



The American Association of Immunologists Oral History Project

Transcript

Steven J. Burakoff, M.D.
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Interview conducted by
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Williams: This is an interview with Dr. Steven J. Burakoff for the American Association of Immunologists (AAI) Oral History Project. Dr. Burakoff is the Director of the Tisch Cancer Institute and the Lillian and Henry M. Stratton Professor of Cancer Medicine at Mount Sinai Medical Center. Dr. Burakoff served as the AAI secretary-treasurer from 2002 to 2003 [Ed. 2003 to 2009], and he was awarded the AAI Lifetime Achievement Award in 2009. We are at the IMMUNOLOGY 2015™ in New Orleans, Louisiana. Today is Saturday, May 9th, 2015, and I'm Brien Williams. Many dates in that little speech that I just saw for the first time a couple of minutes ago.

Well, let's start with you telling me as much as you want to about your family background.

Burakoff: Okay. So my grandfather came to the United States from Russia with four cousins in, I believe, 1903, there were pogroms in Russia at that time, and subsequently moved from there to Hartford, Connecticut, wound up in New York, where my father grew up, was a sales manager. My mother grew up with a family out of Philadelphia and Holland. She became a nurse.

I grew up in Forest Hills, New York, where a number of people in research have grown up, including Gene [Eugene] Braunwald and others, went to Forest Hills High School, went to college to Lehigh University. I was supposed to be an engineer. I tell the story I wasn't crazy about engineering, but got out of college during the Vietnam War. The draft was imminent. I actually was afraid of blood, but I was more afraid of my blood in Vietnam, so medical school seemed like a great place to go.

So I went to Albany Medical College, which was a small medical school, very supportive of being a clinician. Then for my internship and residency I went to Cornell Medical Center in New York City, and I had the actual fortune, my chief resident—and this was in 1973—was Tony [Anthony S.] Fauci, head of NIAID [National Institute of Allergy and Infectious Diseases]. I kind of expressed my interest in immunology, but in a broad, naïve form. So Tony helped me in my senior year spend almost a year at Rockefeller [University] with a very famous immunologist in those days, Henry Kunkel, who's credited with having discovered immunoglobulin.

Then he came to me a few months later and said, "If you want to be a committed immunologist, you have to go up to Harvard Medical School and train with Baruj Benacerraf." Baruj Benacerraf ultimately won the Nobel Prize in 1980.

I applied. I was married. My wife and I went in 1973, where I became a fellow at Harvard Medical School. I was at Harvard Medical School for seven years. I became an assistant professor there, fell in love with immunology. I just thought it was just kind of the perfect science. It was science, but it also was a field where the immune system was developed because it had application. It was there to

prevent us from getting cancers, to control viral and bacterial infections, and it was spectacular. Developed lots of close friends, from Ron [Ronald N.] Germain to Emil Unanue during that time.

Then in 1980 I got a call from a guy named David Nathan. David Nathan, who went on to become a very famous hematologist, called me and asked if I'd be interested in going over to the Dana-Farber Cancer Institute in the Department of Pediatric Oncology. And I pointed out we had three problems. One, I said, "First of all, I'm not a pediatrician." And he said neither was he. I said, "Secondly, I'm an immunologist. I'm not an oncologist." And he said, well, he was mostly a hematologist. And I said, "Third, I wouldn't go to a Cancer Center for all the money in the world." Because when we trained at Cornell, we spent three months a year at Memorial Sloan Kettering, and in the seventies, pretty much getting cancer was a lethal disease. He actually pointed out by 1980, 40 percent of the children with what's called common lymphocytic leukemia were being cured already, so it was seen as a curable disease.

I went over. I met people who are really committed to doing both research and bringing it to the clinic. It was, I think, really the beginning of translational research. I thought it was a spectacular place to go, so I moved my lab there in 1980. I was very fortunate. I did some work thirty years ago. I got tenure at Harvard very quickly. In 1985, Benacerraf had actually moved over to become president of the Dana-Farber, and he called me in and said to me, "You're now going to become chairman of the pediatric oncology department."

I gave him the litany. I said, "I'm not a pediatrician. I'm not an oncologist."
[laughs]

He looked at me, he said, "Well, you've got tenure, so I can't get rid of you, but if you don't take the job, I'm going to put somebody over you who's going to make your life miserable." [laughs]

So I went home to my wife. We had a three-year-old. I said, "Maybe it's time." We'd been in Boston at that point twelve or thirteen years.

She said, "We're not going. We're staying in Boston."

So I took the job. I ran Pediatric Oncology for fifteen years, and it was really spectacular. I mean, the field moved along through clinical trials, so by the time I left in 2000, almost 90 percent of the kids with leukemia were being cured at that point.

I had what was called the Jimmy Fund. The Jimmy Fund was an organization that raised thirty to forty million dollars a year. The Boston Red Sox were major supporters of the Jimmy Fund, so my daughter was really impressed. All her

friends' fathers were Harvard professors, but I was the Ted Williams Professor, who we felt as Bostonians was the greatest hitter certainly that ever lived.

This gets a little more personal. My daughter grew up in Boston. I expected that she would go to college in Boston. This is now 2000, and she sat me down and she said, "Dad, you know, I have to leave Boston."

I said, "Why?"

And she said, "Because I have an overbearing father." [laughs] So she went off to Princeton.

I got a call from NYU [New York University] that they needed to reinvigorate their cancer center and were going to put tens of millions of dollars into it. But what was interesting, there was also an opening to run what's called the Skirball Institute. This is a basic science institute. Dan Littman was there. And I guess I had the idea that integrating a basic science institute with cancer would be an interesting challenge, and clearly it was. Again, we built new research buildings and clinical buildings, were able to bring people like Dan Littman and others, who were doing more basic immunology at the time, into, in his case, the field really of autoimmune diseases, the work he's done on the gut. And I continued my lab. My lab would shrink at Dana-Farber. It was rather easy to run pediatric oncology. I had a lab of twenty to twenty-five people. Once I began running a cancer center at an institute, it was down to ten to twelve people. So NYU was terrific. It was much less focused on integration—translational research.

In 2007, I got a call that Mount Sinai had just raised well over \$100 million to really, again, rejuvenate their cancer center. They were building a new research building. Half of that would go to cancer. There was an opportunity to put in the cancer center all the clinical outpatient, where all the cancer patients came, on several floors and have several floors above, which would be room for almost two hundred scientists to work. So, for me, the concept of having scientists right next to patients, so information as well as cells, etc., could move back and forth through basically one stairwell was really fascinating.

So I went there seven and a half years ago. We've done over sixty faculty recruits. It really is a place for me that has worked for several reasons. It's building a cancer center [Tisch Cancer Institute] in a major medical center, and today the reality is the unfortunate growth of cancer is because of aging. It's really a disease of aging, except for those rare cases when children develop it.

It [Mount Sinai Medical Center] also sits right on the border of Harlem and the Upper East Side. Poverty levels in Harlem are 35 percent. The Upper East Side is like 7 percent. I always say that 7 percent is probably the academicians who are trying to live there. So that was really looking—you could look at a broad spectrum of diseases. In Harlem you had a high incidence of hepatocellular

carcinoma, liver cancer because of the high incidence of hepatitis. You had, among the African American population, very aggressive prostate cancer, triple-negative breast disease. So that was one of your responsibilities to care for that, but also focus on diseases that were really tough to be able to treat.

It was also a place that had always believed in translational research. It has a history. Inflammatory bowel disease was described there by [Burrill B.] Crohn of Crohn's disease. And also it had—and I found it interesting—it had immunology institute, so if you could induce immunologists who were only thinking about the gut or autoimmune diseases to think about cancer, too, instantaneously you had forty-five faculty members. We've done that, you know, so we have maybe a different concept. Autoimmune disease is a disease where your T cells are attacking self, which means our body hasn't learned to make them what we call tolerant. Cancer is just the opposite. Cancer is a problem where the cancer induces tolerance. So, for me, I saw this as the yin and yang of a problem that we could look at in multiple ways, and it really has worked. I mean, we have a great cancer immunology program. We build vaccine centers at this point. So it's been kind of an interesting journey. My lab is funded by a number of companies at this point. I'm down to four people.

But what I kind of say is, you know, I was supposed to stay at Harvard Medical School and become a basic immunologist, and that I could actually thank Tony Fauci for and Baruj Benacerraf, who has obviously won the Nobel Prize for creating a field. What was great about him, it was all about the data. He couldn't care what prize you won. There was no politics involved. It was just "Show me the data." Then I can blame David Nathan. I learned about pediatric diseases. Though I wasn't a pediatrician, I'd go to what was called the Jimmy Fund Clinic one day a week to feel what it was like to take care of these kids, and it was really amazing. I think what happened is I took in this concerned passion for these kids, and I think at that point it was hard to be just a basic immunologist. I think probably that experience is what has resulted in the evolution of my becoming more of a cancer center director than a basic immunologist.

I mean, it's been a terrific ride. I keep on threatening to step down—they won't let me [laughs]—from the Cancer Center, because actually I would like to do in the next three or four years is to focus on immunotherapies. So we're at a point today where much of the work that many of us did, understanding the basic mechanisms of how T cells work, have now, in fact, resulted in all these therapies. Checkpoint blockade inhibitors are resulting in metastatic melanoma patients, 60 percent of them living for over three years. It used to be a death sentence. So the ability now to harness the immune system in all these diseases is really a spectacular moment in time. It's great because it's being applied to cancer, so I can see it from the laboratory. I can see it from the clinical side. I have all these great clinicians now.

Mount Sinai has created this huge network of seven hospitals, so it's the fifth or sixth largest cancer center in the country at this point. I see that as a responsibility, an opportunity to provide clinical trials to many more patients. We're seeing now over ten thousand new patients a year. As I mentioned before, cancer is a disease of aging, so we have a continual fight on our hands, but we really do have the armamentarium to do something about this now. So it's just a great time.

Williams: You spoke so fondly last night about the lab community up at Harvard when Benacerraf was in charge. Talk about what were the ingredients that made that such a successful and rewarding place to be.

Burakoff: So what was great about Benacerraf, very tough guy—I'll give a little vignette I actually gave at his memorial. So I'm going to say I'm only an M.D. I was supposed to get a Ph.D. at Rockefeller [University], but I was in too much of a hurry. And my first year went spectacularly. I was lucky, undeservedly lucky. My second year, nothing worked, and I went to Benacerraf. I was, you know, not spoiled, but very supported, middle-class kid. I guess I was going there looking for support. And I sat down—it was Dr. Benacerraf—I said, “You know, I've been working for a year. I have nothing to show for it.”

He looked at me, he said, “You know, Steven, you're an M.D., aren't you?”

And I said, “Yes.”

And he said, “You know, medicine's an honorable profession. Maybe you don't have what it takes to do research. Maybe you should get out.” [laughs] Well, I was ready to kill the man, and I wasn't going to get out until I proved I was going to be successful and then get out. Obviously, once you're successful, who wants to get out?

And, you know, he sat in his office kind of quietly, rarely went to meetings. We all were waiting for him to get the Nobel Prize. He was the greatest strategist I've ever—not very articulate. In fact, my closest friend who remains is Ron Germain, who was an M.D., Ph.D. student at the time, is winning one of the big awards here [AAI-Thermo Fisher Meritorious Career Award], Emil Unanue, who went on to, again, win the Lasker Award [1995 Albert Lasker Award for Basic Medical Research], and we'd sit around strategizing. We didn't have big genomics at that time. There was limited technology. It was developing strategies to figure out how to prove a problem. Then we'd kind of go in to Benacerraf, and at least 10 percent of the time he would find a better way of doing it. I mean, he was just an amazing strategist. And also everybody was the same, you know. [laughs] He would kind of dispense with everybody, no matter whether you were a full professor. I've mentioned names. But I remember him pulling in the professor who was head of Microbiology at the time at Harvard, unhappy with some issue. So we were equally treated.

Science was everything. It was all about “Show me the data.” Data would excite him. He didn’t care if there—there was really no politics. It was really kind of almost a pure experience. And because he was so good, everybody wanted to please him by showing him great data. So we were all partly—well, we were excited about what we were doing, but we really wanted his support, you know, the pleasure that he showed when one had great data.

In his own way, he was a great mentor. Linda [A. Sherman] was part of this group. In fact, I kind of learned to cherish young people. I think one of the awards that maybe I’m most pleased by, in 1995 Harvard Medical School had the first mentoring award. So between scientist and physician, Harvard had six thousand people or something like that, and I won the first mentoring award, which was a big deal, a big symposium. You may not want to put this in, but I was very friendly with the Dean of Harvard Medical School [Daniel C. Tosteson], and Harvard’s a very tough place, you know. So I turned to him, I said, “You know, there was a lot of competition for this award.” [laughs]

But, you know, I like people and I like people who were excited with what they did. In the end, it really works out to be very beneficial. You have a laboratory of people who are excited at what they do. They work harder. The whole environment’s more fun. I loved to go to lab meetings, especially when we had like twenty, twenty-five people. Everybody kind of tried to show how smart they are, but not in a malicious way at all, kind of maybe seeing if they could outsmart me or whatever. So you kind of went in pumped up, and it was very exciting.

I think science is a wonderful discipline. People certainly don’t do it for the money. I know lots of these people who could have done a lot better financially. And I feel privileged to be part of such a great community.

Williams: I was going to ask you about the culture that you’ve developed in the labs that you’ve headed, but I think you’ve pretty well described it right now. How collaborative an environment do you try to achieve?

Burakoff: Well, I certainly try to—I want to say that my laboratory, and I think Pediatric Oncology, which was declared the best program in the country, was very collaborative. I think part of the problem with Harvard, though a great, great place to do science, there’s so few people who go to tenure that what it kind of does is provokes competition. And, you know, when it’s controlled and people get together, which they do more so than ever now because there’s more and more need for big science, I can’t say it can be destructive, but I don’t think it provokes or supports the best science.

Again, I was very fortunate. I built Pediatric Oncology. I made it six times larger over the fifteen years. And it was an extremely collaborative place. One, because we had something like the Jimmy Fund, money wasn’t a big issue. Many of the

people who I recruited as assistant professors are really actually giants in the field now. One of them [Eric Lander] started the Broad Institute. Others have gone on to full professorships at Harvard and other places, Wash U, etc.

I think mentoring or developing interactions kind of starts from the top. It's really what you said for instance, and when it works, it really is synergistic. When it doesn't work, I mean, it's more destructive. In that way, I've always been very lucky. As I said, I never worried about—again, it was partly luck. I did something reasonably important thirty years ago. So it was about the science. It was building Pediatric Oncology, building cancer centers. It was never—I mean, too many people, unfortunately, have to worry about they get to Harvard, sometimes they'll go to Harvard Medical School, this is the only place on earth for them, and they lead a very anxious life, hoping they're going to do well enough so they could stay.

In fact, a vignette. When we were building the radiation oncology department at Mount Sinai, we had down a great guy who was the head of Radiation Oncology at the Mass[achusetts] General. I knew him quite well. I went in. I won't mention names in this case. But he asked me, he said, "So tell me, why did you really leave Harvard?" I think he thought there must have been some kind of scandal or something. I mean, like, who leaves Harvard?

I looked at him, I said, "I got bored. I wanted a new challenge." [laughs] And, you know, it's a different challenge. I mean, it's meaningful in a different way, and I think that those of us who have family support, are in reasonably good health, have supportive environments where we work, we're really pretty fortunate, you know.

Williams: As you described your career, it occurred to me that you took on more and more what I would call administrative responsibility. Did that take you a lot away from the science or not?

Burakoff: You know, the larger the responsibilities became, clearly it was inversely proportional to the size of my laboratory, but it also did something else which was interesting but had me less fully involved and engaged in immunology. I think to run a cancer center, for example, you have to kind of know the field well enough, not in great depth. You have to kind of know the players. You have to get out there. And so I had to learn a lot of cancer biology. So I think Michele [Hogan] knows I go to few of these meetings. There's a Stand Up To Cancer board that has these dream teams supported by Hollywood out there once or twice a year. I'm on that advisory board. I'm on the Melanoma Advisory Board. I'm doing more probably in cancer, but always there looking at how immunology can help, being an advisor to one of these dream teams. So what's happened is I probably have a much broader knowledge, but maybe more superficial at this point, because I see that to be able to run a great cancer center, you have to know the field, but you also have to know the personalities. I mean, you have to know the

personalities if you want to create the synergies that can come about from people working together.

So, yes, I mean, and now the administration has just become enormous, though I was lucky enough to hire—you know. The good and bad thing is I'm not an oncologist, so I don't see patients. So I've hired great clinicians, great clinical investigators, a number of them from the Dana-Farber—they get somewhat annoyed with me for having done that—from Memorial Sloan Kettering. But I think you have to have a broad knowledge base. What's great, again, about immunotherapies, immunotherapies are there for cancer, so it kind of all folds together at this point. So it's a pretty exciting time.

Williams: You mentioned an achievement about thirty years ago in the scientific field. Can you talk briefly about your contributions to particularly translational science over the years?

Burakoff: Yes. Interestingly, I probably have done, myself, less work in translational science. It was really much more early on. In fact, Linda [Sherman] brought up one of the points when a paper published [in 1974] by [Rolf M.] Zinkernagel and [Peter C.] Doherty showed that T cells could kill virally infected cells. There was a question whether there was two versus one receptors, and it seems, looking back, the answer was neither surprising or would seem very important. But at the moment, with Ron Germain and a number of people, we figured out that it was one receptor, and that really became fairly important in terms of how one studied cytolytic T cells. Linda, we were mentioning, creating proteins in membranes with Matt [Matthew F.] Mescher and Vic [Victor H.] Engelhard.

We also, when we got over to the Dana-Farber, realized—and few, I think, discoveries are ever—there's a time and a place where a number of laboratories come up with something. But in those days, again, thirty years ago, helper cells and killer cells were divided by being $T4^+$ if you were a helper cell, $T8^+$ if you were a killer cell. But $T4$ was thought of as maybe just a marker. Immunologists use it to be able to isolate helper cells. Well, it didn't make sense to us, because these $T4$ cells in mouse, as in human, you know, by Darwinian selection, you don't save something just for that, just for the immunologist to isolate cells. So we began to realize it must be another receptor, and, in fact, did the experiments together with Jack Strominger, who was over at the bio labs at Harvard, and a number of the people in my laboratory that actually showed that $CD4$, as we call it now, is a co-receptor. And that, in part, was kind of the beginning of co-receptors. It was other people like Jim [James P.] Allison and Jeff [Jeffrey A.] Bluestone who realized other receptors, one we call $CTLA4$ is a negative regulator, $CD4$ and $CD8$ are positive regulators, so they work in concert with the T cell receptor to give you a better response.

But a paper on that came from two other laboratories within a matter of months. It was done almost simultaneously, what we know about it, I think by Susie

[Susan L.] Swain in the mouse when we were doing this in humans, but it kind of began a whole field, I mean, this group of us, about co-receptors that really, in part, led to what we know today, these negative signaling receptors, which it's called checkpoint blockade inhibitors, which is now giving us the therapies to block them with what's called anti-CD4, anti-PD1.

So it was then focus on the T cell. We study now an enzyme or a kinase that if you knock it out of T cells, T cells respond much better. Since it's a kinase, we now have support from several companies, because if we could come up with a drug to inhibit the kinase activity, that could also enhance the T cell response. So it's been very focused on first it was more cellular then it was using molecular biology in the early nineties.

I joined a laboratory run by Lew [Lewis C.] Cantley and Ben [Benjamin G.] Neel, who are both in New York now, at Harvard to learn biochemistry of cell signaling, so that was kind of always fun, you know. I'm the Harvard professor of whatever here, and I'm a postdoc learning signaling there, so it was always fun. I used to love to work with structural biologists, published a whole bunch of papers with one of the best chemists in the country, a guy named Stu [Stuart L.] Schreiber, who was at the chemistry labs, trying to understand how immunosuppressive drugs work on a real molecular level.

So the fun of it is working across fields. The fun of building something is bringing lots of fields together. You obviously, in some of those fields, you don't have the in-depth knowledge, but we published a whole bunch of papers in structural biology because there were molecules we realized we couldn't really understand if we couldn't see it and got the structure. Linda put up one of the great, great discoveries for how antigen presented, was done by Don Wiley in 1987 when they came out with the structure of the MHC [major histocompatibility complex]. It explained hundreds and hundreds of papers that were trying to understand how antigen was presented to the T cell.

You're going to have to do a lot of editing. [laughs]

Williams: One question that does come up, as someone unfamiliar with the field to begin with, who decides on the nomenclature in this field? How do you come by that?

Burakoff: [laughs] You know, at times there actually have been committees. So there was a number of workshops that came up with what's called the CD nomenclature, so, like, this is now CD4, CD8. It gets a little difficult when you're up to CD134 or something like that.

So, again, a little vignette. Years ago when I was at the Farber, one of my trainees, who was head of research at the Brigham [and Women's Hospital], was giving an immunology lecture to what I call a mixed audience of molecular biologists and virologists. And after she finished—and she's a very, very good

speaker—somebody came up to me afterwards and said, “You know, I feel that when an immunologist speaks, there should be subtitles for the immunologically impaired.” And, you know, it is kind of true. What happens in each field, especially in clinical medicine, you develop nomenclature, and things only come about when you begin to develop a common language, even between scientific disciplines. But immunologists are among the worst, you know, are the worst. [laughs] Partly because we have so many molecules that are studied. I mean, thank God for Google or whatever. You can look up CD134 in a second to remind yourself of what it is. [laughs]

Williams: What about major disappointments in your scientific career? Did you run up against a big bump at any point?

Burakoff: I wouldn't say I've had major disappointments. I thought at one time—and I was a candidate to be a dean at several medical schools. That didn't work out, but I'm sure to some extent it was also my fault. I realize I would have been a terrible dean, partly because I really am passionate about doing something about cancer, really coming from the kids, and I'm extraordinarily tolerant to support all aspects, from outreach studies to community, I mean if it advances the field of cancer and brings treatments to people.

Disappoint? I don't know, you know, the question you ask yourself, but your life doesn't give you do-overs. When I come to the AAI, for example, somebody like Linda Sherman, people who loved immunology and have stuck with it for years and years, you kind of say, “Well, could I have achieved more in immunology if I hadn't had now a good part of my energies diverted? Would that have been more satisfying?” I kind of don't know.

I always joke maybe I have a little bit too much ADD [attention deficit disorder]. I still wake up in the morning, bounce out of bed, and this is after a lot of years. So the disappointment would be to say, “Gee, you know, I would have liked to have known what it was like if I took that different path.” Reminds me of a great interview with Warren Buffet. He's now eighty-four. He said, “I appreciate I'm going to die in time, but, goddamn it, I would love to know what's going to happen in the next thirty or forty years.” He said, “That's where I feel cheated.” And to some extent, you kind of ask yourself, “What would it have been like if I'd stayed more focused on immunology? How might I have evolved?” I love the fact that it's become more applied now. But, you know, I don't have a lot of complaints.

Williams: I was thinking, too, of maybe a line of research that started out being very promising and then ended up a dead end.

Burakoff: Oh, well, that was the second year. [laughs] That was the year—now broken out. It was a point in time with Benacerraf where we were trying to study what were called suppressor cells. Today I think those are what people call T regulatory

cells. We didn't really have the molecular techniques to define them well enough. There were experiments that worked and didn't work. Never really worked well for me. It was part of the time I went to Benacerraf, you know, looking for some emotional support, which I didn't get. [laughs]

But I think it's just more about could you have done more than big disappointment. Although I must admit I've been pretty lucky, you know, coming from a middle-class background, and I think my parents were just happy I went to college and not jail, you know. Medical school was fine, but it was just to keep me out of Vietnam. Finding Tony Fauci, who we still kind of joke. I don't see him very often. He's pretty busy. So I feel pretty lucky. Great family. In my family, they point out, I play a doctor. My brother's a real doctor. He heads Clinical Gastroenterology at the Brigham Hospital. My daughter's doing a fellowship in pediatric emergency room, and she wants to save the world. She goes to Laos every year. She spent a year in Laos. We have pretty good health, you know. My career has gone well.

Williams: Was it just you and your brother?

Burakoff: It was just me and my brother. My brother always wanted to be a doctor. I thought that was the stupidest thing in the world. [laughs]

Williams: Let's turn to AAI for a moment. When did you first join?

Burakoff: I thought I joined AAI like by 1976, something like that. [Ed. Burakoff joined AAI in 1978.]

Williams: That was pretty early in your career.

Burakoff: Pretty early. In fact, I remember it [AAI annual meeting] used to be in Atlantic City, and even then Atlantic City was not a spectacular place to go to. I remember that first year, because we were studying how this molecule complement can punch holes in cells and make them basically explode, and it couldn't do it to certain tumor cells, and published a paper, and I was giving a talk, one of these short talks at AAI [annual meeting]. I still remember I was terrified. I was up the whole night, the whole night. [laughs] I was pretty shy. I've gotten over that over time. But to speak in front of serious scientists, which in 1974, went pretty well. I mean, I had it all written out, you know. [laughs] I wasn't going to ad lib the way I ad lib my life now, I feel, you know. And, you know, then I was seriously involved with it. I come less often now because I wind up going to all these cancer meetings at this point.

Williams: But you did take on the role in '03 of secretary-treasurer.

Burakoff: I actually started—in 1985, Tony Fauci had been head of the [AAI Program] committee that organizes the meeting, and when he stepped down, he

recommended me, and I ran it for several years [1984–1986]. I remember Tony’s advice. He said, “Steven, keep meetings short. It allows you to make more of the decisions.” Tony’s run the Allergy and Immunology Institute [Ed. National Institute of Allergy and Infectious Diseases] fantastically well. So I did that several years.

I was involved with the *The Journal of Immunology*, went up to, I think, being a deputy editor for several years [1992–1994]. So I’ve been involved in a number of committees. Then I guess in 2003, I was asked to run for secretary-treasurer. I think Michele [Hogan] approached me. The way that works is you do it for three years, and I think they take a vote and then you do it for another three years. Actually, that was good because it was during tough times. We actually helped build up the reserve. I always said it was easy; I just wouldn’t let them spend money.

So the AAI has really been extraordinarily important for immunology, for young people, as you see. As times have gotten tougher, in some ways we’ve now had to spend more money on travel awards, etc., because the NIH hasn’t grown. It’s actually diminished in terms of real funding. In fact, most places now, we’re fortunate in New York because there’s a lot of philanthropy there. Our medical school is now the Carl Ichan School of Medicine. Carl gave us like \$250 million. Carl was a medical school dropout. His parents, after he went to Princeton, told him, “You better go to medical school,” because he had no talent and he wouldn’t get a job if he didn’t go to medical school. [laughs] He’s worth \$25 billion now.

So we have a reasonable amount of philanthropy, in New York City especially. We work hard, actually, to get IP positions so we can have patent positions, because [Harold E.] Varmus and other people have just said unless something changes, you know, the NIH—and you saw that great thing that Matt Klinman [Ed. son of Linda Sherman] did on NIH. I mean, you know, restricting government spending had enormous impact on us, and we’re losing people.

A couple years ago, somebody who I recruited to the Skirball Institute when I was there, Chinese but actually got their Ph.D. in structural biology at Brandeis [University], was recruited back to China. I met with him in Beijing. He has this institute. I gave him room for eight people. They built him a building for four hundred people. And I gave a lecture there. We went to dinner. I know him well. And he said, “We have a very simple strategy here. We send all of our postdocs to the United States to get trained and then we bring them back.” So where in the past we would get these great postdocs and the best of the best would stay, the best of the best go back now. And this is happening to us a lot, so we need associations like AAI to be both advocates and to figure out how to nurture young people.

And you would think, given what’s happening in immunotherapy now, immunotherapies are probably the biggest advancement in cancer treatment since

the initial advent of chemotherapy forty years ago. You would think the government would maybe think about what it would mean in terms of cost savings. If you could basically cure someone early on versus what we do too much now is—myeloma is a great example. I mean, we've done a great job in myeloma. Myeloma patients tend to live about ten years on expensive drugs, undergoing transplants. That is very expensive for society. If you could have curative drugs, it would be so much better for the economy. But we'll see.

Williams: So when you came in as secretary-treasurer at the AAI, there were fiscal issues at the organization, or was it more the national scene?

Burakoff: We were lucky the first couple of years, there was the doubling of the NIH, and then we got hit in 2008. It really started in 2007, where there was great concerns about obviously the economy, but the economy was affecting medical schools, it was affecting research institutes. So at that point, or even a little before that, we started saving more money for a rainy day, basically, so that we really built up the treasury so we could sustain AAI, sustain travel awards for young people, which is, I think, one of the really important things we do, without knowing how long we would be in a restricted economy.

Williams: And did you face some opposition for being Mr. Scrooge?

Burakoff: No, no. The council was terrific, you know. There was no opposition. There were some people who just felt we should be giving out awards, and I would just kind of say, "No, we're not." And they said, "Okay." [laughs]

Williams: And your view prevailed.

Burakoff: What's so great about the AAI Council, I mean, people really know each other for years, and you stay on that council for many years, and Michele's spectacular, so it works very well.

Williams: So, some general last questions here. What are the challenges to the field that lie ahead? I think you've just discussed one at length. [laughs]

Burakoff: I would say you hear it all the time; it is, in part, the NIH. There's more money spent by other governments, even England. China is spectacular, what's happening there. They get it. South Korea gets it. It's kind of crazy. At one point—it kind of shows you how unfocused I was—Samsung put a billion dollars into building a cancer institute in Seoul, Korea, and I actually was asked to be the director of it. And when you see what is happening in South Korea, if you see how hard students work, if you see what China's doing, it's much bigger, so it's in select areas. We'll all benefit to some extent, but we risk our preeminence.

I still think, in part, the great thing here is how much we really support, I want to say, young, innovative people starting companies. The fact of the matter is the

United States is still the closest thing to a meritocracy. I have lots of friends in France. If you want to go to medical school in France, everyone takes an exam at the end of high school, like when they're eighteen, and the 10 percent that pass it go to medical school, and the rest never go to medical school there. We have so many more paths to be able to get where you want. I kind of took a less traditional path. I mean, maybe it was to escape Vietnam, but, you know, I wasn't the world's greatest student at the time. I wasn't particularly interested in medicine.

But the United States has that, you know. Again, it's not always a meritocracy. There was an article yesterday in the [*New York Times*] about if your name is Clinton, Bush, or whatever, you have something like 1,800 or 8,000 times the likelihood of having a more successful career than if not. But on the other hand, we're so broad-based in ways you can figure out how to get somewhere.

Frank Bruni has been writing a whole bunch of articles in the *New York Times* about how much we push too hard on our kids going to the best colleges, and, in part, it's ultimately finding your passion. So I found my passion, like, at twenty-eight, twenty-seven, when I found immunology. I literally could not stop thinking about it. I kind of did what I had to do to get through medical school. I was a good intern and resident. I found immunology. It was spectacular. So I ain't much better at having—you know, people have various paths to find what really just excites them. So I really do think we're as good a meritocracy as exists, perfect by no means.

Williams: I was going to ask you what you're advising students and trainees at this point as to their role in the future.

Burakoff: You know, it really does come down to if you can find your passion, keep your eyes open. I mean, these kids who get crushed because they don't get into Harvard or Princeton or whatever, I mean, yeah, I mean, go to a good school, take it more seriously than I did, you know. [laughs] I spent a lot of time in my fraternity when I was a college student. Lehigh was an all-boys school at that time. But I think in the end, really, I think you've got to keep your mind open.

Williams: And in terms of future career paths for these young people, where do you advise them to look?

Burakoff: Well, again, I mean, obviously, science is a lot harder. I mean, the great thing in the States is there's very few people—the Bill Gates, the Zuckerbergs—who drop out of college. Well, probably should get a college education. The numbers really do say you have four or five times the likelihood of getting a better-paying job.

I believe you kind of play in the sandbox, a very serious sandbox, but I just feel the things that come along can't define your life. The people who just get

overwhelmingly depressed, crushed, or whatever, well, you know, in some ways I don't think you can allow what is happening there to define you. We've always been in certain places. Sometimes it feels like a crushing defeat, though I'm not sure. Again, that's why I say I see it as a sandbox. That's what I always kind of told my trainees. It's one you play in seriously, but you have a lot of other things that define your life, from your friends, your family, your health, etc. Take your job really seriously, whatever you choose to do, but don't let it be life-defining. You then become too susceptible to whatever the vagaries of that position or that work is.

Williams: What about focusing almost exclusively on academia as your future? Do you suggest that students should look beyond that now?

Burakoff: Well, I think they can. I think academics, you know, is going to be a more limited opportunity in the future. I was fortunate in 1989 and '90 to be one of the founding scientists at a company called Vertex, which has done phenomenally well now, especially once I got off the board, unfortunately. And it was, like, one of the first rational drug discoverer. I wasn't a founder, so I'm still working. But the talent that were—and this was to discover drugs. It was called rational drug design. You get the structure. Once you had the structure, you could try to see what would fit into the pocket that drove that kinase or whatever. These guys were unbelievably smart. There are unbelievably smart people in and outside of academics, with as much passion, and so I think there are lots of interesting alternatives.

There's a great story. There's a great delicatessen in New York called Russ & Daughters, and it's been in the family for years, and I believe the son wrote a biography not too long ago. His father was pleased he went off to medical school, and then one summer he worked in the deli and he said, "I love working in this deli much more than medicine." He now runs Russ & Daughters, which is one of the great delis in New York. So, you know, we have restrictions. You've got to put food on the table, etc., but there are a lot of paths.

Williams: How have you mixed career and family over time?

Burakoff: I've done it by having an incredibly supportive wife. [laughs] She's really been understanding because I spend a lot of time at the lab. We have one daughter, and I would say what I've also, though, been cognizant of, she's trained in archaeology up at Harvard, where she or we should live. My mantra now is when I get offers elsewhere, I point out, I say, "My wife says we can live anywhere in the country as long as it's New York City or Boston." I looked at a big job at the [Fred] Hutchinson Cancer Center years ago, and I got kind of the "This is the most important decision of your life." I kind of jokingly say I was going to be going to Seattle with Mother Teresa. So I'm cognizant of how that would work. We now spend much more time together. Our daughter, after leaving Boston

because of me, now is doing a fellowship in New York. So I've had a very supportive family.

Williams: Michele [Hogan] had told me about the time when you turned down coming to NIH because you wanted to have time to drive your daughter to and from school.

Burakoff: To be honest, I think it was Penn, but I don't remember where it was. So what was wonderful—it is true, I traveled a lot. But it turned out my daughter went to a private school in the Harvard Medical School complex. She was angry at me. I kind of made her go. It was a school for only young girls. And I was always cognizant of how tough it was for women in science, not that she should decide to go into science. But because it was in the Longwood area, when I was in town we would drive in together, listen to Monty Python. [laughs] We knew all the Monty Python songs, and that was really terrific. When I was home and I didn't travel that much, but I probably traveled too much, our daughter's a—I mean she's fortunate she has a doting mother and a father who she knew cared, even if I was in the lab or in God knows where sometimes. But it was true, driving her to school, it's memorable for both of us. We could still sing you some of the Monty Python songs. [laughs] Or tell you the story about the dead parrot if you're interested. [laughs]

Williams: I don't think we have quite the time. [laughs] Over the years, what have you done for fun? What kind of recreational pursuits?

Burakoff: Well, I actually like to play tennis, but I've got to keep my day job. [laughs] But we do a lot of traveling and we try to do it relatively exotically. I think my wife wants to be sure that people can't get to me. So we actually came back about a month ago from a trip through Cambodia and Saigon, met up with our daughter there, went on a trip on the Mekong Delta. The year before, we were in Myanmar. I think the year before that we took a safari in Tanzania. The year before that, we were in Patagonia and Chile. So that's kind of fun to do.

Now that we're in New York, I think we're out three or four nights a week between plays and the opera and friends, etc. In fact, I think we were out every night for the last three weeks, because I keep on saying, "Well, I have like a good ten or twenty years left. I can't waste a night." [laughs]

My wife says, "I'm exhausted." [laughs]

I love the opera. You wouldn't want me to sing for you. I love off-Broadway. New York is *really* exciting to be in, and I think it all—we were in Boston for twenty-seven years, brought our daughter up there, you know, great early music, a very livable town, and coming to New York fourteen years ago was—I mean, we have a little place up in Connecticut which I have to get to on the weekend because, you know, New York is so—it really never, never stops, so you can get a little overwhelmed by it.

Williams: Did your wife pursue a career as well or—

Burakoff: She worked as an editor in a company when I was in medical school, and then when we went up to Boston, she actually went back and studied first at Brandeis and then at Harvard in archaeology of the Middle East and got to that point where she didn't write her Ph.D. That's when we had our daughter. Actually was writing children's books which were set in the Middle East. And actually in 1978, she spent three months at a dig in Susa, which is on the Iraq-Iranian border. Her parents spoke French, so she speaks French well. This was around New Year's and we had a big New Year's party, partly to celebrate her going off, and she was leaving for three months. I had dinner invitations every night for three months, because no one thought I would survive without her. [laughs] She had to fly into Tehran herself, take a train all the way down to the south of Iran, be on a dig for three months. They didn't worry about her one bit. It was whether I would survive. [laughs]

Williams: You were in New York on 9/11 [2001].

Burakoff: Yes.

Williams: Did that have impact?

Burakoff: Enormous impact. In fact, my wife, when we first came, at NYU they have apartment buildings on Washington Square, and they were renovating one of the apartments, so she was at Washington Square, which is less than a mile, when the two towers came down. And she had to walk up—I was at that point living above what's called the Skirball Institute. They have apartments above that.

I clearly thought about going back to Boston at the time. Where we lived, NYU Medical Center is right next to the Medical Examiner's Office, and I don't know if you remember, but that's where all the body parts were brought. They put up tents, etc. So at NYU at the time, there were always pictures being put up by people who were trying to find their loved ones. It was literally overwhelming, but I would say I was amazed at how supportive everyone was in New York. I was just in awe of how New Yorkers came together around that.

But it was devastating. We lived down on Washington Square, and the smell from the towers persisted for six months after that. I mean, I think New York, like I say, became stronger for it. God forbid that's the way you have to become stronger. People were unbelievably kind to everyone during that time, but it was devastating.

Williams: It interrupted your scientific work, too, or not?

Burakoff: Not a lot, actually, in the end, because really, you know, NYU was at 34th Street. What was happening, what was really sad, is all the physicians and the medical students were all poised—because Bellevue is a big trauma center, which is the city hospital next door where the students go, and none of them could do anything. So people were devastated because they couldn't do anything because there were so few people who survived in any way. And, as I say, Lower Manhattan was devastated for a long time. Not to say that everybody wasn't affected emotionally, but, you know, it had a limited impact.

I mean, I was gone—[Hurricane] Sandy had a huge impact. That was the hurricane that hit New York City that basically flooded NYU at the time [October 29, 2012]. At that point, I was up at Mount Sinai. But, I mean, New Yorkers are really quite amazing.

Williams: Anything we haven't covered that we should be covering in this historical record?

Burakoff: [laughs] I don't know. I mean, again, I'll end by saying I think having a career in science, mine has been a slightly different one. I think it's really fortunate for those of us who have the opportunity. I think, I hope, our government catches on at some point but, you know, we all have that mantra. I think AAI is wonderful, and I've been a pretty lucky person.

Williams: Thank you very much.

Burakoff: You're welcome. Thank you.

[End of interview]