American Philosophical Society
oral history transcript
Pamela Bjorkman
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Anna Doel:

Today is August 12th, 2023. I'm Anna Doel talking with Pamela Bjorkman online. Pamela, where are you connecting from?

Pamela Bjorkman:

Altadena, California, which is just north of Pasadena, California. I'm a professor at Caltech in Pasadena.

Anna Doel:

Before we start with the questions, do you remember giving another oral history interview—I found one.

Pamela Bjorkman:

To the Pew Scholars, yes. There was a Pew Scholars interview project, and I believe I was interviewed for that. It would've been in the early 1990s.

Anna Doel:

Would it be okay if we revisited this interview at some point today?

Pamela Bjorkman:

Sure.

Anna Doel:

Could you tell me a little bit about your childhood? When were you born?

Pamela Bjorkman:

1956.

Anna Doel:

Where did you grow up?

Pamela Bjorkman:

Portland, Oregon, or just outside of Portland.

Anna Doel:

Could you tell me a bit about your parents?

Pamela Bjorkman:

My father was one of four children of immigrants from Sweden, who met here in the United States and raised a family. He was very intelligent, but unfortunately never had the chance to go to college, and he became an accountant. Back then, you didn't need to be a CPA to become an accountant. So, he was an accountant at a tractor company in Portland, Oregon his whole working life, except for when he was called up to the military for World War II and the Korean War. He was in the Air Force in both of those cases.

He met my mother when he had been recalled for the Korean War, and she was from Newfoundland. It's a province of Canada now, but back then it wasn't a part of Canada. It was transitioning from a Dominion in the commonwealth of Britain, and she was on the Canadian side, I think, even though she wasn't Canadian. Anyway, she was on an airbase in Labrador, which is now part of the Newfoundland province, and she met my father there when he was stationed there. And then she moved to Portland, Oregon when they got married and after that she was what you'd call a housewife.

Anna Doel:

What kind of household did you grow up in?

Pamela Bjorkman:

Well, I had an older brother three years older than me. And I'm not sure. What do you mean by what kind of household? It was a middle-class household. They bought the house in 1960. It was in an area that was just being built up, so it was all farmland, but then they gradually started putting more and more houses in there. When we first moved there, we were just in a sea of farmland and then houses built up. Eventually, there was a grade school nearby, so it was living the American dream for both of them, I think.

Anna Doel:

Before you started school, what do you remember about your childhood?

Pamela Bjorkman:

I remember things here and there. My first memory is that my mother took my brother to some baseball practice. I was two years old, and I was angry that I didn't get to go. My father was supposedly looking after me, but I took my tricycle and rode down to the place where they were practicing because I thought I'd be part of it, which there were probably cars on the street and everything. I just remember being very angry about that, that I wasn't allowed to be part of that. Why can't I participate as a two-year-old in this boys' game? Back then, of course, girls wouldn't have participated anyway, even if I had been the right age. And I also remember I wanted to go to school. When my mother took my brother to first grade, the story is, which I don't remember, that I just sat down and refused to leave the classroom.

Anna Doel:

How old were you when you learnt to read? Do you remember?

Pamela Bjorkman:

At the very beginning of first grade. It was like a night and day difference. Everything changed for me. That was the best thing that ever happened. My parents didn't emphasize intellectual pursuits that much, so they didn't teach me to read early. I was always reading with my kids, so they knew how to read before they went to school. They weren't interested in that, and I got to first grade and suddenly just started reading. I started reading chapter books almost immediately, and it completely changed my life.

Anna Doel:

What kind of books did you enjoy reading as a kid?

Pamela Bjorkman:

The thing that made a huge impression upon me was my mother's brother, my uncle, who still lived in Newfoundland, sent me these books by Lucy Maude Montgomery, the *Anne of Green Gables* series. Back then it was not that easy to buy them in the United States, but every single year I got one from my uncle. The first one I got was *Anne of Green Gables* when I was in first grade, and I read that and it was just like this whole world opened up to me, that I could actually read something that was a story. I just loved it.

Every single year I got one of those. And I also read books I got from my school library, the Thornton Burgess books about different animals in a forest, like Jimmy Skunk. I can't remember their names, but each book was about a particular animal, and it was the story of that animal in the forest, and I loved those books. And when I had my own children, I spent huge amounts of time trying to find them because I wanted to read them to my kids. Eventually I did find them, and somehow, I got paperback versions of all of them. Some of the things I liked the most about having kids were all these books I remembered as a child, I could now share with my own children, so that was really, really fantastic.

Anna Doel:

Did you enjoy school?

Pamela Bjorkman:

Yes, I loved school. I was just some little nerdy kid. I loved it. I don't know why. I had friends and if they said, "What do you want to do?" I'd say, "Let's play school." That's pretty weird, but it was what I wanted to do. I loved all the assignments and everything.

And then speaking of books, the teachers used to read books to us. At lunchtime, I think maybe the teachers would read a chapter book. And there's a couple of them I remember from then, which then became my favorites. I think I was in about fifth grade, so I was probably about 10 when I read Madeleine L'Engle's *A Wrinkle in Time*. Have you heard of it? The heroine in the book is a young girl, and she does all these adventures. But the amazing thing about this was that her mother was a scientist in this book, and her father was something else, I can't remember. Her father's missing, and so she and her younger brother, who's some kind of genius, Charles Wallace, have to go find the father. I've forgotten the plot, really. But the point is that the girl was the one in charge, and she ends up taking along some friend of hers who's a boy. She does all the

math stuff because she's better at math than her friend who's a boy her age, and her mother's a scientist.

And I was enthralled. It had never occurred to me before that that women could have a job, that women could actually be better at science and math than boys. I was totally indoctrinated in this idea that it was fine for you to get an education and you can go to school and you can do well at school, and then you find a husband and smile nicely at cocktail parties. That was the whole idea where I was growing up. It was the suburbs. And my friends' mothers, with only one exception, were stay-at-home moms. They didn't have careers or jobs. This is the sixties, and that's what they were doing. That's what I thought my life would be like.

Anna Doel:

Pamela, you are breaking up a bit. I don't know if it's the proximity to the microphone on your computer, but sometimes I just can't hear you very well.

Pamela Bjorkman:

Sorry, I'm not sure what to do. I haven't moved. Can you hear me?

Anna Doel:

Yes. This is really good. Let's just test the theory. Maybe it's the distance from the microphone. Maybe it's something else. But for a while, see if that helps us. Were there any disciplines, subjects in school that you were more interested than in others?

Pamela Bjorkman:

I'd say English. I was very interested in writing, really. I would write like puppet plays, and then I would make puppets and perform them, and I'd write stories, and I was really interested in some form of writing.

Anna Doel:

Did your parents support any of your interests or help you develop other interests?

Pamela Bjorkman:

They weren't unsupportive. My mother liked the idea that I went to ballet lessons and tap dancing and stuff like that. She was a woman of her time, and that's what you did if you had a little girl. And then my brother did whatever little boys did at the time. But it was very gender oriented. I got the girls' toys. My brother got the boys' toys, and we played together a lot. I certainly played with his toys, and I don't remember, maybe he played with mine. But I was very much indoctrinated in the sense that little girls play with dolls and they grow up and find a good husband and get married and have children.

Anna Doel:

Did you go on family vacations? Did you ever visit Newfoundland?

Pamela Bjorkman:

Yes, we visited Newfoundland the summer I turned 10 and my brother had turned 13, and we were there for probably the whole summer. And my father couldn't take time off work, so what we did was we took a train from Vancouver, British Columbia to Halifax, Nova Scotia, because my parents didn't have a lot of money. They didn't have a lot of spare money. My father was supporting the whole family, and he had a decent job, but it wasn't a high-power executive job by any means. So, we took the train to save money.

That took a week, and I still remember seeing all the places in Canada from those train cars, the beautiful scenery, just being a kid running around on the train. My mother had relatives across Canada. And we stopped in Montreal, and we stopped in Ottawa. And everywhere we went, she knew people. In Halifax, she didn't have any brothers or sisters there, but we must have known people. I can't remember how we got to Newfoundland. Maybe we took a short plane trip, but then we stayed in Newfoundland for the summer, and it's a small town called Grand Bank, which is at the tip of the Burin Peninsula. Everybody's heard of St. John's, the capital of the province, but this is on another peninsula to the southwest. It was a fishing town.

We went there and stayed the whole time. And it was different from the way I'd been growing up. We had a lot of freedom, even where I was growing up in Oregon, because kids wandered a lot back then. Certainly, with my kids, I wouldn't have let them outside to just walk a mile when they were five years old. But things were different when I was growing up, and kids did that. But here in this small village of 3000 people, I could just do whatever I wanted. And every single person in the town was related to us in some way because they're all very inbred. We stayed with my grandparents, and they totally and utterly spoiled us. It was very much fun staying there.

Anna Doel:

Did your parents expect you to go to college?

Pamela Bjorkman:

Yes. That was always the plan. The reason it was done was that my mother graduated from college with a degree in English, and she was, from what I've heard—and I saw evidence of it—always the best in her class, which would've been a very small class considering. But she always did really well. And then she went to college and got a bachelor's in English, which is interesting again. And then what did she do with that?

She taught school for a while in Bermuda. I don't know how long, but then she worked in a bank for a few years. And then she was on the American Air Base in Labrador. And she met my father, and they got married when she was 26. So that was a little bit old for those days. My father was actually 12 years older than her, and he was very introverted. When I was a teenager, I would meet women who knew him because I was growing up in Portland. He'd grown up in Portland. His high school friends and everything were still in the town. And one summer, my mother went off to Newfoundland, and I stayed at home because I was 16. Of course, a man can't look after himself. The idea was that I had to be the housewife for my father and make meals and everything. And I remember going out, going to various places where these women would come up to me and say, "Oh, your father was so handsome. I tried to get him interested in me, and he just wasn't." I think he was very shy and very reticent, and my mother was extremely outgoing. I think something happened when he finally got married. Anyway, I forgot what the question was. Oh, it was whether was I expected to go to college. Yes, I was expected to go to college, but it

was phrased to me as “you'll meet a nice man there.” That was why I was supposed to go to college. I wasn't supposed to actually try to do anything there. I was supposed to meet a nice man there.

Anna Doel:

Which parent do you take after, your shy father or your outgoing mother?

Pamela Bjorkman:

My father. No question.

Anna Doel:

Did you have friends in school?

Pamela Bjorkman:

Yeah. I always had close friends. That was really important to me. And some of them from high school I'm still in touch with.

Anna Doel:

When it was time to apply to colleges, how did you navigate this whole thing? Did you know which college you would want to go to, or was it your parents' decision?

Pamela Bjorkman:

Well, this is kind of weird. I think you may have read something about this in the Pew interview. What happened was when I was about 16, there was this university called Willamette, which was in Salem, Oregon. It was about an hour from where I was living, and they had some kind of event where they hosted high school students. And I went there. And I just said, "Okay, I'll go there." And my mother, it was really, really, really important to her that I go to a private school. I would've been happy to go to University of Oregon or Oregon State. But no, and I don't mean to sound critical here, but she was very status conscious. In her circles, it was like “my daughter is at this private college, and your kid, God forbid, is at a community college or something.”

I think by the time I was ready to apply to college, I had completely rejected ideas of status and money and stuff like that. I was completely disgusted with materialism in the way that young people have strong ideas. As a high school student, I got this job at a fish and chips restaurant, like some fast food dump, and did really menial labor for a $1.50 an hour. And my mother was very upset about this because she didn't want her daughter doing that, and I was really determined that I was going to have my own source of income. But she wanted me to go to Willamette, and I was fine. And it seemed like a nice place. And I went there for my freshman year.

During that time, I was 18 and I was a freshman, and the level of control over me... I have to say this carefully, but my mother exhibited this enormous level of control over me or tried to for my whole life. And as a person in middle school and high school, I was extremely unhappy with this. My way of getting around it was to have activities from 7:00 AM in the morning until 10 at night, so I was never at home. And I forgot to say that also, I played the violin and was in the

Portland Junior Symphony. And that took up a lot of time. I decided I wasn't going to try to go on in music, so I was going to do something else.

But after being at Willamette for a while, the level of control over me was like, if you don't do this, then we're not paying your tuition. It was all very trivial, but it was like I wasn't dressing properly, I wasn't wearing makeup, I wasn't wearing the right clothes. Anyway, after years of problems I had had, I finally said, "That's it. I'm transferring to University of Oregon," which was $700 a year tuition at that time. Willamette was out of my range to pay for, which it was $4,000 a year, which sounds ridiculous these days because that's nothing. But I could manage the $700 a year myself. I got two jobs the summer after my freshman year, and I filed for independence from my parents, and then I paid for college after that at the University of Oregon.

Anna Doel:

It sounds like your confrontation was with your mother. Where was your father in that situation?

Pamela Bjorkman:

Trying to survive.

Anna Doel:

I see. And how about your brother?

Pamela Bjorkman:

Well, the situation with my brother is very difficult, and it's hard for me to talk about even now.

Anna Doel:

I'm sorry, you don't have to if you don't want to.

Pamela Bjorkman:

No. My brother died of an IV drug overdose when he was 24. He was three years older than me, graduated from high school in 1971. There was still a draft for the Vietnam War in the US and his draft number was 53, which is low. And my father pulled strings to get him into the Air National Guard. He had one year of active duty, which was in Biloxi, Mississippi. One year of active duty and then one weekend a month at the reserves or something.

It's actually the same program that George W. Bush was in, who was five or more years older than my brother. But it was the same thing. But the difference is that George W. Bush just stopped going to the weekend things. My brother went to all of them. He did all of it. He did the active duty and then he came back. And he was even more introverted than my father, and things had been hard for him in school. He apparently had what you'd call ADHD these days. It was just told to me that he was hyperactive. That was what they called it back then. And he took Benzedrine and stuff like that, that people took then, which would be Ritalin or Adderall now. And he was never happy or didn't fit in socially in high school. My mother forced him to wear really awful clothes to high school, which must have made him not fit in.

So, when he went away, he kind of found himself. And when he came back, first he said, "I just want to stay in the military." And my parents said, "No," but I don't know exactly why. I'm not

sure why. They said, "No, you're going to college." And he went to Oregon State for a term, but he just flunked out immediately. Didn't want to do that.

Then he had a series of jobs and lived in various apartments, but sometimes he would move home. And I didn't quite know. We were close in some ways, but I didn't know about the IV drug use. He never said anything about that. But he died in the spring of 1978.

Anna Doel:

Where were you then?

Pamela Bjorkman:

I was in my senior year of college. I was at the University of Oregon.

Anna Doel:

In Eugene?

Pamela Bjorkman:

Yeah. And he had actually tried to commit suicide a few months before, and I had come up to Portland to visit him in the hospital and tried to find out what was going on. Then he came down and stayed with me for a while in Eugene. And I regret to this day that I couldn't understand what was happening. I don't even know if the drug overdose was an accident or not. It might have been.

Anna Doel:

How did his death affect you?

Pamela Bjorkman:

Well, I just immediately went to graduate school.

Anna Doel:

That was your response?

Pamela Bjorkman:

Yeah, I just like, "Hey, I'm going to graduate. I'm going to go to graduate school. I am going to put this aside." It was terrible, and I probably should have tried to deal with it more, and I just didn't. I didn't. I should have. There are all these things I regret, like not reaching out to him and not saying, "Look, don't live in their house. Come down, you can stay with me and what's going on?" All these things.

Anna Doel:

It wouldn't have been easy to say this to your older brother though.

Pamela Bjorkman:

I suppose. I could have though. If I were talking to someone else who was 21 at the time, and I knew about the drugs from the time I was like 19 maybe, or 18, but they weren't heavy, it was marijuana and such, and I wasn't concerned about it.

He got me this job the summer after my freshman year where we were both key punching data entry. It was a real job instead of a fish-and-chips job. For 10 hours a night—the job ran from 5:00 PM until 3:00 AM or something like that, but it was only four days a week—you were entering all this stuff on a keypad. Awful. And the whole time I was there, I realized that this was some people's lives. I was just there for the summer. That was the most horrible job you could imagine. But I was there for the summer, and I can't imagine what it'd be like if that was your job full time. But anyway, I did that at night and then in the daytime, I had a job in the cash room at JC Penney's. Those stores still exist in the U.S., whatever they are. They sell all kinds of things.

Anna Doel:

They're a department store.

Pamela Bjorkman:

Department store. It's kind of like a Sears or something. I was working 60 or 70 hours a week, and I was saving up all this money so then I could pay for college after that.

Anna Doel:

That sounds exhausting.

Pamela Bjorkman:

Yeah, but I didn't want to think. So, I just did stuff. Usually my response is, "I don't want to think." And so, I did all this stuff.

Anna Doel:

At that time, did you know what you wanted to be?

Pamela Bjorkman:

Yes. In high school, after taking chemistry, I took biology as a sophomore, and I didn't like it because it was all memorization. And then I took chemistry as a junior, and I loved it. I don't know why. I just really loved it. It had rules. It made sense to me. I loved it. And then I took physics as a senior, and I liked that also.

So, I decided I wanted to apply chemistry and physics to some kind of human health thing. I wanted to do what you'd call translational research now, but I didn't know what that was. And I told one of my high school teachers that was what I wanted to do, and he said, “Ttry to get a job in a research lab." And he said, "Call around to the various hospitals and see if you can get a job." I tried, but of course nobody was going to hire me.

I really envy it when I look at all these high school kids now who email me and want a job in a lab, and there's a way to do it, but I wasn't connected at all to the scientific community at that point. And I never got to have a job like that.

But after I'd been at the University of Oregon for a while, they had summer research programs, and I could do those. I finally got to do what I wanted to do in high school, and I knew I just wanted to do some kind of science. I don't know why, but it really captivated me. And it had not in high school biology, I really didn't like it, like I said, because we just read something, we memorized it, and we took a test.

Anna Doel:

After you graduated from the University of Oregon, you went straight on to?...

Pamela Bjorkman:

Harvard.

Anna Doel:

A PhD at Harvard. Did you apply to several grad schools or just Harvard?

Pamela Bjorkman:

No, by that time I was working in a research lab at the University of Oregon, it was run by Hayes Griffith, who is retired now, but he was a chemist there. He worked on electron paramagnetic resonance spectroscopy, and he was running the lab jointly with someone named Pat Jost, who was, I think his partner, they weren't married, but Hayes is now married to someone else.

Anyway, he was with Pat, and Pat has died now. She was a female scientist, and she was doing the day-to-day running of the lab, and I said, "I want to do science." And she said, "Okay, you've got to get your calling card, and that's a PhD, so you need to apply to graduate school." And then she said, "Here are the places you should apply." And that's what I did.

Anna Doel:

So, she helped you navigate this a little bit?

Pamela Bjorkman:

Yes. I didn't have an advisor or anything. I don't think things were like that then. In any case, I didn't have anyone helping me, I didn't understand how to do this, and she just explained it to me. You take the GREs, you work in a lab, you write a statement. She was very, very helpful. And doing research in the lab was wonderful.

Anna Doel:

You moved across the entire country to go to Harvard—how did that work out for you?

Pamela Bjorkman:

Well, it was interesting. I was intimidated, usually intimidated. There was a program in which you did rotations, and I did four rotations, and early on there was a lab or a departmental retreat at Woods Hole and I heard Don Wiley talk. I think he got tenure the year I arrived. So, he was a

relatively new professor, and he was talking about doing structural biology to look at influenza hemagglutinin.

It was this idea that I knew what structural biology was, because I'd taken biochemistry and I'd seen X-ray crystallography results, and they were all structures of enzymes at the time, and I had absolutely no interest in enzymes. For some reason, I found them incredibly boring. But the idea that you could solve a structure of a viral protein and learn about influenza, learn about flu and human health and your immune response to it—that was really interesting to me.

So, I went from thinking that I would continue to work on membrane proteins with some biophysical techniques. That was what I went to graduate school to do. I just completely shifted to, "No, I want to do some kind of structural biology."

Anna Doel:

Did you feel supported at Harvard? Did you feel like you belonged?

Pamela Bjorkman:

No. It's different now. And the interesting thing is that I just went to a lab reunion. The lab I was in was a joint lab Steve Harrison and Don Wiley ran at the time, and they did until Don died in 2001, in fact. And Steve organized a lab reunion, and that was in June, two months ago.

I hadn't thought about things that happened there for a long time and hadn't met with people. And we're all in the same place, and we're talking about the way things were, and it's just not the way things are now in graduate school.

When you got to Harvard, you joined a lab, and then you never spoke to any other faculty until you defended your thesis. They didn't have committee meetings; they didn't check up on the students. They didn't have seminar series to make sure that students were on track. You just joined the lab, and you were on your own. And it depended on your advisor. If your advisor was responsible for you and trying to look out after you, then things were fine.

But when I joined Don's lab, there was almost nobody in it. There was Ian Wilson who was a postdoc. He was working on the hemagglutinin structure, and Judy White had just finished her PhD, but by the time I actually joined Don's lab, she was gone. So, it was Ian and a technician, but then it was Steve's lab, so that was the people in Steve's lab.

If you wanted to learn something, you just went to someone else, which I did. And at the time, it was mostly people in Steve's lab. It was a very small enterprise, and I just learned how to do things mostly from other people. There was also the Lipscomb Lab, and it was another structural biology lab. And Doug Reese, who's a professor at Caltech now, was a graduate student in the Lipscomb Lab when I arrived. He was a TA of mine for a class that I took, and he was very helpful.

Then years later, Doug and I were sharing x-ray equipment at Caltech. There wasn't this looking after of students. And I think that Harvard was a bit unique in this because the program I was in, the attitude at least that we perceive of the faculty was like, "Oh, you guys are at Harvard. That's so wonderful. That's all you need. We don't need to mentor you. You will graduate. You're at Harvard, that's great."

Maybe it was just young people a lot, but we were definitely lost. And so, everybody banded together and had [inaudible].

Anna Doel:

It does still sound a little bit solitary, this type of work and existence in general.

Pamela Bjorkman:

No. In some ways, it was an amazing experience because of these friends, I've never had such close friends. So that when we got together again in June, it was almost like time hadn't even passed.

It was really interesting seeing these people again. And they're all, the ones I saw anyway, the ones who went back for the reunion, they're all very successful. But I don't think that, for the most part, things were not easy at that time at all. And people were very unhappy and acted out in various ways, which were immature and childish, I suppose. But funny sometimes.

Anna Doel:

When you were in graduate school and then went on to do postdocs, how much presence and visibility did women have in your field?

Pamela Bjorkman:

That's another story, which is that I was doing X-ray crystallography in the United States at a time when women just didn't do it. But the interesting thing was they did do it in the UK.

There was Rosalyn Franklin, of course, and there was Dorothy Hodgkin. And there was this idea that women could do this. So now you start, I joined Don's lab in the summer of 1979. And there was one, I think Martha Teeter was an example of a female crystallographer, but the people who were in the field, all of them were men. When I would go to meetings, it was always men. And when I would go to my lab, it was all men. And for the first two years I was there, I believe it was all men.

When I wanted to join, I was encouraged to join Don or Steve's lab to do biochemistry, not crystallography. Because the women who'd been in the Harrison-Wiley lab before me had done biochemistry. They had not done structural biology.

Now structural biology is at least half women in the United States, but back then it was just like, "No, you just don't do this." And I wanted to do it. And I said, "No, I want to do this." And it was just weird. Everything was very weird. And I remember when I went to start my postdoc at Mark Davis's lab, and I was now in the immunology community, and I started going to immunology meetings, and it was all kinds of women, and I was just utterly shocked. It was a completely different atmosphere.

Anna Doel:

Did you do two postdocs after Harvard?

Pamela Bjorkman:

No, I did a postdoc at Harvard because I wasn't finished with the HLA structure, so Don let me stay on.

Anna Doel:

And then the Stanford postdoc?

Pamela Bjorkman:

I was supposed to be at Stanford two years earlier than I went, but I just couldn't stop this project. I couldn't give up the HLA structure. And then Don, actually in a very generous way, let me take it with me to Stanford, where I worked on it. And Mark Davis just let me do this too. Instead of really working in Mark Davis's lab where I was supposed to be, the idea was that I would learn molecular biology and make DNA libraries and expression libraries, and learn T-cell biology and everything, and immunology while I was doing all this crystallographic computing instead. Mark was very generous about that.

So, for the first year I was there, I didn't really contribute to his lab. But on the other hand, I talked to people a lot. I found his lab really open and engaging, and people seemed happy, which I thought was remarkable at the time. And I think I brought more of a structural appreciation to this molecular biology/immunology lab. And the ironic thing is, right after the Harrison-Wiley reunion, there was a Mark Davis reunion at Stanford. I went to that one, within the space of one week, I saw the Harvard culture and then the Mark Davis Lab culture. And it was still different.

Obviously, things have changed a lot at Harvard. They don't do this anymore where they just leave their graduate students on their own and never meet with them. They don't have a committee. If I had had a thesis committee and they had discovered that all I did was try to get decent crystals of this protein, they would've said, "No way. You need to switch her to a different project. You can't do this." So, in a way, it was good that I didn't have a thesis committee.

Anna Doel:

How difficult was it to find a job after your Stanford postdoc?

Pamela Bjorkman:

It wasn't difficult at all because when the HLA structure was published in the fall of 1987, I got all kinds of, "Please apply here for a job." And it was overwhelming to me. All I wanted to do was go be a real postdoc. I came to Stanford in the summer of 1986. The paper was published 15 months later. I just wanted to do what I'd gone there to do. I didn't want to apply for a job. It was a very strange situation that most people aren't in.

I'd gone from someone who hadn't published a paper. I don't have a published paper in my thesis, and I couldn't get a postdoc fellowship because I just hadn't done anything according to the powers that be. And all of a sudden, I had these two papers, and then everyone wanted me to apply for jobs.

And the complication was that the person who's now my husband who'd come from Harvard was doing a postdoc at Stanford too. So, we had to look for two jobs. And it was hard in that sense, but we both got these offers at Caltech. So that did work out.

Anna Doel:

How did you meet your husband?

Pamela Bjorkman:

Well, we were in the same graduate class. There were 12 people in our graduate program at that time. I think there were 12 of us, and he was in the same class as me. He joined Mark Ptashne's lab originally working on DNA binding proteins and regulation of gene expression. But then he joined Tom Maniatis lab when Tom moved from Caltech to Harvard, and my husband followed him. We've never worked on similar things. We were all in the same circle of people. And that's how we met. And then we arranged to do a postdoc at Stanford, but he finished earlier than I did. And then I kept staying on at Harvard. So there was a year of opposite coasts. And then finally I moved to Stanford.

Anna Doel:

Could you talk a little bit about your life at Caltech?

Pamela Bjorkman:

Sure. Well, it was extremely strange at first because we arrived as assistant professors in February of 1989. And our son was four months old at the time. And I didn't understand it, but there were hardly any female professors there at Caltech. Out of 250 or so, there were about 15 maybe. I've forgotten the numbers here, but there were so few that I knew every single one of them. And they did not have children. You did not have children if you were a female professor, you just didn't.

Depending on how you want to count this, I was the first female professor at Caltech to have a child. But see, he wasn't born at Caltech, so maybe that doesn't count. Anyway, I quickly became friends with Mary Lidstrom, who was a tenured professor in engineering and applied sciences and a microbiologist. Her first one was born three months after my son. She already had tenure, but she was the only woman that I could talk to about what it was like to have an infant. And our sons became best friends, actually.

And it was just very strange because when Caltech approached me to apply there, which I did, and I applied long before my son was born, or even when he was planned. I had no intention of having children. I'm sure I presented as someone who was not going to go off and have a child because I really had no intention of having a child. And I think to this day that given the way Caltech was at that time and the way certain institutions were, they never would've hired me if they thought I was going to go off and have a child. I can't confirm this, but I think it was just not okay. But by the time they offered me a job and I had accepted it, I became pregnant—and what were they going to do? Even then, it was illegal to just rescind the offer because I was pregnant. And they didn't know.

They had a children's center there, but they didn't tell me about it. So, I didn't put him on the waiting list for the children's center. They didn't send us anything about here's how you take care of your kids, because they didn't have any experience with that. It is totally different now. I'm very pleased to see that of the women we hire now, many have children already or they become pregnant immediately. There are no problems with doing this. There's help with finding childcare, there are lactation rooms, there's all kinds of stuff. Things are really different. But my son is 34, almost 35 now. So going back 34 and a half years, it just wasn't like that.

Anna Doel:

How did you manage having an infant then a toddler and this new job?

Pamela Bjorkman:
I don't remember.

Anna Doel:
Was it a blur?

Pamela Bjorkman:
Yeah. It really was... but the thing that really helped me was that I came there, and I had an office so I could bring my son in. I had a crib there and then later a playpen, and I used to go into the lab and work with him. He was in a backpack. And until he started grabbing things, I could work in the lab do what I wanted because I had an office and because I had funding to have people doing experiments that I was directing. When I look at how do you keep women in science, how do you keep them in academics, there's been studies that show that if you interview men and women at different stages, graduate student, postdoc, beginning a job, and you say, "Do you plan to have children?" And if you're a woman and you say yes, then you're less likely to want to go on in academics.

If you're a man and you say yes, it makes no difference at all. The men just accept that, "Yeah, I'm going to have kids, and of course I'm going to have a job, and what difference does it make?" But the women decide that they can't combine having a family and being an academic scientist. So how do you solve that? You can't change society, but you can give money for women to have offices and pay for the childcare and give them a way that they can bring their child into their workspace when the child is young.

It's just a matter of money because I can't change people's attitudes. But if you could fund that—I've tried over the years to convince people of this, I must say I haven't been very successful, although things have changed a fair amount. But I believe that, for example, Caltech should fund childcare for all their graduate students and their postdocs. Flat out just pay for it, because you can't afford it on their salaries. I know this because for the three or four months that we were postdocs, we were spending two thirds of our combined income to hire someone to come to our house. Two thirds of our entire income. That wasn't sustainable and we couldn't put him in a daycare then because we were moving.

And then when we got to Caltech, the Caltech daycare didn't handle infants at the time. So, we found this other place, and it turned out that they weren't actually there most of the time. They had one person for 10 kids, but you couldn't tell when you dropped the child off. And it was a disaster there. I found out after a few months, and that's another thing I felt guilty about for my whole life, that between the ages of five months and eight months he was in that place, and I didn't know what was going on. There was no provision to help you find a place that was good. And it is all different now. Caltech handles the Caltech daycare center, which, I trust, handles infants, but they didn't back then.

So anyway, I guess I'm saying that things have changed a lot. I think they could change more. And I have tried to advocate to Caltech that they have a targeted fundraiser or whatever. Every once in a while, they have a fundraiser for this aspect of biology or this aspect of LIGO, space or black holes or whatever. So, they do a campaign for that. I think they should have a campaign that's targeted at wealthy, older female donors who understand that maybe they could have been a scientist, had they had the same opportunities that young women have now. And I'll bet they

would fund all kinds of things. They'd fund childcare. And Caltech is so small that they could afford to just pay for everybody. If you're a professor, you can afford it, but as a graduate student, some of the staff or as a postdoc, you can't afford it, and they could offer this. It would make a tremendous difference. We'd get very good people coming to Caltech because of this. They would be attracted to Caltech because of this. Other universities would see this and want to emulate it. I think it would change a lot of things. I have not been successful at advocating for that, which I brought up over 20 years ago. They won't do a campaign like that. Maybe it's illegal now. I don't know. It's probably illegal now to target something for women. I don't know.

Anna Doel:

I have a connected question. Early on in your academic career when you were working in a research lab, was there this 24/7 culture in the lab?

Pamela Bjorkman:

Yes.

Anna Doel:

Is that something you brought into your own lab?

Pamela Bjorkman:

No.

Anna Doel:

Is that something you support?

Pamela Bjorkman:

I couldn't do that because I had an infant. All of a sudden, I was stuck to daycare times. It was this totally bizarre adjustment from my 24/7 lifestyle to all of a sudden I could not be there late at night. It would've been very different if I hadn't had the infant. But from the day I started my lab, people would know that I wasn't going to be there. I was often there with my child after hours or on weekends, but for the most part, that's not possible when you have an infant, that's just not possible. So no, I didn't bring it into my own lab. And now whenever any of my friends who are all, let's say, my age or within five or 10 years older or younger than me, when we get together, we always say, "Well, nobody works very hard anymore. Nobody's there all the time." It's true. It's just not the same. I'm not sure why, but it doesn't seem to be that way.

Anna Doel:

Do you think it affects productivity?

Pamela Bjorkman:

Yeah, sure. But on the other hand, we wasted a lot of time. We were hanging out doing stupid stuff, but that brought a lot of camaraderie and a lot of random science talks where we would have some discussion and somebody would say, "Oh, maybe I could try that." It was just these

chance meetings at midnight in front of the centrifuge or something. When people aren't in the lab as much, that doesn't happen. And with the pandemic, it's just everyone I talk to who runs a lab says things have changed now. People realize they can work from home. A lot of them do. And I just recently talked to my lab about that, "Look, I know some of you can work from home, but what you're missing is the chance meetings and the discussions that turn into ideas, you're missing all that." I'm trying to encourage them to come in more. I don't force them.

Anna Doel:

What's the reaction so far in your lab?

Pamela Bjorkman:

They didn't say anything. I said this at a group meeting a couple of months ago. I think I've seen more people in, but again, I don't stay late anymore, even though I don't have kids at home now. I just don't do that now. Maybe, I am too old or something. I just don't do that, but at least I'm free to stay. As soon as my kids left the house, it was just shocking to me that, all of a sudden, I had all the time in the world it felt like.

Anna Doel:

When you started at Caltech, what was your research focused on?

Pamela Bjorkman:

Well, I had solved the structure of HLA, which was the first time anybody knew what a major histocompatibility complex protein looked like. And the big shock of that structure was that it presents an antigen in the form of a peptide, and that the peptide is buried in this groove. And it was this very beautiful structure that explained a lot of immunology. It didn't have to work out that way, but it did, and I felt extremely lucky, and it was really fun to interpret it. It was like, "Oh, it just makes so much sense." And that was just amazing. So then when I started at Caltech, I knew every bit of that molecule because I'd built it into the electron density map, so I knew all the residues and everything.

And then this paper came out saying that there was an immunoglobulin receptor called the neonatal FC receptor or FCRN. And that had been cloned by this guy, Neil Simister, and also Keith Mostov. The paper comes out and it has sequence homology to MHC proteins. Not very much. It was like maybe 20, I've forgotten now, but it was 30, 25 to 35% sequence identity in the heavy chain and it associated with the same light chain as MHC class I proteins do. Then you say, "Well, this is a receptor for a macromolecule, an antibody. 150,000 Daltons. It's not a receptor for a peptide, which is nine amino acids. What in the world is going on? Does it have a groove? Why would it look like this? What is the evolutionary origin of MHC class I molecules?" Because they have to do with adaptive immunity, meaning you make new immune responses to a new pathogen. And that's only in vertebrates. It's not innate immunity, which is in both invertebrates and vertebrates. So, what's the evolution of MHC molecules? Were they there to be protein receptors or were they there to be peptide receptors? So, I got really interested in figuring out what that would look like.

We started expressing FCRN and studying it biochemically and doing its structure and eventually solved its structure bound to FC. And so that was kind of the highlight of my tenure package. But

I also had gone to Stanford to clone the T-cell receptor and express it and then solve that structure. We were still working on that, but that just never went anywhere, and we did not get that structure. And in fact, it was solved by Ian Wilson's lab first and then Don Wiley's lab, and they presented those structures. But to this day, my lab has never solved a T-cell receptor structure, even though that's what I went to Caltech to do nominally.

Anna Doel:

What are some of the applications of your research?

Pamela Bjorkman:

Now we're trying to make vaccines. We study how antibodies are raised to viruses. By doing structures of the antibodies bound to the viral proteins. And so that would be HIV envelope trimer or these days, coronavirus spike trimers. We've also worked a little bit on Zika virus antibody [inaudible] and hepatitis C. And the idea is structure informed vaccine design, which is something a lot of labs are working on. You figure out how the antibody binds, then you figure out what would be an immunogen to elicit that antibody. For HIV, that's very, very hard because antibodies are generally strain specific, but there's a huge number of strains. You can make neutralizing antibodies, but they don't work against most strains, and so they're useless. We've tried for a long time to make a HIV vaccine and like other people you may notice there isn't one right now. So yeah, it's not through lack of trying.

For coronavirus, everyone can make a vaccine that works against SARS-CoV-2. Everyone. You just put in whatever you want of spike protein, and you make a protective vaccine. It's fortunate that that the world wasn't confronted with an infectious respiratory form of HIV, or we'd all be dead. But anyway, so for the coronavirus that we made you just put in the spike protein, you make the vaccine, you give it as an mRNA, you make a predictive vaccine, you give it as a protein, you make a predictive vaccine.

But what we wanted to do was make a vaccine that would protect against the next spillover event, which I think is going to happen because we had SARS in early 2000s, then we had MRSA in 2012, and then we had SARS-CoV-2 in 2019. If you add it up, we're due for another spillover in the late 2020s. And we wanted to make a vaccine that you wouldn't need to update if you have another spillover. You have all these bat viruses and other animals. Sometimes they're circulating. They could spill over, especially with the animal trade in Asia, and bats interacting with people because of climate change, and people moving closer to their caves and getting infected. So far, people get infected all the time with SARS-like viruses, but they're not transmissible. Nobody knows about it unless they check.

But what if the next one is transmissible? So, we made a mosaic nanoparticle, meaning it presented eight different pieces of spike protein from eight different SARS-like beta coronaviruses. And the idea was that we would generate cross-reactive antibodies. Normally, you just make antibodies, and they work against SARS-CoV-2, which is great. And then they sort of work against the variants, not as well. But back when we started, there weren't the variants of concern. We were thinking more about spillovers.

And we make this thing, it actually does stimulate antibodies that bind to different regions of this spike, the more conserved parts. It retargets your immune system. We're trying to get that. That's been funded by CEPI, the Coalition for Epidemic Preparedness Initiatives. And we're trying to

get that, that's funded for human clinical trial. And then the question will be, "Well, how do you assess if it's working?" Well, you can't because I hope we won't have a spillover by the time there's a human clinical trial. But from all our preclinical studies in animals, it looks like it would be protective to things that are not represented on the nanoparticle that would represent what might be a spillover. I mean, we can't predict what the spillover strain will be, although we keep being asked that by the regulators. Seems kind of obvious that we can't predict that, but.

Anna Doel:

What are some of the ethical concerns that may be associated with your research?

Pamela Bjorkman:

I can't think of any. Are there? I suppose people think that we shouldn't be promoting vaccines. Maybe those are considered ethical concerns. I've gotten letters from people saying that I'm funded by big pharma to do all this stuff. I am not funded by big pharma, for what it's worth. I am not. Tony Fauci doesn't direct my research. I don't see any ethical concerns. There's some gain of function concerns, like people will make another strain because they're trying to find out which part of it is involved in the protection. And you might do something that is more infectious. You might alter the virus somehow to make it more infectious. My lab doesn't really work on stuff like that. I can see that that needs to be regulated. I can also see that the people who are so incredibly concerned about that do not seem to be concerned about the fact that policies that push people next to bat habitats are going to spread more new viruses.

And now I'm not talking about coronaviruses necessarily, but I can't think ... Hendra virus and stuff like that, that came out from bats roosting in some kind of trees where horses eat grass upon which they have defecated and then they get this virus. And if the bats didn't need to be in these trees near the horse farms, this wouldn't be happening. So, there's a push in Australia to plant more trees and get the bats away from them. But I don't see the people who are so concerned about laboratory research, I don't see them in there going, "Oh no, look. Here's a bat cave. And people live near it, and they go in there, and they get guano for fertilizer, and they could get infected." I don't see them all up in arms about that.

I just don't understand these ethical concerns. I don't understand the idea that researchers are trying to make vaccines in order to hurt people. I don't know. I don't get it. But I'm kind of under the radar here. People don't think of my lab when they want to go and say all this crazy stuff.

Anna Doel:

Speaking of your lab, I was wondering if you could talk about it a little bit. I looked at the website of the lab and it gave me a really warm feeling of a community of like-minded people and a strong research group and people who really want to take care of each other.

Pamela Bjorkman:

Well, that's nice. The website is done by Marta Murphy. She's been my admin for over 20 years, maybe. And she has made the lab a very inclusive place. And starting in the pandemic, she was getting ready to retire, but then she was able to work from home during the pandemic. She stayed on past when she thought she might want to retire because she can just do it from home. And this works really great for both of us. And I miss her. I used to talk to her all the time because her

office was across from mine. But we still have group meetings that are partly Zoom because there are people that we don't require to come in, if they're doing the ordering for example, or Marta.

But Marta has set up this atmosphere and we try to have lab traditions and so on. And I'm trying to, it kind of went downhill during the pandemic, and I keep hearing about this. Even when people came back, there was just this kind of, it's like malaise or something just, and it's kind of gradually improving a little bit, but this is not over... I talk about this with a lot of other people and it's kind of a universal thing. I think it's going to take people a while.

Anna Doel:

What is your current project? Is it the vaccines?

Pamela Bjorkman:

Yeah. We do structural biology. People do different things depending on their interests, but they might do structures in order to design a vaccine, or they might do the structures just because interested in how the immune system recognizes things. There are always little intricacies of exactly what the antibodies are doing. And there's all kinds of interesting stuff about every structure. I still am a structural biologist at heart, so I really like all the details about the structures. But if the person wants to work on vaccines, they go off and do that. If the person wants to work on some new type of possible therapeutic for HIV where it's not a vaccine but some kind of genetically encoded therapeutic or maybe an injectable therapeutic. I have one student who was interested in that, so that's what he's doing. That requires structural knowledge.

People don't always do structures. Sometimes they just use the structural knowledge. I try to let people follow their own interests. I think that works out better. And they often come up with ideas that I never would've thought about. So really, we're kind of divided into let's get this mosaic nanoparticle into humans in the clinical trial. So that's, part of my lab people are working really hard on that. And that requires bioequivalent studies. Is the product that's made in large quantities that would go into people bioequivalent in animals to what we make in our own lab in animals? We have a lot of effort on that, and that's run by someone that I can't really live without, Jennifer Keefe, who's a staff scientist in my lab who's been with me ever since she was a postdoc. And she understands all the science, but she also does a lot of the regulatory stuff with CEPI and is our program manager for that. So, there's a lot of stuff with the CEPI thing.

There are spinoffs to the CEPI project where we're trying to figure out, at a fundamental level, why do these mosaic nanoparticles induce a broader response? I'm really interested in that because that means like you go into a germinal center, which is where B cells and T-cells interact to help B cells make good antibodies. What's going on that makes us get the cross-reactive response? And what if we change it up and we're designing experiments to answer, at a fundamental level, how that happens. CEPI doesn't care about that, they just care about the vaccine. But I find that very interesting. We still haven't given up on HIV. We had some ideas recently about what we might try now again for HIV. Haven't given up. It's hard to say what the project is.

Anna Doel:

There are multiple projects.

Pamela Bjorkman:

Yes. We started something after people came back after the pandemic where we have group meetings and then somebody presents their project formally with slides. We do that once a week. But then every other week we have subgroup where we just sit down in the kitchen on our floor without slides and we just talk. And a lot of ideas come out of that.

Anna Doel:

Teaching and training others, is this something you enjoy?

Pamela Bjorkman:

Sometimes. When I look back, as a university professor, I am supposed to teach. We don't teach that much in my division, traditionally, and so my teaching burden is very light. But when I think about it over the years, some of the most interesting things my lab has done came from the fact that I was giving lectures, and then I learned something I wouldn't have learned otherwise.

Right now, I teach immunology, co-teach it with Sarkis Mazmanian, who's a microbial sort of immunologist, a gut microbiome person. And we also teach virology with two other professors, David Van Valen and Viviana Gradinaru. Viviana is a neurobiologist and David is a computational systems biologist. And it's a very different type of virology course. David's also an MD/PhD, so he comes out with a different kind of perspective. But that class was what David Baltimore taught at Caltech after he was president. It's very hard to take over that class. But it has its own spin now.

But I learn all kinds of things through that. I do enjoy the teaching, although, like everyone else, I complain about it. Mentoring is good, most of the time. I like it, especially graduate students, I think about if they came when they were 22 or 23, it's so different to see them when they graduate. It's just like night and day.

I told my kids this when they thought they were grown up at 18. "No, you're not." You're not. You change so much. I guess your brain doesn't fully develop, I've read, until you're 25 anyway. I see these people at different stages, and they're totally different, and it's really satisfying to see when it works, to think back on them as a first year graduate student versus when they defend. And so, that's really satisfying.

It's very unsatisfying when you have a student and they're just not that interested. And then you wonder, "Well, why are you in graduate school?" And that happens every once in a while, it's really frustrating and depressing.

Anna Doel:

What are some of your mentoring strategies? How do you handle your grad students?

Pamela Bjorkman:

I don't know. I guess maybe I should have a plan, but I don't. And I just listen to them. Usually, if something's going on, I say, I have scheduled meetings because I am doing a lot of traveling and I always have, after my kids got older, I did a lot of traveling. It's hard, I can forget about people. I have regularly scheduled meetings where I see them at least twice a month one on one. But

more than that. My office is right by the lab, they can come in whenever they want. But I have the regularly scheduled time.

If there's something going on, I just ask them. And then I try not to interrupt. I just say, "Okay, tell me what's going on and what you think about this." And then I ask, "Well, is there something you'd rather be doing? Is there something I can do to support you?" Or something. So just asking questions. And then I can make suggestions, but I try to let them talk for a while before I make suggestions.

Anna Doel:

Do your former students keep in touch?

Pamela Bjorkman:

Some of them do, which is really nice. Some of the early ones. Yeah, my first student sends me a holiday card every year. She's in Taiwan. She's a professor at some place there. I hear from her once a year and that goes way back. But some of the other ones over the years, it depends. Some of them do, some of them don't.

Anna Doel:

You mentioned traveling a lot. Could you talk a little bit about that?

Pamela Bjorkman:

Yeah, traveling meaning seminars and meetings. And I tried to really cut that down when my kids were little. Or I brought my kids with me on a bunch of trips. Nowadays, they have babysitting at these meetings. That would've been fantastic. Eventually we got a friend of ours who became our kids' nanny. I would pay for her to go with me to places. We'd get a hotel. And then I'd go to the meeting, and she'd look after the kids. And I did that in France when my daughter was six months old or something. And I did it at various Gordon conferences in New Hampshire with both of my kids. My son is older, so he would come. I did that constantly. But I tried to keep it down.

But then later, when they were older, I went back to, I'm going to go to this meeting and that meeting and this seminar and so on. And then we've always had very nice family trips over the years. Not now because my kids have their own lives, but we always went to lots of exciting—to me anyway—places, like several trips to China, with travel in rural remote places, Guatemala, Mexico, Belize, Australia, Vietnam. Family trips. I'm trying to think of them, we went all over the place. We did family vacations in the American Southwest too. Lots of things. A lot of backpacking and stuff like that, and trekking trips that my husband and I did, or I did on my own to Nepal. Oh, we went to India a bunch of times too. I forgot about that. Yeah.

Anna Doel:

When your kids were growing up, what was the division of labor between you and your husband to manage the household?

Pamela Bjorkman:

Well, what I've always said to him and to other men, is that no matter what he did, he was going to feel good about himself because it was more than what his father had done. And no matter what I did, I was going to feel bad about myself because it was less than what my mother had done. So, my role model was I was supposed to be there and be the only person doing anything, and the man was supposed to come home, and I was supposed to have lunch and dinner prepared for the man and then clean up everything. So as far as our division of labor, I was not happy with that idea. And my husband didn't want it to be that way. And I would say that he did a lot, and I can't complain about him. But I'll also say that in general, there are a lot of things that men don't notice, and then women have to do it. And I don't know how this is ever going to change, but I've read various things about the emotional labor that women do. That it's not that their husband says, "You have to do this," but they don't notice it. So, they don't schedule the doctor's appointments, the dentist appointments, they don't schedule the afterschool activities. They don't schedule the pickups, they don't schedule the friend things. They don't schedule the parties. I did all that, right? And it wasn't that he refused, it was that he just didn't notice.

Anna Doel:

He probably didn't know how to do these things?

Pamela Bjorkman:

He didn't know how. And then also, if he did try to do it, he would just say things like... My daughter wanted to be in these acting things when she was in grade school, and she was on a competitive jump rope team. And that was a lot of stuff. I would travel with her to the Junior Olympics, and it was a very close-knit thing, and I did all this. And he would just say, "Well, she doesn't need to do that." It would just be, "Well, why are you doing this? Nobody told you you had to do this." But to give him credit, he arranged all the family backpacking trips. He did all of that stuff, and I just said, "Thank God, I don't have to do anything in this case, and I'll just go along, and he'll have it all scheduled." We had river rafting trips for which he did everything. So, it divided out into stuff that he was incredibly interested in. We did a lot of rock climbing, and he would arrange all of that. And we have a cabin in the Sierras, and he was the one who wanted to get that. We would go up there and then go hiking and climbing and stuff like that. And so, he would do all of that. I would say that he did a lot. And it's just that it was not 50/50. And I don't think I've met women my age where it was 50/50. Unless the man was a stay-at-home husband.

Anna Doel:

In that oral history interview that you gave in 1992, I think, you mentioned your child, because you had one child back then, and he was a toddler. I was wondering if you could speak a little bit about your children and who they've become.

Pamela Bjorkman:

Our son, who was the toddler then, is now 34 going on 35. He has a PhD in math. And from the age of one, when he became obsessed with numbers on signs and stuff like that, it was very clear all along he was going to do math. There was no question about it. As a student, he would just randomly chart sports statistics on graphs and calculate things. It was just so obvious that he was going to do math.

He got a bachelor's degree in math, and then he went on to graduate school in math. And while there, miraculously, there was a woman in his graduate class as a PhD in math. It's like she has experienced what I experienced 30 or 40 years ago because math is mostly men now. And they got married.

They're married now, and they teach at Harvey Mudd College, which is part of Claremont Colleges. She does research in various forms of dynamical systems, and he's doing more teaching right now. And they're both at a math conference in Japan, but I think they left, no, they left, they're probably on a plane right now and they're going to travel around Japan afterwards. So they live near us and we're absolutely thrilled because it's shocking that they ended up within a 40-minute or so drive of us. We're really happy about that, so we can see them a fair amount.

Our daughter is nearly six years younger than Leif, our son. And she ended up graduating with a degree in expressive arts therapy. She has never been interested in science, and she's a phenomenal writer, just as a young girl, as a young toddler, that was obvious too, that she was really verbal, more so than most children. She was speaking in whole sentences by the time she was a year old. And then she used to just spout off all this stuff that was astonishing for a one- to two-year-old. And then she started reading really early and she started reading nonstop. She's always been interested in creative writing. And so, her degree is in therapy that would work with children through the arts, music, writing, art, things like that. And she's living in Boston, where she's published two books of poetry. I don't think that's probably not a viable way to actually make a living, but some people do. But anyway, she designs programs for enrichment of children in afterschool programs, and she's thinking of going back to graduate school to get a MFA. So maybe she'll do that at some point.

Anna Doel:

What are some of your interests outside your research and your family?

Pamela Bjorkman:

Well, I still like reading and I try to exercise. I still am interested in various traveling things that we kind of put on hold during the pandemic. But before I get really old, I'd like to visit more places. And we're going with friends on a trip to Patagonia, where I've always wanted to go. That will be in the fall. And my husband and I do rock climbing still, mostly in climbing gyms, but we still do that. And we're doing a river rafting trip down the Colorado River in about 10 days, in the Grand Canyon, whitewater rafting. So, we do that. I'd like to, now that we can travel again, I'd like to do that.

I was involved for three or four years in teaching biology to Tibetan monks in exile in India through the Emory Tibet Science Initiative. And that, I used to go over there and teach monks, which was really interesting. Culturally, it was very interesting. And the Dalai Lama is very supportive of the monks learning western science and combining it with the Tibetan Buddhism. We would try to design experiments that they could do in the lab, but they didn't have a lab. You can isolate DNA from bananas, you just need a banana, and you smash it up and you have isopropyl alcohol and coffee filters, and you can precipitate the DNA. Anyway, we would do stuff like that.

And I did that before the pandemic. I used to go over there. Well, I think I only did it three times, but I would go over there for 10 days to design this class. Kind of hard to do because everything

is translated, so you have to speak your sentence, then it gets translated, then you speak it again. That was really great.

And I'm interested in trying to understand more about what they believe. I've been to a lot of Tibetan monasteries over the years, on various trips through the Tibetan parts of China and also India and the Buddhist parts of Nepal. I'm interested in that. My daughter and I volunteered at an orphanage in India, near Jaipur, that I keep in touch with. I've been there five or six times maybe. I would like to support things like that.

I'm interested in—and it's not really my job, but I run the DEI committee, the diversity, equity, and inclusion committee for division. And I don't know if we're making a difference, but I'm trying to support outreach efforts. I really believe that if we want to increase diversity in science, in the U.S. anyway, that we need to bring in people in the Los Angeles area itself that live really near me, that have no idea that you could do experimental science. It's just terrible. There are high schools near my house where the kids don't have any idea about that because they're poorly funded public schools.

We're trying to develop programs where people would go out. And every time I teach a class, I give them extra credit if they go out in the community and just do a demo in one of these schools. Stuff like that.

Anna Doel:

Do you have friends?

Pamela Bjorkman:

I hope so. I'd like to think so.

Anna Doel:

Is it something that's important to you, to have friends?

Pamela Bjorkman:

Yeah, definitely. On this river trip, we'll be with longtime friends. A lot of my friends don't live here anymore. It's either people I met at Caltech, and they've left, or people that go before Caltech. I'm very close to people around the country that I don't get to see very often but that I try to see when I travel.

So yeah, I have friends. I have friends at Caltech where we get together, we try to, Francis Arnold is a friend of mine, the 2018 Nobel Laureate in chemistry. I've known her for a long time. And my daughter and her son were friends. Every once in a while, she will organize this women's dinner that we have. Or sometimes it involves men as well, various people at Caltech.

Anna Doel:

Pamela, you've received numerous awards. How do you feel about them? Do they mean anything to you? Is there one special one that you cherish?

Pamela Bjorkman:

I'm grateful for the awards, but it's not what I care about. What gives me pleasure is figuring things out in the lab. I guess when I got this L'Oreal Women in Science award, that was 2006, that meant something to me because my whole family came to Paris. And in 2006, my daughter was 11 going on 12. And it meant something to me that she could see that there were other women. I was the North American laureate, but there was a South American laureate and a European and an Asian one. And she could see that there were women doing things other than supporting their husbands or something. That meant a lot to me.

And it meant a lot to me that my son could see that as well. He certainly is very supportive of his wife. You shouldn't say it that way because it's not the man's job to support their wife. It should be an equal partnership, right? I feel like they have a very equal partnership, my son and his wife. I guess that one meant something to me, maybe more than other things.

Anna Doel:

Is there anything that I haven't asked you about that you would like to mention here?

Pamela Bjorkman:

I can't really think of anything.

Anna Doel:

Thank you so much, Pamela. I'm going to stop the recording now.