.

**Williams:** Right. So after your three years on the hectic East Coast, you decided, of course, it was time to return to Minnesota. [laughs]

**Jenkins:** Yes, my wife is very clear about that. [laughs] And I wanted to get back too. Our children are born during that period, one in Chicago and two in Maryland, so we had our hands full. We were ready to get back to our families and get some help. [laughs]

As luck would have it, there were actually two positions in immunology in Minnesota, which is really—you know, it's a small state, and there's the University of Minnesota and there's the Mayo Clinic, and both institutions were recruiting immunologists in 1988 or '87, I guess, so that was *incredibly* fortunate for me. The job I, frankly, really wanted was at the Mayo Clinic, but it was my first job interview, and basically stunk the joint up [laughs] and didn't even get an offer. So, luckily, there was this other job at the University of Minnesota [(U of M)], which, at that time, that department wasn't as strong in immunology as the Mayo Clinic, but it was in Minnesota, and, luckily, I learned from my debacle interview at Mayo Clinic and did better there, and so I got the job. And I've been at U of M since 1988, my whole career, independent career, yeah.

**Williams:** Is your wife a scientist?

**Jenkins:** My wife has got a bachelor's degree in biology, and she worked as a lab technician up until our twins were born, and then we couldn't really afford the daycare, so then she stayed home with the kids.

**Williams:** But then returned to the lab at some point, though?

**Jenkins:** No. Our kids are now on their own, so she does volunteer work, but she never went back to science.

**Williams:** So how did your career develop at the university?

**Jenkins:** Well, that paper that Ron Schwartz and I published at NIH about that signal 2 idea, that gained traction really quickly, so I was able to get NIH funding quickly, and, luckily, I—you know, sometimes postdoctoral fellows don't get credit for discoveries made, because Ron was a very well-known guy, but I did get some credit, so I got speaking invitations and my name got out there, so my career took off very quickly. So, when I had grants, I could broaden my scope of my program and do better. The graduate program there had a really good student pool, so I had a lot of really good graduate students early on. The postdoc environment wasn't

as great there, and a lot of postdocs want to be on the coasts, so that took longer, but as I did better and better, I could get good postdocs, so that all worked out for me.

**Williams:** So at what point did the Center for Immunology come about [crosstalk]?

**Jenkins:** That came about in 1995, about. So I'd been there for seven years, but although I was still pretty junior, so I really wasn't ready to be a head of anything, but the institution wanted to invest more in immunology, and they hired a guy named Matt [Matthew F.] Mescher to come and try to organize the fragmented immunology community. We probably had fifty AAI members, but in eight different departments all over the map and twenty different buildings. It was really just diffuse. So Matt came in with the charge to organize that, and the Center concept came up. You know, most universities are department-based, all the power's in the departments, but there was no immunology department, so the idea was form a center, devote research space and a building to the discipline, and then populate that space with people from different departments, led by the director, which was Matt. Matt just did a phenomenal job, and that's when we turned the corner and started hiring good people who stayed, their careers flourished, and we really moved up the pecking order. So we owe that to Matt Mescher.

**Williams:** And now you're the director.

**Jenkins:** Yeah. Matt, eventually, he wanted to retire, and so in 2013, he retired, and then I became the director. I'd been the associate director for the whole time, so I would advise Matt, and it was good because he mentored me, so I could see what he was doing and I learned a lot from him. So then I was chosen as the next director.

**Williams:** And becoming a director, does that take you away from your science?

**Jenkins:** Some, yeah. Not as bad as being a department head, because I was responsible for lab space and for organizing the teaching in immunology and making sure that all the investigators are working together and trying to build a seminar program and a journal club and an annual retreat and things like that, so that takes time, but not like human resources-intensive stuff that department heads have to deal with. But, yeah, probably 25 percent of my effort goes to being the head of the Center.

**Williams:** Right, right. And have you been responsible for some more major discoveries or developments?

**Jenkins:** Well, yeah. I'm justified by saying the AAI has this program called Pillars in Immunology, where famous papers in immunology are chosen, and so my paper with Ron Schwartz is one of those papers. And then I have two other papers from my own career that are Pillars of Immunology papers, and that relates to, again, taking our understanding of how T cells respond to antigens with this second



signal, and to take that work from in vitro investigations where we were in test tubes and manipulating the cells to how does this happen in the body. So I developed methods to track these T lymphocytes in the bodies of animals, and that was very powerful, because that let us learn about the physiological situation of how the cells respond in lymph nodes.

Like when you get a flu infection, there's T lymphocytes that have antigen receptors that are specific for the flu virus. There's actually not that many of them, because you have this diverse repertoire of cells, each with a different receptor, so that you can respond to almost anything, but the cost of that is for any one thing, the cells are rare at first, so when you get the infection, they have to divide. They have to then change their biology so that they go from dividing to killing microbes, and they have to go from dividing and differentiating in lymph nodes to going to your lungs, where your infection is. So this in vivo methods of tracking antigen-specific T cells enabled characterization of all those aspects, so that really enabled the field to do a lot of in vivo immunology.

**Williams:** So you were discovering the mechanisms that were in place.

**Jenkins:** Yeah, we discovered tools, and then we've made some hammers and we hit some nails, and most of the nails, really, were related to, in a large part, the anatomy of the immune response, where does it happen, what parts of the body, and how do lymphocytes change their behavior so that they can move around in the body, and, again, from this proliferate in lymph nodes to migrate to infection sites. Our tools were really useful for answering those kinds of questions, which we attempted to do.

**Williams:** Sort of sounds like you were battle correspondents, in a way.

**Jenkins:** Yeah, maybe. I don't know. A rap on our work probably was, it was descriptive, but bottom line is you have to accurately describe phenomena before you can understand—you've got to observe the dancing bear before you ask why is it dancing, you know.

Then my career became more mechanistic as we drilled deeper down into the nails, but my main contributions, I think, are in developing the tools to track antigen-specific T cells in the body and then discover some of the anatomic rules of the immune response.

**Williams:** Like, give me an example of that.

**Jenkins:** So have you ever had a Mantoux test?

**Williams:** No.

**Jenkins:** A Mantoux test is the test that's done to know if you have TB [tuberculosis], a TB infection. So you go to the doctor, they give you a little prick of extract from tuberculosis, the tuberculosis microbe, and then if you have an active TB infection, within twenty-four hours, you get a big red spot there. So that, it turns out, is due to the fact that if you have a TB infection, you take TB-specific T cells that are normally in your lymph nodes, they detect TB antigens, they proliferate, they differentiate into cells that then seek out non-lymphoid organs and they move from the lymph nodes into the skin so that when you get challenged in the skin, they immediately respond there. If you're immunologically naïve with respect to TB, then you have very few TB-specific T cells. They're all in your lymph nodes. You could give a little bit of TB antigen and nothing happens.

So the kind of work that I was doing could explain the Mantoux test, and now, of course, we want vaccines that can create that kind of situation so that you can get protective immunity without having to have TB. So understanding the signals it takes to get T lymphocytes to proliferate and move is of key importance, and move to the right place and stay there, or at least have the ability to go back there quickly. So I think, hopefully, that answered your question a little bit.

**Williams:** Well, and in the process, explains the nature of vaccines.

**Jenkins:** Yes, yeah. But we still struggle with vaccines against certain kind of bugs, including TB, and so we need a new generation of vaccines. So we have to understand this process at an even deeper level now to vaccinate against the bugs we can't vaccinate for now.

**Williams:** As you look forward from today, do you have an optimistic outlook on what's likely to happen in the future?

**Jenkins:** Very, very. The fact that we now have vaccines and immunotherapies for uniformly fatal cancers was unthinkable even ten years ago. The field is making some progress that's starting to accelerate to make vaccines that provide universal protection against influenza. That would be an *enormous* breakthrough. I think in ten years, we'll have such a vaccine. And there's even some hope for vaccines against HIV that are broadly protective against all the different sub-strains of HIV that are out there that create a problem for vaccines.

And then this whole new—there's now the understanding that the immune system is playing a major role in atherosclerosis, probably in Alzheimer's disease, probably in aging itself, and so all the new tools that are being built and have been applied to infectious disease and cancer now are being brought to bear in these new areas, so I'm very optimistic, very hopeful that immunology's going to keep paying off.

**Williams:** Let's turn to your association with the AAI. You joined, as I understand, in 1988.

**Jenkins:** Mm-hmm.

**Williams:** And what was behind that decision?

**Jenkins:** I had been a student member, which was like an annual thing, but in '88, I became an independent faculty member, and so I joined AAI immediately when I was a new assistant professor.

**Williams:** And your motivation for that was?

**Jenkins:** Both Ron Schwartz and Steve Miller, my Ph.D. advisor, they were very committed AAI members. I'd been coming to the annual meeting as a graduate student and postdoc. I saw the value of it. I saw just the importance of AAI as a networking organization, as a political action group, and it almost seemed it was a matter of duty, in a way.

**Williams:** Well, fairly early on, you became active in committees and things of that sort.

**Jenkins:** Yes, I did. If I was asked to serve, I served.

**Williams:** And then you got the ask for the ultimate position of president of the organization.

**Jenkins:** Well, yeah. The way it works is you run for council, and then if you're elected, then you are inevitably going to be president in six or seven years, so you're really committing to a long—but that's good, because every year on council, you're learning the job of being the president, because you're only the president for one year, so you've got to land on your feet.

**Williams:** So reflecting back on your year as president, what stands out in your mind?

**Jenkins:** Well, of course, the meeting when I was the president, and I got a really good feeling from that, of course. When I was president, I also went to Capitol Hill more than when I'd been on council. I'd gone a few times. So I was part of the AAI's Capitol Hill activities. That really stands out. I signed a lot of letters on behalf of AAI. [laughs] That stands out. I was involved—there were discussions that went on around papers that were published in *The JI* that might have had some issues that were brought up by the Publication Committee, so I was involved in that. It was a great year.

**Williams:** You mentioned in your President's Message, which I've read, your concerns about funding.

**Jenkins:** Oh, yeah. Yeah, I still am. But it's interesting, it's been now five years since that. I think this is the new normal. It's been like this now for fifteen years. So, of course, lobbying for more funding is a good thing to do, but I think that we all realize this is the way it is now. Let's get on with it. Let's do the best we can. But

I'm worried about funding. And like I said, scientists are kind of in the rejection business, but usually there's always a few successes mixed in there to keep you going, right, a few jackpots to keep you going back to the casino. But when the pay line got so low, there were people who just could not get their grants to run their research programs, and that created a negative atmosphere and started taking a lot of the fun out of it, so that worries me that that's going to discourage people from coming into the profession.

**Williams:** So how do you define the new normal?

**Jenkins:** Fifteen percent of grants are going to get paid. You have to write more. You have to write two if you used to have to write one. The system's made it easier to write them. They're shorter, and so developing the skills to be an effective and clear communicator and producing a readable application are all parts of the new skill set.

**Williams:** They probably don't teach you that in graduate school.

**Jenkins:** Yeah, they really don't, and I think there's even some confusing messages about the way to clarity is detail, and, in fact, I think it can often be the opposite, of reducing the big idea to some more metaphorical level that can resonate with a reviewer who's an expert but not a super expert in your little niche, you know, make it easy for them to understand your big idea, and that's a different kind of set of skills, although in the end, it's like arguing like an attorney. You're writing an argument to a jury, in essence, and so don't let them guess. But young people now are much better at it than I was when I started, largely because of these mentoring programs where junior faculty are mentored by senior faculty and by other—we have professional writers and professional public speakers working with our faculty now to improve our communication skills, to get our message out.

**Williams:** Is that common, you think, in the field?

**Jenkins:** I don't know. I don't think so, especially the public speaking part. They're experts in oral communication. They're not scientists, but they understand the science of oral communication. They're a data-driven group. They know what works, they know what doesn't work. They can help us make better slides, how to use our bodies, how to connect with the audience, how to deal with your nerves, all these things that make you a more effective communicator, someone people want to listen to, not someone people *have* to listen to. So, yeah, I think that's a good value-added program we have.

**Williams:** Is that targeted to the graduate students?

**Jenkins:** It's targeted mainly to the graduate students and postdocs to help their job interviewing potential, yeah, but I think I've learned as much as any of them, even

though I'd given hundreds of talks for money, but I never was that self-reflective about—no one taught me, you know. So I have radically changed how I give my oral presentations using their methods, and I could instantly tell it was better. It was more fun for *me* to do it, number one, and the reaction I would get from the audience was so much better.

**Williams:** Those are skills that probably translate well on Capitol Hill too.

**Jenkins:** I think so, yeah. Clean message, less is more, some repetition, but not too much, yeah.

**Williams:** Going back to your President's Message, you talked about a term that I don't understand, really: publication metrics?

**Jenkins:** Yes.

**Williams:** Tell me about that.

**Jenkins:** Yes. Well, that's an actual field called bibliometrics, and so this is mainly done now probably pretty well by measuring citations. So if you publish a paper, then that work will be cited in other papers, and that's used as evidence that this paper influenced the field. So now, of course, there's how many times does your paper get downloaded or tweeted or things like that to not just ask did you release a movie; did anyone buy a ticket. You know what I mean? So the field, it's really easy to figure out if you made a movie. You can just look at the list of—you can go to the journals and see if it's there. Figuring out if anybody went and that movie had an impact on the culture, that was harder to measure, and so now that started to be measured. The administrators were using that information to measure individual scientists, individual programs, and to ask basically who's better than who, and that kind of thinking is often tied to who gets resources.

So I felt like scientists need to be engaging more in basically the dialogue about how should scientists be measured. Is this how we want to be measured, and why? Because the bottom line is a lot of the metrics that are used to measure scientists were put in place by administrators with very little input from scientists, and now some of them are in the mainstream enough where it's going to be hard to get them out. And now with tweets and downloads and social media, what sort of metrics are we going to use to objectively identify important work? You may think, well, jeez, it should be obvious if it's important, but oftentimes it's hard, actually, to do that, especially with a vast literature. So I think that was probably what I was dealing with at that time.

**Williams:** So you were questioning the use of—

**Jenkins:** I'm a big proponent of their use, actually, but in a system that's been vetted by the people being measured, and so I wanted to see a debate on the issue from the

academic community, not by deans of academic institutions. So, you know, I think the horse is out of the barn, but I think the debate is still—although because I was a proponent of using citation metrics, at least as an additional criterion for promotion and tenure and other decisions made about quality, I guess I should be happy that some things have been put in place now at almost all institutions. Like when you come up for tenure, there's not just going to be a stack of your papers; it'll be the number of times each one of those papers has been cited will be reported. So I personally think it can help people who might be in more obscure fields and whose work is being appreciated by their field, but maybe not by a broader audience. They'll rack up some citations in that area.

**Williams:** In 2015, you became a member of the Committee on the Status of Women.

**Jenkins:** Yeah.

**Williams:** Talk about that.

**Jenkins:** Well, that's a very important issue. You know, we still have a lot of—we have income equality in science. The number of women who are at every rank from assistant to associate to professor, there are fewer and fewer women, and so we clearly have an institutional issue here to deal with, so I'd like to be part of the solution, at least be a listener. As someone who runs an immunology center, I—and in our center, we have a group called Empowering Women in Science that we support, they give a budget, and we support their mission to help them help us identify the issues.

**Williams:** Do you see progress in that area?

**Jenkins:** I do, I do. I think the #MeToo movement has raised awareness of the issue, some of the disparities that I just mentioned that are happening in science. So I think step one in any problem is awareness. Tell you what, now, you run a scientific meeting and you put your poster up and it's a bunch of white guys, you're going to get some serious scrutiny from people in the field. So that is progress, I think. We have a long way to go, but—

**Williams:** In 2018, you received the Excellence in Mentoring Award. Talk about the importance of mentoring to your own career and in general.

**Jenkins:** It's probably the best award I've ever received, you know. The older you get, the more it becomes about your trainees and your legacy, so to be recognized, especially by AAI, which is a huge organization—and when I was president, I knew how competitive that award was, so I was completely—my trainees nominated me and wrote letters of support and made a good argument, evidently. So, yeah, I was on cloud nine to get that award.

**Williams:** And what goes into being a good mentor?

**Jenkins:** Probably many different ways to be a good mentor, but for me, I learned a couple important things. When I was young, it was my way or the highway. I realized that was probably not the best way to go. People are different. Figure out a way to go forward. And I'm always mindful about it's my responsibility to help them get to the next point in their career, help them get a job, and so I've always had a relatively small group. I put a lot of effort into every person to make sure that they have a chance to succeed, and I don't have a sink-or-swim operation where I only need a few people to be doing well and I'm doing well. Not that all my trainees have totally flourished, but I've at least tried, because I think that's humane, and it's worked pretty well for me. I've benefited from that system.

**Williams:** Right. You're associated with the AAI High School Teachers Program.

**Jenkins:** Yes.

**Williams:** Tell me about that.

**Jenkins:** My first high school teacher starts in June, so she'll do a research project in my lab, and then she will use that information to produce a curriculum piece, either a lab exercise for her class or a set of lectures or a board game or something like that. So I'm an enormous proponent of public education, and I was actually elected to the school board in my community. My son's a public school teacher. So I'm *really* supportive of that.

**Williams:** So that's just beginning.

**Jenkins:** Yeah.

**Williams:** Mm-hmm.

**Jenkins:** Well, at least my having an actual teacher participate in the program in my own lab, yeah.

**Williams:** Right, right. You also run an intensive summer school. Talk about that.

**Jenkins:** Well, that was to get my own students up to speed about what my own lab had published. If your lab's around a long time, the institutional memory starts to fade as people leave, so this was to basically read our own papers so that new postdocs or students that were starting in my lab knew what we had done before, knew what techniques we did or didn't have, what principles did we have evidence for. So we would do that in the summer and read these papers and critique them and then bring in other papers that were relevant to the topic. So, yeah, I've done that for many years.

**Williams:** And continue to do so?

- Jenkins:** I do it a little less formally now, although this last year, we started in again. So just because when you've been around a long time, you just have a lot more papers, so trying to figure out how to do that well, I'm probably being lazy. I should do a better job there.
- Williams:** You know, it strikes me that the field of immunology, you're always so forward-looking that it probably is beneficial to take a moment and look back the other way.
- Jenkins:** Yes, because there's a trend now to just collect all the information, because we have these amazing methods to collect these large data sets, and that's not a very clever thing to do. So what's really interesting—and the further back you go in history and you look at the way the papers are written, how they got their ideas, how they did their experiments, you just come away with this sense of cleverness that it took to come up with that idea and then design an experiment that could even tangentially address that idea. And the clever people still win, so I want my students to see that. Fine, you know, do RNA sequencing, collect all the data, but in the end, knowing what to do is still important.
- Williams:** What's the lesson you teach your postdocs and such about the disappointments that you encounter in doing science?
- Jenkins:** Well, I try to teach them you really have to take joy from the little victories, the little things in your daily existence you can do and control. When you make that buffer and it's pH 7.2, you know, be a little happy about that. And don't take any of the criticism—take it to heart, use it constructively, but don't let it own you. You have to have enough confidence to say, "Okay. Either I disagree with that or I'll do better," but you can't just let it defeat you, and the more you get rejected, the harder that gets.
- Williams:** And how to handle negative results.
- Jenkins:** Yeah. Well, I'm always about the bottleneck. Why is that happening? Do we not have the right technology? Is our hypothesis wrong? I really do work hard at that, so I have our projects have a good technology behind it so that we can get a clear answer, yes or no, and if it's no, we stop and we get a different hypothesis. Some projects never die because people aren't willing to let them die. So a well-designed system, not that you can always do it, has stopping points, and you have to let it go. I've had a few points in my career where I've made radical changes in the direction that we take because we got evidence we were not going in the right direction. So if you're not willing to do that, you're not going to survive.
- Williams:** Can you give an example of one of those instances?



**Jenkins:** Sure. We had developed this new method to measure how these T cells were responding in the body, and it involved this trick of taking these mice made by recombinant DNA technology, where they all had the same antigen receptor, like they were all specific for influenza. We would flood them into a mouse and then we would give the infection, and we could watch those cells respond. It was really cool, but the bottom line was it turns out that flooding the system that is normally designed such that all the different antigen-specific cells are very rare so that you can have a very diverse response, you can respond to almost anything, that that homeostasis was perturbed by all the cells we had flooded in. In our own work, it became clear that that system that I had championed and convinced so many people around the world to use was flawed, at least it wasn't perfect, and so we now rarely use that system. We developed a different way to find the *real* T cells at their ultra-rare state, because that was the bottleneck that other system was trying to solve. It solved that problem, but then it created a different problem.

**Williams:** And how did you announce that discovery to the world?

**Jenkins:** We published it. That was hard. But it turns out my career only got better because we went from that path to a better path that was recognized. I wish it was recognized by more people, actually, that still use that earlier method, because it can do certain things that the more modern—it's easier to find one in 100 cells than it is to find one in a million, let's put it that way, and that lets you do things you could never do in the one-in-a-million case, but you still run this risk. So that was hard for me.

**Williams:** You described, I guess, again, during your President's Message that as far as you're concerned, doing immunology is fun.

**Jenkins:** Yes, it should be fun. If it's not fun, you're not in the right business. It's a great time in immunology, like I said, because it's exploding into all these other new areas. So we can't let all the rejection take the fun out of it. So that's another reason the AAI's a great meeting. It's fun to come here and see people and, you know, party. [laughs]

**Williams:** Are you recommending a career in immunology for young people that are considering a life in science?

**Jenkins:** Absolutely. It's still a great profession to be any kind of professional scientist, given you have a chance to really make a difference, put a brick in the fort, maybe more than one, maybe build a whole wall. But that's pretty gratifying, so I hope all the weeping and gnashing of teeth that is going on amongst the people who are in the field now related to their grant issues or having their papers rejected or whatever isn't creating a negative vibe that students are picking up on. They probably are, but I still find there's lots of students who want to do this. So there will always be people who want to do this, I think.

**Williams:** Will there also be always people who are taking a negative stance?

**Jenkins:** Maybe, maybe.

**Williams:** Where do you see that happening?

**Jenkins:** Well, I see people caught—like I said, the system kind of really hit the wall maybe ten, fifteen years ago, so there were people who, in midstream, their career was going pretty well, suddenly—bang!—hit the wall, and that was really crushing for them, you know. It's like somebody pulled the rug out from under them. At least people now who are entering the field, like I said, this is the new normal, and so I think they come in with their eyes wide open about what the challenges are going to be, and that, I think, in and of itself, is going to make more realistic points of view, which I think will create a more measured kind of temperament. I don't know if I made that clear.

**Williams:** Are you worried about conditions here causing the slippage of some of the scientific activity to overseas?

**Jenkins:** Oh, of course, yeah, yeah.

**Williams:** How do you see that happening?

**Jenkins:** Well, I think in the old days, there were many, many promising students in China wanted to come to the United States and get their training. Well, now many of those students stay in China to get their training because they've really upgraded the quality of their research enterprise, invested *huge* amounts of money. So we're in a competitive world economy the way everybody else is. So, yeah, I'm concerned, but there still is something about the American system, that kind of individualistic "get your own idea" thing that's going to still make us tough to beat, I think. But it's just a shame that when we're finally ready to deliver because of all these great new technologies and stuff, we still can't really get much increase from the federal government for this kind of research. That's pretty frustrating, and if that goes on for too long, we will slip, because everyone else has these tools, too, now, even if they were developed here.

**Williams:** Anything else you'd like to add to this interview?

**Jenkins:** I don't think so, other than I'm so thankful to have had this career. Like I said, at first, I didn't even know what the career was, and I'm not sure I was that ambitious. I got more ambitious. [laughs] My wife will tell you that. But I'm just thankful that I could—I'm five years away from retiring, and to have had this experience has just been incredible. I feel pretty lucky, fortunate.

**Williams:** Great. Thank you.

**Jenkins:** Thank you.

[End of interview]