The American Association of Immunologists
Oral History Project

Transcript

Richard A. Goldsby, Ph.D.
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Interview conducted by
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Williams: This is an interview with Dr. Richard A. Goldsby for the American Association of Immunologists (AAI) Oral History Project. Dr. Goldsby is the Thomas B. Walton Jr. Memorial Professor of Biology Emeritus at Amherst College. In 2003 he delivered the inaugural AAI Vanguard Lecture. We are at IMMUNOLOGY 2017™ in Washington, D.C. Today is Saturday, May 13th [2017], and I'm Brien Williams.

Dr. Goldsby, let's start with a little bit of your family background, where you come from, and maybe some of your grandparents and so forth.

Goldsby: Okay. I was born in Kansas City, Missouri, and grew up there. I was there until eighteen years of age when I went off to college. My parents both had—they're kind of immigrants, if you will. They had come up to Kansas City from Arkansas. My father, I guess, originally coming from the Louisiana-Alabama border. They, frankly, came up for a variety of reasons, but really seeking a different and better life from the one they had and respite from conditions that existed in that part of the country at that time. They were fortunate immigrants in that they brought a little education with them, and my father had gotten involved in selling insurance, and that was going well for him. My mother had taught school, and then she retired to become a homemaker when we came to Kansas City. Life was really very nice and very good.

My father, inconveniently, died of an immunologically related disease when I was five years old, he died of asthma, and my mother raised my brother and myself and put both of us through college, something for which we're both incredibly grateful to her for doing.

I went to public schools in Kansas City, and at that time schools were segregated, and it turned out that the irony is for me and for many of my colleagues coming along and who went to Lincoln High School, that turned out to be a surprising advantage as opposed to the disadvantage one might think, reason being that because schools were segregated in Kansas City, even at the college level, the junior college had to be all black and it had a black faculty, and to save money, the Kansas City Public School System, bless their hearts, hired some faculty who were capable of teaching college courses and also had those teachers teach in high school. So the fellow I took English from had a master's degree from Harvard [University], the guy I took math from had a master's degree from Tufts, and the fellow I took psychology from—I first heard about the mind-body problem as a junior at Lincoln High School in Kansas City—he had a Ph.D. from University of Indiana.

So when I went off to college my first year at Kansas University (KU), I was kind of surprised that so many of my classmates hadn't been exposed to some of the things I'd been exposed to. Of course, those Kansas farm boys were very smart and very hardworking, and by the time we were sophomores and juniors there, they had caught up and had passed me by. [laughs]

So I had had a very pleasant time growing up in Kansas City. I had good schooling there and at Kansas University, where I was an undergraduate. That was a place that had benefitted again from immigrants. We had a number of faculty members at KU who had come to the Midwest from New York and many places on the East Coast to escape anti-Semitism. We had a superb chemistry department full of professors who took a great interest in many students, and myself included, and I had become enamored with chemistry before I got to college, but there in college people like Arthur Davidson and Jacob Kleinberg and many others. These people were very inspirational and extremely helpful to me. Kansas University was a much, much better university, unfortunately because of the misfortune that some of those individuals who were on this faculty had experienced on the East Coast at that time. I'm glad to have lived long enough to see a situation where there have been black mayors in Kansas City. Anti-Semitism overtly is a memory as opposed to a reality in places like New York and that sort of thing.

Williams: Was University of Kansas integrated at the time then?

Goldsby: The University of Kansas was integrated, but I was basically recruited to KU as a result of winning a small prize in a science fair, to integrate their scholarship hall system. They had a system where they would take in students, and you got a great break on your tuition and some other expenses taken care of, and these were, by and large, students who had some economic disadvantage, and they were all white. I had some very, very smart classmates from there who have done very well and gone on. They decided that they would put some black students in, and I guess I was the first black student to go into the scholarship halls there at KU, and I still have many friends from that time, and it was an extraordinary experience. It was very much like being in a fraternity without the paddling. So I liked it a great deal.

Williams: So that was, on the whole, a positive experience?

Goldsby: It was a very positive experience, yes, very positive experience. I have trouble dredging up negative experiences from the time there.

Williams: You were easy at making the adjustment of being in what sounds like an all-white environment?

Goldsby: It was, but I guess I would not say it was—it was easy to make the adjustment, because I didn't have the perception of going into a hostile environment, just as largely growing up in Kansas City in the part I grew up in, across the alley from me, white people lived, and there were interactions across that space. And in the high schools in Kansas City, they anticipated integration coming, so there were a number of inter-high school programs designed to have the groups interact with each other.

At my church, Paseo Baptist, my pastor, the Reverend Doctor [Daniel A.] Holmes, once a year he would go out and he would take the pulpit at a Jewish synagogue, and Rabbi [Samuel S.] Meyerberg would come and take the pulpit at Paseo Baptist. So Kansas City, at the time I grew up, the part I grew up was not a hostile place, so it was not a place where I felt a great deal of hostility.

I think I was openly called "nigger" for the first time when I was a dining car waiter in Salt Lake City, Utah. I went out during the summers and worked on the dining car, wonderful Union Pacific scholarship. I could almost make my expenses during the summer from the tips I made as a dining car waiter. Someone gratuitously hurled us off the back of a truck, and more than being hurt, I guess I was surprised, because it was outside my experience, which I want to emphasize I don't think is typical for many black people who grew up in my time. I just happened to be very, very lucky.

Williams: So tell me about this early onslaught of affinity for chemistry.

Goldsby: Well, I wanted to be a physicist, but I wasn't smart enough to be a physicist, so I went into something easier like chemistry, and my uncle in Chicago had sent me money I could use to buy chemicals. I had a little laboratory in my basement in Kansas City where I struggled to make explosives. I wasn't a very good synthetic chemist, and fortunately, the explosives didn't work very well, so I wasn't able to burn the house down, but I found it fascinating.

The Kansas City Public Library was also a very welcoming place, and they were delighted to see a person come in who wanted to learn some chemistry on their own, and they would give me books and so forth. Eventually, I got hold of the textbook for the first year of chemistry at Kansas University, so when I went to KU, I had been through a significant amount of the textbook.

It's still a fascinating subject. Unfortunately, it can't compare with immunology for being interesting, at least as far as I go. But immunology is a rather imperialistic subject, and it kind of subsumes some areas of synthetic chemistry and physical chemistry and so forth, so you can still think a little like a chemist from time to time and be doing respectable immunology.

Williams: So you felt like you got a good grounding in chemistry at Kansas?

Goldsby: I got a good grounding in chemistry at Kansas, yes, and also as a graduate student, I went to graduate school at the University of California at Berkeley, and at that time, no offense to Harvard and some other places like University of Illinois, I'm sure that Berkeley had the best chemistry department in the world. It certainly had more Nobel laureates in chemistry and physics, aggregated, than any other place had. I worked for a man named Melvin Calvin, who won a Nobel Prize for uncovering the path of carbon in photosynthesis, and Melvin was a wonderful

advisor. He had a small, intimate group of sixty. [laughs] Ten of those were graduate students, and he had a peculiar affinity for graduate students, so he took an interest in us. I was married by that time and had a child and had another on the way, and he realized I needed to make a little extra money, so he got me hired at University of California as an instructor, so I got a very nice little salary that way, as well as a stipend for my research. So it was a very nice place to be. I was in too big a hurry as a graduate student, I think, but I did have a family to support, and I kind of rushed through the place.

Williams: Yeah, I noticed it was, what, you were three years there, I think, at Berkeley?

Goldsby: Almost, yeah.

Williams: What years would that have been?

Goldsby: '59 to '61.

Williams: I'm curious because I arrived there in '62. [laughs]

Goldsby: Oh, you were at Berkeley? I see. [laughs]

Williams: So we both have walked through Sather Gate.

Goldsby: When you arrived, it was a very sedate place, when I left, it was a very sedate place, but then Sather Gate and the uprisings happened a little bit later on.

Williams: Oh, yeah, I lived through that.

Goldsby: You would have been a much livelier environment than I was.

Williams: Yeah, that's right. I felt like in many ways I learned more—

Goldsby: I don't envy you a great deal. [laughs]

Williams: Well, it was an interesting time.

Goldsby: Not with that, anyway.

Williams: Right. Now, you also did—you worked as a chemist at Monsanto. How did that—

Goldsby: After being an undergraduate at Kansas, I went to work for a year at Monsanto, worked for a very talented guy named Bob [Robert] Radue, and it was very nice at Monsanto. Then I went from Monsanto after a year there, I went to graduate school at Berkeley.

Williams: Where were you when you were working at Monsanto?

Goldsby: I was in St. Louis. I was in the organic research division at the Queeny plant.

Williams: What was the private sector like compared with your experiences at Berkeley? What were the differences?

Goldsby: Well, I've worked in the private sector on three different occasions as a scientist: once at Monsanto, once at DuPont, and then when we started our own company seven years ago. Monsanto was a pleasant place to work. I worked for a guy who was just a genius at both human relations and at science. He happened not to be a Ph.D., but he was smarter than many people who had doctorates there, and he was very supportive of me and my career and so forth, and when after a year I up and quit and went off to graduate school, I didn't get snarls, I got smiles and encouragement, and it was really very nice.

DuPont, I worked in central research at DuPont, and working in central research was very much like being in a department in a university. That's a place where some of the basic processes of nitrogen fixation were worked out. Ferredoxin was discovered there. The fellow I worked for, Pete [Peter] Heytler, very bright guy, had discovered a new class of uncouplers for oxidative phosphorylation. It was just a place that crackled scientifically.

The only shortcoming that one had at DuPont was one didn't have much intellectual security in the sense that—and this is odd—at that time DuPont was an extraordinarily rich company and extraordinarily successful, and they had this group of scientists to form an interface between their company and the academic world to a large extent. So they had people working in ones and twos on many different problems right at the forefront of biological research. But as soon as you were working on an area where the academic competition got to be large and very powerful, you were switched to something else where you could do work that would be original and cutting edge, rather than competitive and similar to what was going on outside. So it was very innovative, and it was very much cutting-edge research, but you'd work on something for four or five years, you would get good results, you would open an area up, and then they would suggest that maybe you'd like to take a leave for four or five months or maybe a year at a university and come back and get a fresh start on something new. [laughs] So people got moved around a fair amount but very gently, and it was kind of a velvet glove that you were held, you were gripped by there at DuPont.

Williams: So it didn't interfere with continuity of concept or progress of research?

Goldsby: It interfered with continuing development of an area that one may have had a similar role in opening up, but while one was working and while one was doing very innovative work, there wasn't any interference. One got all the help one needed. One could call in academic consultants. One could go and visit academies. It was a great place to start scientific problems.

Williams: So why did you leave?

Goldsby: I left because I was a little involved in teaching of high school students, enriching their science environment around Wilmington, and a fellow who was a consultant, Arthur Galston, a professor at Yale [University], said, "You need to be in a classroom, you need to be teaching, and I want you to do it at Yale." So they weren't very happy that he did that.

So I went to Yale, which I enjoyed a great deal. I was in the biology department there, had some great colleagues there, enjoyed the environment a great deal. Art [Arthur] Galston was very much like an academic father for me, and I got to know Kingman Brewster[, Jr.], who was president at Yale. Yale was an extraordinary place, Yale is still an extraordinary place, and he was an extraordinary man, visionary person who decided very early on in his career that Yale was going to be a place open to everybody, and so Yale went from having a quota for Jews to a place that became 22 percent Jewish enrollment in the mid-'60s. Yale went to a place that embraced coeducation, and Yale aggressively recruited black students, bringing people like [Henry Louis] "Skip" Gates[, Jr.] in as a student at Yale, and many, many, many others who've gone on to do extraordinarily well.

Williams: What kind of a transition did you make from chemistry to biology?

Goldsby: It was almost an immediate one between working at Monsanto and going to Melvin Calvin's laboratory. Calvin was a polymath. He was a biologist, he was a chemist, he was a physical chemist, he was something of a physicist, and he wasn't bad as a mathematician, and, of course, he worked on photosynthesis, which dropped you right in the midst of biology. Of course, Melvin's approach to biology was very quantitative, was very chemical, and he was one of the creators of the field of using radioisotopes to trace biological reactions, and so when you were in Melvin's lab, you were right at the interface in so many ways of what was most exciting in biological science, and he was a very exciting, kind of mercurial guy. [laughs]

Williams: Kind of a what guy?

Goldsby: Kind of mercurial. You didn't want to make him angry. It was much better to be in Calvin's group that to be outside Calvin's group, because he was not a person who spared his academic and intellectual fire, but he was extraordinarily supportive of people who were in his group, and we all loved him.

Williams: You were teaching and researching, or what was the balance there?

Goldsby: Well, I was a graduate student there, so I was completing a Ph.D., and—

Williams: At Yale?

Goldsby: No, at Berkeley. I thought you were talking about Calvin.

Williams: No, we're at Yale now.

Goldsby: Oh, well, at Yale, I was an assistant professor, so I had a laboratory and worked in the laboratory and had students and taught. I taught Introductory Biology there and I had a lab and grants and graduate students and that sort of thing.

Williams: You were there, I think, six years.

Goldsby: I was there six years and an extra year as a visitor early on in the '60s.

Williams: I don't want us to get into the total details of the scientific development, because that's all part of your publication record, but what was sort of the emphasis of your inquiries in the lab?

Goldsby: When I got started at Yale, I worked on mammalian cell cultures, in particular somatic cell genetics, and there was a problem that was waiting to be solved in that area: the replica plating of mammalian cells. You could replica plate bacterial cultures. You have culture on one plate that's cloned into something interesting. You could readily use the Lederberg technique, replicate it to other plates, and that was very important. But in mammalian cell culture, that turned out to be very difficult to do, and for some questions, some of the questions extant at that time, you really needed that technology. And my laboratory was lucky enough to come up with an approach for doing this, and it involved using complementary matrices. You had an array of 96-volt microplate, and you'd take an array of needles, hypodermic syringes really, that would reach in and take out samples and replicate them to other dishes, and so you could replicate your cultures that way and ask questions.

Interferon research was what I was working on. At that time, we didn't really think of interferon research as immunology. We thought of it as virological research, because the interferons were interesting because they were first discovered as antiviral agents, and here we were working with very powerful cytokines that had profound effects on the immune system, and none of us realized it except a guy named [E. Frederick] Wheelock, who was kind of a voice crying in the wilderness, but most of us were very interested in the effects of interferons on virological activities, and we wanted to isolate clones of cells that were better interferon producers, better for assay systems for making interferon, and so cloning cells for those purposes were of great interest to me.

Williams: During that period, what was the status of immunology at Yale? Was it—

Goldsby: Well, Yale had a distinguished immunologist at that time. Dick [Richard K.] Gershon and I overlapped. I didn't realize we were overlapping, but we did, and

Dick Gershon, of course, was one of the magical minds of immunology. I later learned after I left Yale just how much fun it was to listen to Dick Gershon lecture. He's the person who pointed out—who was one of the major people in bringing to the fore how important it was not just to initiate immune reactions but how important it was to be able to regulate them and particularly to suppress immune responses. This is biological dynamite, so once turned on, you needed some way to contain all of that potential mischief that a runaway immune response could produce. So Dick Gershon came up with the notion of suppression, which he called by a picturesque name, "infectious tolerance" because you could take an animal that was suppressed against a particular antigen, you could then isolate cells from that animal, transfer it to another animal, and that animal now was tolerant, if you will, to that material. These were ideas that had been created by Ray Owen many years ago in cattle. But Dick Gershon made it a question of cellular experimental immunology.

Williams: So your next move was to the University of Maryland here at College Park.

Goldsby: Yes. I'm a person who hasn't been able to keep a job. [laughs] So I went into the chemistry department there, the biochemistry wing, and that turned out to be a great move for me, for reasons I never would have thought, one reason being that I met the woman I married, Barbara Osborne, there, who's a very well-known immunologist. I married, and she wasn't an immunologist at that time. I like to think I got her interested in really fundamental biological research, and she got a job at the NIH [National Institutes of Health] and went into immunology, and the rest is history, as they say.

I also, during the course of my time there, met a graduate student who came into my lab, a fellow named Srikumaran, Subramaniam ["Sri"] Srikumaran. He was a guy from Sri Lanka, Tamil, was trying to escape the communal violence there. He had no interest in science or immunology, he just wanted to live, and if you had told him "Would you want to be a steeplejack?" he would have said yes, as long as it was a safe place to raise his family. "So do you want to be an immunologist?" "Sure!" [laughs] What Sri wanted to do was come here, get his veterinary certificate, and go off and treat cows and so forth. In Sri Lanka, he treated elephants. He couldn't do that, but he thought he would treat cattle and maybe small animals.

But he got captured by immunology, and because he worked as a veterinarian, there were questions about veterinary immunology that at that time were crying out for answers. My lab had started to work in monoclonal antibody technology that I'd learned in the [Leonard A.] Herzenberg laboratory at Stanford [University] during a three-year leave I'd taken there, and so we got together and made the first monoclonal antibodies against bovine antibodies. We derived the first hybrid cells that would secrete monoclonal bovine immunoglobulins. Sri and I were just a great team, and he moved with me to Amherst College when I was

hired again, leaving the University of Maryland and then going to Amherst College.

So when I went to Amherst, Sri came along with me as a postdoc, and we kept the work going at Amherst College. So he's an enormously talented guy, went off to University of Nebraska after he left me, and started his own laboratory and has done some remarkable work himself and has cloned cattle that are resistant to a particular infectious bacterium because they lack a particular receptor. So he's done some very beautiful work, and I feel very privileged to have been associated with him for a number of years.

Williams: So is this the point at which you began to work on large animals?

Goldsby: Yes, the last few years at University of Maryland, I guess the last three years at University of Maryland, and then at Amherst College I worked on cattle for most of the time I was there, off and on in one way and another. Of course, there I was lucky enough to—I was at Amherst College for four years, and then the University of Massachusetts (UMass) just across town wondered if I wouldn't like to come over there and maybe join their department, so I moved across town to UMass. But Amherst College let me continue teaching immunology at Amherst, which I loved doing and continued doing there, but I had my laboratory and graduate students at UMass-Amherst.

At UMass-Amherst where my wife, Barbara Osborne, was also a faculty member, I met a guy named James Robl, and James Robl almost nobody realizes—the people in Scotland will not at all clone sheep. Dolly, everybody knows about Dolly in 1997, and that was quite an accomplishment, the first cloned mammal. The next year at the University of Massachusetts, James Robl created the first cloned cows, and these cows were transgenic. They contained a bacterial gene that was resistant to a particular antibiotic. So Robl had created a year later the first genetically modified mammals, and it gets almost no press at all, even though it was a major accomplishment. The paper was published in an obscure journal called *Science* [laughs], featured article there.

So Jim was wondering what to do with these animals, and I got together with Jim, and I said, "You know, Jim, what people really need are large amounts of human intravenous immunoglobulin." There was a shortage at that time. A cow makes something—has something like 60 liters of blood. You can take 3 or 4 liters of blood from a cow every three weeks, and the cow doesn't mind at all. The needle doesn't even hurt very much. So you could make enormous amounts if only you could design a cow that would make human immunoglobulin instead of making bovine immunoglobulin.

So to make a long story short, my wife, Barbara Osborne, Jim Robl, myself, and James Barton founded a company called Hematech, and our purpose was to clone cows that would make human immunoglobulin. The only problem was we didn't

have any money, and to clone a cow—what would you think it cost to clone a cow? At that time, it cost about $25,000. In order to have a research program to do this, you needed to be able to clone a dozen or two dozen cows a year, at least, and we didn't have—I mean, academic salaries are fine. You don't see many professors standing around in breadlines, but $25,000 a cow and needing maybe twenty or thirty of them a year, we just didn't have that kind of money.

So we went out to try and raise money, couldn't raise a dime, and then my wife, Barbara Osborne, was having beer with Doug Green, a very well-known immunologist who's done great work on cell death, and she was bemoaning how nobody would give us any money. Doug said, "Well, you ought to talk to the people who fund our institute," the La Jolla Institute [for Allergy and Immunology] at that time, "Kirin beer. They've been looking to get into a field like this."

To make a long story short, Doug put us in touch with Kirin. Kirin came and met with us in the basement of Amherst College, and they signed a term sheet that gave us a million dollars a year for research. A few years later, we had cloned cattle that appeared in a paper in *Nature Biotechnology*, and we had cloned cattle that would make human immunoglobulin. Then an extraordinarily talented guy from Kirin joined us, Yoshi Kimura, who was just an incredible scientist, and he was able to knock out the genes for making bovine immunoglobulin, so we ended up now with cattle that could make human immunoglobulin without making bovine immunoglobulin.

We sold the company in—I guess it was 2005, and they don't tell former owners a great deal about what's going on. [laughs] But it was really quite an adventure, and our real secret was that, of course, Jim Robl had created these remarkable animals. He's an incredibly gifted reproductive biologist and genetic engineer, if you will. Our CEO was a guy named Jim Barton, who had been a corporate lawyer. So instead of having a bunch of ignorant scientists, people very ignorant about business running things, Jim Barton ran things. He really understood the corporate world, how things were done. He was an extremely skillful negotiator, and Jim was able to negotiate the kind of research funds we needed.

At one time we had over 100 cattle at Hematech, which was located out in Sioux Falls, South Dakota, and then when time came to sell the company, Jim was able to negotiate a very nice sale. [laughs] So I've been very lucky to just happen to fall in with the right people, to happen to find myself working at the right places, and, in general, in an overall sense, to be treated pretty well by most of the people I've come in contact with.

Williams: So at Hematech, you did produce a product that got into the human bloodstream or not?

Goldsby: When we owned Hematech, we didn't get to a point of having a product. We got to a point of demonstrating a very important part of the technology such that Kirin bought the company out. They bought the company from us. To my knowledge, there have not been large-scale trials of the human immunoglobulin produced in the Hematech cows at this point, and we would love to see such trials done, but for various reasons they haven't been done. So that, again, brought home to me the difference between developing a technology and developing a product, they are two very, very different things, and I hope that someday that that actually does happen.

Williams: What's the payoff in terms of developing the technology versus the product?

Goldsby: Well, the payoff in terms of developing the technology is you show your investors and you show the world it can be done, and that does two things. First, in a perfect world, your investors proceed to put more money in and develop it into an actual therapy that we use for patients. So any good products that you have inevitably stimulate competition, so it gets other people involved, and eventually you get a variety of different products, and I think they get better because you're trying to do something better, cheaper, faster than someone else is doing it. So that hasn't happened with the human immunoglobulin producing cattle yet. We're hoping it does. Some of this is probably a consequence of—after Kirin bought the company from us they had it for a few years, and then they subsequently have sold it off to someone else.

Something I do want to mention that I haven't mentioned, and that is my wife got her Ph.D. from Leonard ["Len"] Herzenberg at Stanford, and she was there at an extraordinary time in that laboratory. It was at the time when they were developing the cell sorter. You talked about the difference in developing a technology and developing a product. The Herzenberg laboratory developed the cell sorter as a concept first, as a research instrument, and then they linked up with BD [Becton Dickinson] and developed that into a product that's widely used, and now there are other companies that make flow cytometers and that give them a great deal of competition, which makes everybody's flow cytometers much better.

It was in Len's lab that I was converted from a person who was interested in biochemistry and interferon and so forth, into a person who had an interest in immunology. I went out to California for a one-year sabbatical and stayed out there three years, taught for a while at Stanford University—that was a real pleasure—in their human biology department, and got sucked into immunology, an absolutely for me, at that time, bewildering field. They had all these names. Nothing was called by their right name. Instead of a gene being called an allele, it was called an allotype or something like that. But once you learned the language, it's a lot like learning French, you can get into that fabulous literature and a whole world opens up for you. That's the story in immunology, and it was just magical

and remarkable, and it's just never let me go. That's something I have stayed with for all these years. [laughs]

Williams: Did you take that sabbatical while you were at Amherst or while you were—

Goldsby: I took it while I was at the University of Maryland, and then came back to the University of Maryland and then subsequently moved from the University of Maryland to Amherst.

Williams: I'm curious to know what the allure was for Amherst for you.

Goldsby: Well, the allure for Amherst was a peculiar one. It was kind of a dare, if I'm going to be very frank about it. Ted [Theodore L.] Cross, a financier in New York City, said to his alma mater, he said, "You know, you have this faculty, and it's a faculty that's not integrated in the sciences at all. You have no minorities in the sciences at all, you have almost no women, and you have no minorities at all."

They said, "There aren't any who are trained or able to compete and to teach the way we teach here at Amherst College. We'd love to find some."

So Ted said, "If you can find one, I will give you a million dollars to set up that position, and I'll give you another million dollars to fund whatever you want to fund there."

Well, the Amherst College is a very well-run institution, and those cold-roast Yankees who run the place, that was too tempting a proposition for them, so they set out. About a third of the way into the search, they were bemoaning the fact there weren't any there, and so I looked around at my lab at the University of Maryland, Sri and I had published in *Science* on the bovine work, and I said, "Hey, down here." [laughs] And I've been at Amherst off and on for the past thirty-two years. I'll teach immunology there next semester, and I had a wonderful time at Amherst College. I strayed to University of Massachusetts for four years from there but then went back to Amherst College and have maintained as association with the University of Massachusetts there.

So I guess it was sort of the feeling that there weren't black scientists out there who could do this, I know that there are, and I think that that's a problem that was not very well appreciated the thirty-six or so years ago when I joined Amherst College, and it's one that they're very aware of. Now they're aware that there are blacks out there, and many other minority groups out there, Native Americans, Mexican Americans, many others who can do it. They've become aware that there are very able women who can tenant their faculties and so forth. When you bring this notion up to students today, they're a little puzzled, because they are so much more sophisticated and so much more accepting on these issues than we were many, many years ago. So Amherst College, like so many places now, knows

much better how to look for people, and when they find people of any stripe, they are eager to hire them and give them a chance.

Williams: Were your responsibilities at Amherst mainly teaching or—

Goldsby: No, my responsibilities at Amherst were like any Amherst professor. At Amherst you're expected to do research and it's expected to be research that's competitive; that is to say, you're expected to bring in grants from the NIH, the NSF [National Science Foundation]. You won't get tenure at Amherst College if you can't bring in national funding. You're expected to publish in peer-reviewed journals. You're expected to serve on committees. I wasn't very good at doing that. You're expected to teach. I *loved* teaching at Amherst College, and you get to know the students very well and they get to know you very well, and you get to be friends with them, and years later they're bringing their children back to campus to meet you and so forth. [laughs]

So I had a lab at Amherst College the whole time I was there, and because I had a connection with University of Massachusetts, I was also able to train graduate students, so I always had Ph.D. students in my lab, and I think they added something to the environment at Amherst College. Amherst is a strictly four-year liberal arts, a superb—now that I'm retired from there, I can say that—a superb four-year liberal arts institution, and it doesn't have a graduate program. But there are a number of faculty members at Amherst College who do have graduate students. I had colleagues at biology who had graduate students, or colleagues in chemistry who have graduate students. I think there's someone in physics who has graduate students. So it's that kind of very open, very supportive place.

Williams: But those graduate students are actually students at UMass?

Goldsby: They're at UMass. Yeah, they're there in the UMass graduate program, right.

Williams: So just briefly, where did your research take you over those years at Amherst?

Goldsby: Well, I did a lot of work in cattle during those years, and the last few years I was there, I had a number of very talented and able graduate students, but I'll just mention one that was from—I've had a number of foreign students, and some of the foreign students I've had, their families came as immigrants but they're native born here in the United States. I've had a student from Korea who's just extraordinary, father was a North Korean who married a South Korean and came here, raised a family of four kids, all of whom got degrees in engineering or science or medicine, just incredible story.

I had an Ethiopian graduate student [Mulualem E. "Mulu" Tilahun] who finished a Ph.D. with me, and he did a beautiful job of making a set of neutralizing monoclonal antibodies against a toxin that's produced by staphylococcal bacteria, and Mulu's program was not just to make a single antibody that would interact

with the toxin and keep it from developing a kind of condition called toxic shock syndrome that we still see clinically now. What Mulu did was to make a set of monoclonal antibodies that interacted with different parts of the site to which the toxin binds to T cells. It acts as a superantigen for T cells. By doing that, he made monoclonals into a tailored set, a tailored polyclonal antibody, if you will, for neutralizing this particular bacterial toxin, and we got a nice publication or two out of it.

Then he went on to develop human equivalents of those mouse antibodies that he had made and showed that they could prevent this toxic shock syndrome in mice. So we had a very good collaborator at Mayo Clinic, [Govindarajan] Rajagopalan, who had very nice mice that were transgenic mice that were ideal for doing this work, and we got some nice papers out of that work. So I guess if there is a theme to interacting with students, they come in all sizes, shapes, and from all kinds of places, and you get to know them very well, both as undergraduates and as graduate students.

Williams: The main part of your collaboration with your wife was Hematech, or have you done other work with her?

Goldsby: Well, my wife was the person who introduced me to Len Herzenberg at Stanford, and that got me involved in immunology and immunological projects. At Hematech, my wife was a cofounder, along with the other three of us, and she was a colleague of James Robl, and Barbara was actually—she was a molecular immunologist. So I was the hybridoma guy, Jim was the guy who could clone animals, Jim Barton was the lawyer guy, and Barbara was the molecular biologist who actually understood at the molecular level what was going on.

Williams: I was also intrigued with your work with Mary Catherine Bateson. Talk a little about that.

Goldsby: [laughs] This is not exactly immunology right now.

Williams: No, I know.

Goldsby: Mary Catherine Bateson hired me at Amherst College. She was my dean. Mary Catherine Bateson has one of the more extraordinary minds you will encounter. Her father, Gregory Bateson, was a very well-known ecologist and very well known in psychoanalytic circles, and whatever he touched, it just turned into intellectual gold. His father [William Bateson] is the man who coined the term "genetics." Mary Catherine's mother was Margaret Mead, and people know who Margaret Mead was. Catherine has worked in many different areas, including child psychology. She's done some very interesting experiments at MIT on early childhood intellectual development. During a time when they were only two, three, four, five, six months old, Catherine did some very fascinating work in that area, and she's a gifted writer.

We both got interested in the AIDS problem because we both had friends who had gotten swept into this terrible epidemic, and we both realized that people had a lot of prejudices about AIDS. There was a great deal of ignorance, and so we thought it might be a good idea to put a book together where you had someone who was a scientist and someone who was both inside and outside the science with a larger view writing, and so we wrote this book, *Thinking AIDS*. That was one of the more exciting intellectual adventures of my life. Mary Catherine and I got to be very good friends, and we're, in fact, working on another book now. We're working on a book on race, which is going to be a book on the biology and culture of race as a concept. It's not a polemic. It's kind of exploring the different way people look at race, what the many things it isn't, and some of the surprising things it is. We're just in the midst of that book right now.

Williams: So that brings us, I think, to your association with the AAI.

Goldsby: Yes.

Williams: Did you just become a member in '95?

Goldsby: I became a card-carrying member in '95. [laughs] But I've been guilty by association since 1976 when I met Len Herzenberg and I started doing some work with Len. So I've been in one way or another connected with the AAI for a very long time.

Williams: Then you joined the Minority Affairs Committee.

Goldsby: Yes.

Williams: How did that come about?

Goldsby: I think it came about very organically. You don't get involved in immunology without hearing about the Minority Affairs Committee, and you get in and you get involved in what's going on. I think the same thing is true of the Minority Affairs Committee and the Society for Cell Biology. They also have a very active committee that does some very good work.

Williams: So what were the accomplishments of the committee while you were on it?

Goldsby: I think it would be very good to interview someone else to give a really in-depth perspective on the committee's history and its accomplishments. What I saw the committee do is the committee acted very, very much as an advisory committee for minority students who were interested in immunology, interested in careers in immunology. It was very supportive, faculty members particularly at the junior level who were starting their careers.

One of the lessons that the Minority Affairs Committee tried very hard to get across to young students coming in that faculty members were developing is the importance of developing mentors, and sometimes they would turn to some of us as mentors and sometimes they would turn to people who didn't look like us as mentors, and we would point out to them that our experiences can inform you in ways that are very important. You can see us. You can see something about the kind of lives we have had. But in many cases we were mentored by people who didn't necessarily look like us, and that's a lesson you probably are learning or will have to learn, too, that the most important thing is to become the very best scientist you can become, to communicate widely with many different kinds of people, that when you encounter reverses, don't give up, go at it a different way. Develop allies and come with friends the next time. Often that can be a way around a difficult problem or around some kind of inappropriate barriers that people may be trying to put in your way.

Williams: What was the message you incorporated into the guest lecture that you gave to the AAI?

Goldsby: That was a talk about making transgenic cows that made human immunoglobulin. So what they let me do was tell the story of how that came about, how they were developed, and what the accomplishments were. It was a great pleasure to do that, privilege to do that.

Williams: I was a little surprised that your topic was so scientific rather than speaking to matters of race and minorities and so forth.

Goldsby: A central idea of the Minority Affairs Committee is that when we have our lecturers, that these people would be lecturers on science, and one of the things we wanted the Minority Affairs Committee lecturer to do was it was kind of a demonstration. Frankly, at the time that this lectures series was created, such a demonstration was necessary. I think that now it's much less necessary to demonstrate that members of underrepresented minority groups can do science too. I think that the increases in the numbers of individuals from many—well, the underrepresentation is beginning to be less so, and the acceptance of the fact that given adequate training, given appropriate opportunities, given appropriate periods to develop, that people are people, and some of them can do remarkable things, and they are not color or ethnically coded. I think that's the lesson that people pretty well consider here. But I think the Minority Affairs Committee felt that the best way to convince people of something like that is not to sit them down in a seminar and put up charts claiming that's the case; it's to let them experience it, let them see it themselves.

Williams: So how do you characterize the fact that there are so many young African Americans who are not thinking about a scientific career?

Goldsby: [laughs] That's an interesting question, and you'll get a very different answer depending on how old the people are that you ask. If you ask younger people, they will say, "Yeah, a lot of us are not making the choice to go into science. It's just not maybe the first thing we think about." If you ask someone my age who grew up hearing about George Washington Carver and Percy Julian and so forth, gee, we had heard about black chemists and so forth, and I must have just in my high school within my year of graduation and a year before and maybe a couple years after, I have a colleague who's been chair of chemistry at University of Iowa, black person. I have a person who's been chair of chemistry at a university in Virginia—I don't mean University of Virginia, but a university in Virginia, black person. I have another colleague who's been a professor of chemistry. That's just within a three- or four-year period.

Chemistry was something we thought about, something we majored in in college, something we did. When I came along, if you looked at doctorates given to blacks, the three fields were, in this order, I believe, history, chemistry, and education, in that order. The order's changed a bit over the past forty years or so. So it's something we thought about a lot because we saw a number of other black people doing it, we talked among ourselves about it, we had role models who did it. Somehow that slipped out of the consciousness not only of the larger society but of our group, and I hope it's beginning to come back in again.

Williams: Are you aware of how science is being taught at the historically black colleges around the country?

Goldsby: I have visited Morehouse College, I have visited Spelman College, and I've seen how science is taught there, and it's taught very well. I've spoken to a group at Morehouse College and also at Spelman, and it's a good deal like talking to my students at Amherst College. You're always refreshed and surprised by how quickly these smart young kids can get some rather profound ideas in immunology and how they can demonstrate this understanding by the kind of questions or the kind of comments they make or sometimes even by the kind of suggestions they make.

So those are institutions that I believe have the resources to recruit, and it's difficult to retain, but they've been somewhat successful in retaining the kind of faculty that can teach the very able students they get. At the time I came along, back during the 1950s, the most able blacks in the country were in historically black colleges. Howard University here in town was a mecca of black intellectuals. Percy L. Julian taught chemistry at Fisk University. People used to talk about he was a brilliant arrogant individual, and he would teach chemistry at Fisk twirling his Phi Beta Kappa key. [laughter] So these were meccas, these were concentrations of intellectual talent. John Hope Franklin was at Howard University. James Nabrit[, Jr.], who taught Thurgood Marshall, was at Howard University. So these were places that sequestered enormous amounts of very

impressive black talent. Thank God they don't have a lock on it now. There'd be far too many.

When I turn on my television set or pick up a newspaper now, the thing I'm so happy to see is the banality of black talent. There's so many black talking heads now talking about foreign affairs, talking about national affairs. One's even been President, one's been Attorney General, and they're not just figureheads. These were obviously people who could do it very, very well. They compare extremely well with some of the occupants that we've had in the office. So I just feel delighted to have lived long enough to see this notice of what those of us who grew up in a segregated black society where we saw these people all the time, interacted with, were taught by, were intimidated by their brilliance, where this was not unusual, but these were people we saw.

Williams: Looking back over your life's career, would you do it again the same way?

Goldsby: Oh, if I were lucky enough to have the privilege to do it again, I would do it again, yes. If a genie came and said, "I'll let you do it all over again, but you have to take your chances," I'd turn it down. I'd turn it down because I've had such a fortunate life. Some of it's been my doing, but so much of it has been that I happened to have met the right people, many of whom have been enormously helpful, enormously supportive, many of whom have looked like me, many of whom haven't looked at all like me. [laughs] The only thing I've had in common is that they cared about science and they cared about me.

Williams: Do you encourage young people to pursue a scientific career?

Goldsby: Yes, I do, and I sometimes ask myself after I encourage them, "Now, why did you do that, Goldsby?" Because when I came along, it was so much easier. You turned in a good grant application to the NIH—and a good grant application was finishing in the top 30, 35 percent—you got funded. Today you turn in an application, finishing in the first 20 percent, you're likely not to get funded. I've even known people who have finished in the first 10 percent who have been said, "We hope we can get to you." It's just gotten to be too hard.

When we advertise for a faculty member at Amherst College, we will get over 150 applications. This is a small liberal arts college. Then when we winnow those applications down to what we consider to be somewhat arbitrarily the top forty or fifty, these are very, very able people. When we cut it back to the first ten, look, we could throw the applications down a step, and we could hire any of those people and we'd be just fine. We tell ourselves we are picking the best person. It's a joke. It's a joke.

So when I came along, I think you had a much better chance of getting that first job, you had a much better chance of getting and maintaining your grants and so forth than you have now. There's so much competition, resources simply aren't

enough, and it's a tragedy, because what the United States is doing—and we're the best in the world—what the United States is doing is squandering, squandering what makes—and let me take it out of a national perspective. The only reason we can have the civilization we have is because of science and engineering. Take away science and engineering, you have to bring back slavery. You can't get all the things done that have to be done without having some people with their feet on the necks of others. You bring back slavery and serfdom and all those horrible things, everybody gets sick, there's nothing you can do about it, and there's no way to build these tall buildings like the ones you have here in Washington. That's science and engineering. You can't invest enough in an activity like that. It's also probably the most fascinating things human beings do. You can't overinvest in something like that, and we have been underinvesting in science for many, many years now, and now we're about, I believe, to lose our preeminent position to other places in the world because of it, and it's just a shame, really a shame.

I know somebody said it's our fault. It's our fault because if we were better teachers, the larger public would understand, the larger public would be more excited by the possibilities, by how interesting science is. If we were all Neil deGrasse Tysons and got out there the way he does, of course, we can't do that anyway, so that's kind of a hopeless pipedream, but we need more Neil deGrasse Tysons out there getting people *really* excited about basic science and what it does and what it is, how fascinating it is. We need to do a better job. And I think some of our policymakers need to clean some of the wax out of their ears, and the scales need to fall from their eyes.

I'll get off my soapbox now, but you pushed the button. [laughter]

Williams: Well, I think it probably needs to be said. Anything else you want to—any other buttons I haven't pushed but should have?

Goldsby: I've probably said enough, probably enough.

Williams: I've been asking everyone this question, so I need to ask you too. Other than your scientific activity, what do you do in the sense of for fun or recreational or the other side of your life?

Goldsby: [laughs] Well, we have a nice place in Maine, and we love to go there. We love traveling. We love running around in Europe, so we like doing that. Then I have to confess this, Barb and I, an idea of real fun for us is to really have time and leisure to open the latest copy of our favorite journal and read a paper or two. That's actually fun. [laughs] We have a lot of company in that. There's so much going on. There's so much exciting stuff happening in science, particularly in an area like immunology, that reading a paper is fun too.

Williams: Great. Thank you very much for this interview

Goldsby: Thank you.

[End of interview]