[AC # 859]

Smithsonian Institution
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Van Phillips
Oral History Interview
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DENNIS: Katherine and I were talking about what our lead question was going to be, and we thought that, you know, we've read a lot about you in terms of what the industry has to say about you and that sort of thing, but we're wondering if you can describe yourself in your own words.

PHILLIPS: Okay, give me just a little direction here.

DENNIS: If somebody asked you to describe yourself, what would be some of the first things—what would be some of the words you'd use to describe yourself in kind of a well-rounded way, not, you know—include, like, what you do and other stuff.

PHILLIPS: Probably the first word that comes to mind would be *eclectic*. Even in grade school, I remember I played five different instruments. I just couldn't settle on one.

[Interruption]

DENNIS: Okay, so you were just about to start telling us, describing yourself.

PHILLIPS: Yes. I started by saying the word *eclectic*, and it's—I think there's a varied background interest that I have from I have a dairy farm, I'm studying to be an actor, inventor, father, starting a coffee house. So my interests are varied. And I think that applies itself to working on artificial feet, inventing, in that I kind of think out of the box a lot in terms of I don't limit myself to certain kind of venues, so to speak. So probably varying interests is probably one of the better descriptions I could have for myself.

I'm not sure where you want to go with this. Help me with trying to stay where the focus might be, because I'll jump off and talk about being a dad for a day and a half if you want.

DENNIS: I think the dad stuff's important. I guess we were trying to get beyond the way that you're maybe portrayed in the industry, you know, kind of get a better idea of who you are. Does that help?

PHILLIPS: Okay. And, once again, this is just for the archives, in case somebody wants to get an understanding of who I am?

DENNIS: Yes.

PHILLIPS: Okay. Well, I'll talk about the dad thing a little bit. I have a three-and-a-half-year-old daughter named Olivia. Her mother and I are no longer together, and so basically my time with Olivia is basically my time with Olivia; it's not joint time with her mother. So there's a lot of responsibility in that, and a lot of how I see myself shaping myself is in terms of who I am and what I can offer my daughter at the same time, like where I live and the foods I eat and the

animals that I have on the farm and whether or not I get horses or not, how much I travel, and, gee, would I even take a job as a movie actor if it meant I had to be away from her for three months. So it's really teaching me a lot about getting in touch with my own feelings.

So much of my life as an inventor didn't have much to do with feelings other than I knew there was a—there's a certain excitement about, "I've got to get this done," or, "I've got to get that." And usually they were always having to do with something in the future. If I can get this foot, or if we can get that engineer to design this part, then I can put these parts together and I can have this foot the way it is.

My life—early in my professional life was more about achieving, and now it's more about being, about really being present for her. And that was a—I went pretty far askew in the wanting, in the desirous, in the—always wanting something in the future. It really took me off course in my life. Even though I got a lot done and created a lot of feet, I don't think I was a very present type of person. And now, once again, having a daughter, it's really being in touch with my feelings, because if I'm not in touch with them, then I have no way to be responsible for how she's going to perceive me. And I think that's really a valuable thing to be able to offer a child.

I'm finding that that's also carrying over in—I have two employees at my farm and I'm soon to have employees at this coffee house, and I just think that's so much more of what life has to offer in terms of really being present. So that's a part I could probably talk a lot more about, but probably try to switch gears here for a second.

I still have large dreams. I'm creating a landmine foot, and hopefully anybody who watches this video, hopefully not in the too far near future, will be able to witness that foot also. It's a dream I've had for quite a number of years.

So there's not only a challenge of creating a foot as I was mentioning earlier at lunch, there's the challenge of actually having people wear the foot. When I developed the first Flex-Foot there were so many people in the world, in the prosthetic world, "Oh, that'll never work," or, "What do you need that for?" You know, "Energy storage, what's that about?" Or, you know, "That thing's just going to break," or, "I created that a year ago, or ten years ago, and it will never work for you," or something like that.

There were so many people that were put off by it, and, you know, when we first started the company, the sales were always increasing, but relatively they were fairly nominal compared to total number sales in prosthetic feet in the world. So it was probably four or five years before there was a good share of the marketplace that had any real experience with the foot, even though every year the sales were doubling. And that would be a frustrating thing, you know, if I created a great landmine or third-world foot, for that foot to just come in terms of dribbles in terms of who was actually going to wear it. So once again I'm thinking, you know, there's 15 million people in the world that aren't wearing feet because of one trauma, accident, or another, mostly landmine, it would be a shame if I only sold 100,000 or a half million feet were made as opposed to, you know, having millions. So once again I challenge myself to think in the future in terms of globally rather than, you know, just to a short medium outcome.

The other thing I'm learning really rapidly is how to trust. Right now I have an engineer and I have a graphite consultant manufacturing person, and the three of us are highly trained in what we do. And, once again, there's the brainstorming that's coming out of the three of us working on this foot. And the trust comes into play in that there really never has to be a dead end. If this ch___ fiber doesn't work, or if this adhesion doesn't work, or if this tool design doesn't work, there's an opportunity to create another design.

I offer a lot of that to the group, but also Hilary Pouchak and also the—Mike is his name—is bringing a lot of positive energy, too. So a lot of my life is bringing people who have that same willingness to focus and bring that positive outlook, because that's so much of what, I think, life is about. I have that on my farm with my caretaker, and I have that with my brother-in-law and my sister, the interior decorators and designers of this coffee house; we have to remodel the whole structure. So a lot of my life now is really allowing myself to be able to be surrounded by people who can share the same dream.

Flex-Foot was, you know, unanimously successful, but even so much back then it was having to kind of fight for a lab where the feet could be designed in-house, or fight for a product. I mean, even the vertical shock I had to, like, argue for three years that the world needed a vertical shock project. So now it's more of like, I have the opportunity in my life to bring people in to me who are more in synchronous, you know, or synchronicity, or whatever that word is, in terms of the way I already feel and think.

And that's a lot of fun at this point in my life. I always have that with my daughter. She's always willing to give me high-five, and even then it's—I get so much pleasure out of, "What do you think we should do? Do you think we should go to the beach, or do you think we should go to the toy store, or should we go play in the doll house?" You know, rather than, "Today we're going to do this." It's kind of like, "Whatever you want to do, we'll do it and we'll have fun." And to have that relationship where she knows that she can make a suggestion and it's heard, and to have my engineer Hillary Pouchak say, "You know, I think this placement for the air valve would be the place," or for the engineer to say, or for my brother-in-law the architect to say, "You know, the whole second story should be the theater," that's a lot more fun for me, to have a lot of possibilities.

So, once again, eclectic is still the name of the game, but I would say a shared eclecticness, more of a game state. In the last years that I was at Flex-Foot at the R&D lab, it probably took me fifteen years to work to a place where I got to have a really well-honed, democratic, fun place to think-tank. I had five engineers that would come weekly for one to three hours and sit and we would just jam. It would be kind of reminiscent of, like, a jazz group that would get together and just kind of, you know, freeform. It took me a long time for me to get myself out of the way. Like, it always had to be my idea, or it always had to be something that I thought of, you know. Or I always was going to be the one that created the solution to the problem of how the foot was breaking or not. I'm not saying I still don't have a huge ego and that I'm well vested in everything I take under, but slowly but surely I'm learning, bit by bit, the value in that there's more to receive than there is just to command in the world. I'm more open to hearing what there is out there.

Even in theater, I'm always reminded, you know, it's the other actor on stage that's your biggest asset, you know, and that means you really have to listen and be there. In today's lecture I tried to bring that message a couple of times forward with the kids by saying, you know, if you have an idea, share it with someone who's going to listen. Let there be someone in your life that can support what your ideas are.

And then the idea that we need to find space in our lives to create. I had a picture of a logjam in a river, of these logs meshed together, and that so often has been what my life has been like. Even when I was with Flex-Foot I'd have, like, five different feet, and presentations in Japan and Europe to give, and all these things to do, and there was little, little free wide open space to really—at least to appreciate that which I was working on.

So I guess my life right now is so much more full of appreciation of all the small things that go to make up the whole. And so in today's talk, it was, once again, hopefully giving that encouragement to find the space to feel the beauty and the appreciation of the things that they were holding, the thoughts that they were letting run through their minds, their spirits, these possible future inventors.

I understand that, you know, ideally, in the ideal world, it's easier if someone doesn't have the pressures of nine-to-five job, and deadlines and commitments, which I don't necessarily have right now in my life. But also as students, I mean, they also do have that luxury, especially if someone can seed them with a thought, to find the space and to really allow themselves to have the courage to face the unknown, to be able to build upon an idea, is something that I wish I had when I was young, someone encouraged me to do that, because I'm just now finding that, I think.

OTT: In what way is a more organized spiritual integration part, do you see part of what you're doing or where you're headed?

PHILLIPS: Well, once again, the organization I put into a spiritual practice, which I do have, is, once again, it's the approach for space. If you think of the Zen monk or the Buddhist meditating lama or whatever you want to think of, you usually think of them in stillness. And, once again, that, to me, is where ideas come from. Usually we think of, you know, we're all excited, we've got this, and all those things we've got to do, that those are the great ideas. And in the midst of them you think they're wonderful, you know, and you've got that energetic energy coming from, but usually when you sit back and you look at those, those are interesting and kind of revealing

ideas, but the deeper, kind of profound, kind of valuable things really, really, for me, in my life, come out of stillness. At least the time lasting, the really thoughts that have value.

So the approach is, I really believe people need to create that in their lives, whether it's for half an hour during the day or whether it's just having dinner with friends and family, or whether it's being able to have time before you fall asleep where your life kind of falls back in the background and it's just you being with yourself. Because as an inventor, you can get really swept away by how important you think the invention has to be, or the contribution, or that your whole life is just about being successful at what you're doing. And obviously it's not. I mean, I'm much more than just an inventor, and to be able to have the confidence and the space to realize the big picture and to be, you know, amidst that big picture, allows the space, once again, for ideas really to come across and for me not to grab onto them. Because as soon as I grab onto something and call it mine, I've limited, you know, probably a thousand other ideas and the ability to marriage and to juggle all the other ones that are out there.

So I think, once again I keep coming back to the word, space is what allows order and what allows creativeness to kind of flow through and to keep flowing through rather than the logjam backup.

DENNIS: So it sounds like the way you're describing now the creating these spaces, having the mental space to think creatively and inventively, is something that you've recently come to?

PHILLIPS: Well, you know, it's almost like a circumnavigate, because when you ask me the question, I can remember early in my early Flex-Foot days of sitting at a table for hours and being quite present, really enjoying what I was doing, and drawing and not knowing what was

going to fill the page, and closing my eyes, or looking out to a Salt Lake City sun—I used to live up high in the avenues overlooking the Capitol. I can remember just looking out over the Capitol, seeing the red sunset, and just filling pages after pages after pages.

And then as years went by, with more employees and more deadlines—I mean, the last of the products that we created we had to have Gantt charts, we had Pert charts. For the next two years, "Where are you going to be on this month in the design program? Manufacturing is going to start that date, prototypes have completed on that date, you're going to hire this engineer for that part of the componentry, and you have testing, and you're going to have—." You know, it was—and that wasn't ordained by me; that was sanctioned by my partner and by the president of the company and by the board of directors and the way everything was run in that large company. We were over 100 employees at the end.

Even the products that were going to be designed, I didn't have say over what new product would be created. It was determined by a scientific advisory board that they flew in people from all over the United States two to three times a year. I had one vote and I had to fight and scream and lobby and work, you know. The last foot, the air shock, was something that took me two years to let me get to work on that product. My own company, you know. So that was kind of tumultuous for me and very difficult as compared to just starting a company and realizing that the blank page is where it's going, and to have the time and the freedom just to expound on that emptiness.

So that's kind of where I am now. I've sold the company, I don't have any partners, any pressure, and board, you know, scientific advisory board coming back to me and saying—I have Hilary Pouchak and I have Mike, which I wish I could remember his last name—Brunswick or something. And the three of us are in a highly evolving creative state where we see the potential

to create a landmine foot for 15 million people. I mean, Flex-Foot has sold, I think, maybe 300,000 or something like that; 300,000 feet. So I'm looking to sell, really, the world population. And how do you do that? You have to really open up to the possibilities to have that happen. Yes, so I think I'm coming back to where I originally started.

DENNIS: Can you say more about the founding of Flex-Foot? Because I'm interested in the sort of evolution of how it starts with one guy's idea and turns into this thing that you kind of lost control of, or didn't have as much control or as much say as you wanted.

Phillips: Well, the first idea with Flex-Foot came—as I mentioned this morning, I used to study karate and I had this idea where I could jump up and I could land on what I thought was going to be a piece of spring, Japanese sword steel. I don't even know if it would spring that much, the tempered Japanese steel that they would have made back then, but I kind of had this envision of a *C*. It was going to be out of steel and it could spring. There's no reason I had to land flat. So I think, curiously, is the foot that if I had to take one foot to the grave to me, that would be the one I'd probably wear because it's so much fun. So that foot evolved into a coil-spring foot with connecting tendons in the back, which I never did make but had some professional drawings done. Then I started making some flat feet, and those flat feet plates broke; they were made out of carbon graphite.

Then I met my future partner, Dale Abildskov, and Dale helped me blend in some that *C*-shape into feet structures that I was already making and put me in touch with a manufacturer who could shape some tools, and we built a foot. And the company basically started overnight.

Having met Dale, two weeks later I was running on the foot, and we did a handshake, and we were partners; three of us.

So I worked about two years on the design and development of the foot, and then I brought in my future partner, Bob Fosberg, and he bought majorly into the company, and I moved to California to join forces with Bob. And my other partners, Dale Abildskov and my other partner, basically stayed back in Salt Lake City. Dale died and we brought the other partner out.

So it was basically Bob and myself, and we started in a little one-room office building with manufacturing being done in Salt Lake City, or south of Salt Lake City, and it just grew. We hired an employee, and our first secretary, bookkeeper, order taker worked—you know, shared a desk in the same office as Bob. I worked in San Diego and he was up near Laguna. And then we hired another person, and another, and eventually we just grew. And, like I say, sales every year just kept doubling or kept increasing 20, 30 percent. It took a lot of business management, which, of course, I didn't have, and Bob Fosberg, being an MBA from Harvard, had many suitable skills to manage that growth. So he basically managed the growth of the company and I managed the birthing of additional feet and componentry that helped grow the company.

DENNIS: What year was the company founded?

PHILLIPS: '83-'84. And we sold to a company called Össur out of Iceland about four years ago, in 2000.

DENNIS: When you say you sold it to Össur, did you license them the patent rights?

PHILLIPS: Yes. We sold them the company outright, and then all my products I still own the patent rights to. They have a license, exclusive license, on those products.

OTT: What led to the decision to sell your company?

PHILLIPS: Well, I can speak for—well, there's two principal partners, there's myself and Bob Fosberg. I'll just say it openly. There were just so many disagreements between Bob Fosberg and myself as to how to run a company and what products were going to be created, and I wasn't enjoying it anymore and I know he wasn't, either. And then, also, there was a lot of money on the table, you know. Would the company continue to grow? Is this the time to get out? I'm not a business-type person, but I'm sure Bob Fosberg was looking at the opportune time to sell the company. Marketplaces are ready for—you know, we were attempting to take it public. Should we go public? Should we sell it privately? So the timing was right, the growth charts were perfect, everything was in order, so it was timing-wise.

And Bob was kind of ready to semi-retire; I'm not sure he's doing anything in the business world. But he had worked pretty hard, and it was time for him to get out. And I had made a promise when I was forty, six years earlier, that I was going to sell the company when I was forty, because I desperately wanted to become an actor, and, you know, you push forty, you lose the ability to become a leading-man type. So I was already six years past my promise to myself.

But the company kept growing, and we finally got an R&D lab, which meant we had an autoclave, which meant we could make products in-house and it took ten times less time to make prototypes. We hired great new engineers, and, of course, I always had one more idea and one more great product, and I still have three more that I'm working on. So my promise to get out kept extending to the next year, extending, but then we got these offers and they came in and they were just really difficult to refuse.

I also was ready to get out of San Diego. That was probably the biggest thing for me. I'm not a—San Diego is anything but a major metropolis, but it was getting polluted, it was getting crowded; the freeways were jammed up, driving up to work and back. And I was more and more appreciating hiking, mountains—I had goats—hiking with my goats. I had dogs. They were causing noise problems because they were barking at people walking by the fences and stuff. So I had more and more the desire to get to northern California, to greener and opener and more wider, bigger pastured areas. That's what did it. I had my eye set on moving to Mendocino, and I moved up there.

OTT: What had taken you to Salt Lake City?

PHILLIPS: That happened in about 1981. I was living in Seattle and I was sharing a house with a roommate who was a piano teacher and she taught piano to Dr. [Willem J.] Kolff's son. Dr. Kolff was behind the artificial kidney and heart research in Salt Lake City. His son had heard of my desires to go into prosthetics, and he said, "Oh, you should contact my dad if you're ever in Salt Lake City."

So I was driving from Chicago, where I had completed my prosthetic school training at Northwestern [University], driving back out to the West Coast, and I stopped in Salt Lake City and I called on Dr. Kolff on my way out to Seattle, back to live out in the State of Washington. And Dr. Kolff said, "Well, I'm glad to meet you, but I think who you probably want to talk to is Steve Jacobson, who works in the Center for Biomedical Design. And one of my students here will, if you want to follow him over there, he'll take you over there and introduce you to Steve."

So I remember he rode his bike and I followed in my station wagon and we met Steve. I really wasn't looking for a job, but Steve hired me that afternoon. So I came back about three months later to take the job and to work in the Center's design, and what I was working on was attachment and construction parts for their artificial electronic arm that they were working on.

DENNIS: At that period of time when you were living in Utah doing that, were you also—you were continuing to work on feet as well?

PHILLIPS: Well, I had never really—I had started to work on feet—

[Begin Tape 1, Side B]

DENNIS: Okay, you were just about to tell us what feet you were working on when you were living in Utah.

PHILLIPS: Well, I had come from Michigan, where I had actually worked for Jan Secosa for a brief period of time. When I was going to Northwestern—I'll make a long story short here—

when I was going to Northwestern, I did a research project on check sockets, which is fitting this really accurate fitting of the sockets for artificial limbs. Then I took a job with Jan, who had an incredible facility—I think he still does—had an incredible facility in Michigan, Lansing. I had a design that I had developed when I was in school, of a coil spring and with elastic connecting tendons. And I had started to work on this coil-spring foot with aluminum plate, non-energy storage footplate, and I had a guy that was kind of going to take my drawings and we were going to try to make something. That never really came to fruition.

When I went to the University of Utah Center for Biomedical Design, I was inundated with about six different projects for the lab; I can't even remember what they all were. But my plate was loaded and Steve said, the director said, "I don't want you working on our time on feet. If you want to come in on the weekends on your own time, fine."

So basically he wasn't interested at that point for the lab to start working on artificial legs. So my first foot on my own time working at the university on weekends was, I was taking sheets of carbon graphite prepreg, which is basically carbon graphite fibers with glue meshed in it that cures under heat and pressure, and I laid up what looked like Dr. Scholl's insert plates. I would actually put my foot down, trace the outline of my foot, and that was going to be my foot. Then these would come out about an eighth of an inch, quarter-inch thick, and you could barely bend them, but with your body weight they'd spring. And I'd drill a hole through the middle and I'd attach a pole, bolt it. And then so the bolt nut wouldn't hit on the bottom when I had a running surface, I got a kickboard, which is, like, an inch and a half solid, dense foam. I cut a toe pad out, cut a heel pad out, glued them to the bottom. It looked kind of like a Chinese Birkenstock sandal or something.

And that was a pretty good artificial foot. I could run on that foot. I remember running down the hallway, "Look at me. I'm running." You know, all the fluorescent lights and the white, shiny linoleum, I was running pretty fast. At least when you're running indoors, it always seems like you're running fast. You get out on a road, you know, and you're barely jogging.

And, once again, "Okay, don't work on it on lab time, only on your own time."

And as I mentioned in this morning's talk, every single foot plate ever built I broke within an hour. You get on a tennis court and you go out for a big hit and you put a lot of weight on the toe, and it breaks.

So then I met Dale Abildskov, who was a friend of the graphite supplier who was donating, giving the lab free pieces of graphite to work with. And Walt Jones was his name, and Walt eventually became a partner. And Walt, he's a big talker, as a lot of salesmen are that can just talk about anything. Walt found out that my grandfather was dean of the business college, the first and the longest running dean of the business college at University of Iowa, where Walt had done his undergraduate business degree. So that opened a whole thing, and Walt, "Oh, really?"

It was like, "Yeah. Okay."

"I know your grandfather. I saw his building." Before I knew it, I was having lunch with Walt. Walt had to put me in touch with Dale. Dale's roommate, they were both divorced, fifty-year-old guys, and Dale was a brilliant aerospace engineer. I showed Dale my designs and talked about the C-sprint and talked about various interlocking, interfacing heel designs, and Dale helped me come up with a drawing that eventually was very much like the first foot that we sold, incorporating a lot of the ideas and making sense of the drawing. Instead of bonding things, we made things bolt on, and advanced the concepts into workable concepts.

Now, I didn't know the limits and the laws of how to work with graphite. And two weeks later, as I mentioned, we had made a tool, I had laid up the carbon graphite, attached to my socket, bolted the heel on, put some heel pads on, and we met for the inaugural run two weeks after I met that first time with Dale, in his condominium and ran down the hallway, and ran down with a lot of spring. The entire leg, you know, as my original design had it, the *C*-shape was bending. The whole thing was working.

I remember we all looked at each other. They were kind of leaning out of the hallway watching me run down, giving me room to run back and forth with, and I can remember Dale, Dale was kind of a—he was a very fragile diabetic. Year and a half after we started it, he died in a diabetic coma. Dale would—we'd have our R&D meetings in my living room up on the Avenues in Salt Lake City, a beautiful old Victorian home, and I remember this red covered couch, and Dale would kind of get comfortable on it and kind of drift off. His blood sugar levels—he wasn't very good with his blood sugar levels, and he'd kind of drift off and I'd be sitting there with Walt. "Now what?"

So the early days were quite tenuous in terms of, you know, where we're going to go and how we're going to form a company. So there were basically—after that first foot that Dale and I made with Walt, I had gone back to my employer, Steve Jacobson, and said, "I'm quitting." Just, "I quit." And, you know, I had a career. My first career out of college I was going to get a master's in biomedical science of some sort with an engineering major, and I was going to be a research developer, I was going to have a job at the university, and I was going to be an inventor, and all the things I'd ever wanted, and, you know, in two weeks I'd thrown—I was enrolled at the college, I was taking chemistry and biology courses, and I quit. I stopped going to school.

I didn't have any money, and Dale and Walt would kick in, they'd pay me six dollars an hour so I could still pay my rent, and work, like, sixty hours a week making the feet and taking the drawings and going out and getting materials. I bought a drill press and a tile-cutting saw with a diamond bits blade that they use for cutting ceramic tiles, and I cut graphite feet with that. I hooked up a big monstrous evaporative cooler that could move 4,000 cubic feet of air out of my basement so I wouldn't inhalate all those toxic graphite dust chemicals. Bought tools, bought an oven, and hooked up vacuum presses, and did all the stuff.

Salt Lake City, you know, you can drive all over the commercial aspects in the middle of winter and buy bolts here and have people bend big pieces of aluminum for tooling here, and I had big tanks of nitrogen so I could fill up the pressure tanks so they wouldn't explode under pressure.

And, okay, I'm going to make a leg and we're going to start a business. It was kind of incredible when you think about it, you know. Everything on a shoestring. Dale falling asleep on the couch. Me making—I made probably 200 feet; every one of them I broke. I remember this, I would call—now you've got, for forty bucks you can have unlimited calling, you know; there are all these SBC and AT&T, Sprint. But back then, long distance telephone calls, that was a lot of money for a shoestring budget. So I would call, I would get up extra early—I think before eight o'clock you could call at, like, 30 percent less—and I would call these companies and a lot of them were East Coast so I'd have to get up really early. I would call them before they would even get to work so that I would leave a message so that they would call me back on their dime, and that was the way I afforded the long distance telephone calls. Because, you know, they could be 300, 400 dollars a month, you know, easy, back then.

Getting samples and—I got a lot, you know, a lot of people helped because they understood, you know, I'm an amputee, I'm starting a new business, and designing an artificial leg. And, once again, a lot of these people were building with all this graphite samples and aerospace adhesive technology that I was calling on these salesman, they were only used to building, you know, ICBMs, missiles, weapons of mass destruction. And so many of them were wanting and willing and happy to help some young upstart design artificial legs. You know, "Medical science, gee, I'd like to help you." So it wasn't too hard getting lots of samples, different materials, different adhesives.

Meeting all kinds of really interesting people. You know, twenty years ago in Salt Lake City, all these really old metal-bending tool shops, and, you know, this is, like, blue-collar industrial area in Salt Lake City. It had a lot of shops and a lot of really dark and dank and windswept kind of cold places that, you know, strong, hard men working with steel and forming tools and stuff like this. And I'd go in these shops that were, you know, you could fly a 747 through, you know, big, big construction, interior steel welding, big Caterpillar tractors they were building stuff on. "Can you form me a piece of metal that looks like—I know it looks like a ski, but it's going to be an artificial leg."

"Okay. When do you want it?"

A big truck would drive by, and I'd go, "Well, how soon can you have it?"

"Well, I'm doing a job for McClusky and Cameron's out there. How about next week?"

"Okay." [Laughs] I'd come back. Just a really interesting beginning. Everything was all brand new for me. I'd never been exposed to that kind of, you know, lifestyle before.

So everything I did, I'd get on the phone, "Dale, where can I get some metal bent? Where can I get a tube pipe to make an autoclave? Where can I get some carbide drill bits? Where can I

get some cutting denters and some other welding done?" It was all in these like steel fabricating shops in the outskirts of Salt Lake City. So it was kind of a fun beginning in a way.

OTT: When you were describing some of the process, you said "bolted," not "bonded." What's wrong with bonded?

PHILLIPS: Well, we did both. Some of the earliest feet we actually bonded the heel to the bottom of the foot. And you can see [referring to artifacts] almost every—well, that foot's bolted, you can see the bolts going through here. But this foot, you can see there's a piece of foam rubber in here. This is actually bonded to the graphite. So there's a great big bond surface here, and actually there is a lot of flexibility in the foam so there's no, like, stress concentrations trying to peel or break away the bond to the foam to the graphite.

So traditionally both systems are used, but bolted is tried and true. And if you design the graphite to withstand the penetrating stresses that the bolt incurs, you can design around it repeatedly, reliably. So early on we tried some initial bonding, but they were kind of messy. So many of our designs that initially went out, the prosthetist, after we sent the leg, they were all adjustable. If the prosthetist wanted the foot to become a really, really, active—well, you can see here [referring to artifacts]. See, this is really a clamp, okay. And there's a curve here and the mating surface of the heel is curved.

So I can slide this heel up and down on this pylon, and when I do it, if I slide this heel up, now for the heel to be in contact with the shoe, you can see what happens to the pylon; it has to tilt back. And when I tilt the pylon back, effectively the toe is longer. And I can demonstrate that. If I held a plumb bob right down the middle here, which would be the center of force from

the stump, from the amputee, I drop a plumb line, I drop it straight down. If I tilt the pylon forward, I drop a plumb line, now it moves closer to the toe. So, the longer the lever arm, the more force I have to bend the pylon.

You know those drawings where you see a guy with a long pole and he has a fulcrum? He's trying to pry out the rock in his field. He gets a long pole; he can put a lot of force into the rock. Well, the longer the toe, the more force I have to bend this whole pylon. The more force I put into it, the more energy I'm going to have to return out and to run faster. So typically sprinters, athletic people, could have a much longer toe than little old ladies and little old men—you know, that's how we referred to them early on—who needed a short toe lever because they couldn't manage the forces.

So we had a foot, very lightweight, highly energy storage, that could be used for the sprinter and could be used for the geriatric, depending on where the pylon, what angle the pylon was at. So we had a system where the clamp, the prosthetist could unscrew the clamp, loosen the heel, slide it back, effectively lengthen the toe lever, and then you can see the holes in the clamp, he would drill through both the pylon and the heel and then bolt. So if we had sent it to him already glued up, obviously he couldn't move the heel, and to ask the prosthetist to get out two parts of epoxy glue, wrap it, you know, it would just be a mess in his hands. We tried that a couple of times; that didn't go very far.

So there are a couple of reasons we went to bolting. One was just for reliability and the other one was so that it could be user-friendly out in the field.

DENNIS: Where did that energy storage idea come from? Was that kind of already out there in the world of prosthetic technology, or was that something that you hit upon when you were doing karate?

PHILLIPS: Yes. Part of that, once again, all feet were basically just blocks of wood, steel. There was some articulation in ankles with little tiny solid rubber bumpers, but you can't ask a little rubber bumper to store very much energy. It just can't. Physics, laws of physics, the molecular structure can't store and release that much energy. So they were good for slight articulations within the foot, but the idea behind storing energy really did come from a strong, innate desire to not have to land, "kerplunk," on, you know, a solid, slightly articulating ankle.

And, once again, the slide I had shown this morning, I actually had done pole vault in high school and actually, the pole vault that I had, since I wasn't on the senior track team when I just tried it my freshman year, they gave me an aluminum pole which didn't bend. But I had seen the other poles bend that the varsity students had, that the seniors had, you know, that actually bend. And, of course, I'd been to the pool and jumped on a diving board. I knew what things felt like when they could spring. And I just—for the life of me. I just couldn't understand why the foot couldn't spring. I mean, why? It just didn't make any sense. Why shouldn't it bounce? I had a pogo stick when I was young. You know, you probably had one of those, where you hang on the handles and your big coil spring, you're bouncing up and down. I mean, that's five times more fun than trying to run on a non-energy storage foot.

So to this day I'm amazed that people hadn't—well, I am; I'm amazed and I'm not. Because when I designed the Flex-Foot, there was—even ten years before I designed the foot, twenty years before I designed the foot, there was fiberglass. Someone could have made that foot

out of fiberglass. It would have been heavy, it probably wouldn't have lasted as long as it should, but someone could have made a foot out of fiberglass.

When I came into the picture in, you know, in '83, '81, graphite was everywhere and that's how we got our hands on it. It was a much better product than fiberglass. But why, you know, why had that twenty-year period of time gone by where no one had really used plastics or graphites or fiberglasses? In the early patent literature, it's interesting, you'll go back, and if you dig deep there's designs where they have goat stomachs' air bags. They're not used in the way that I'm using air in my products now, designs right now, but they were thinking in terms of articulating facets of the foot that would actually slightly store energy. They used whale—they had bones that would bend, I suppose until they dried out sufficiently and then they'd crack.

But there were early attempts way back when. If you look at the early patent drawings that go 150 years back, people had all kinds of ideas. And back then, it was the materials limitation which kept them from really, you know, fulfilling their dreams. But still, there was that twenty- or thirty-year period where people really hadn't thought out of the box, and that always amazed me.

OTT: Did you try multiple legs that were out there?

PHILLIPS: Almost all of them. You know, when I broke the flat foot plate playing tennis, I had to go back to my Sach foot. Prior to the Sach foot, I had the most technologically advanced foot on the market at that date, which was called the Greisinger foot. It was named after a German, it was made in Europe, it had a horseshoe rubber bumper, it had a horseshoe in the back. It had a heavy metal articulating pivoting ankle, and then these two points, you'd roll forward, and you'd

compress a doughnut in the front, and you'd roll back and you'd compress a heel bumper. Those things always squeaked, they always squashed out, little energy, weighed a ton; not a ton, but maybe a thousand pounds.

I traded up to the Sach foot. Some people think I traded down just because it weighed too much. That's a lot of inertia. It's fine if you're just walking steady state, the articulation is nice, but if you want to put your foot over there, you have to redirect a pound and a half of energy, of material. And it's not a very quick foot. You definitely wouldn't want to run in it.

So I wasn't running then. I was trying to play tennis, I was trying to be more active. The Greisinger is just way too heavy.

DENNIS: Then another question about this energy storage concept. I know that, like, this morning, you talked with the kids about how this shape and the energy storage compares to a cheetah's leg. I've always wondered, when did that idea come to you, or to someone, in the invention process? When did you start thinking about this borrow from nature kind of idea?

PHILLIPS: Well, I have to say that the *C*-shape came prior to thinking about animals. My dad—I know where that sword came; I just remembered—my dad had been to—he flew for the—I'm not able to correct this because my dad's passed away, but my dad, I believe, told us that he flew for the Chinese government during World War II. I mean, we've got all these old Chinese locks and Chinese paper money, and he had a sword that he gave me that was from Mongolia, he told me. And it was a brass-handled, curved—it looks like a scythe. I mean, it's like two and a half feet long. It was in a scabbard that was like a piece of leather that was sewn on the outside, and I was only able to take that scabbard off twice in my life, and then once I got it back on, I could

never get it off because it had shrunken in the attic or something like that. But that was a *C*-shape.

So the original foot I was thinking spring steel, like a leaf spring in a car. But then when I was at the University of Utah, I can't remember where the research was. I think I gave a presentation for the lab; I did. And I was reading about how they were taking tendons from kangaroos, dolphins, and horses, and I remember seeing the literature on it. On these strain gauges they were able to move the elastic return energy of these tendons, which was quite phenomenal.

And then when I started working with graphite, graphite is nothing but strands of filament fibers that are smaller than the hair on your head; millions of them all, you know, bound together like a rope, held together with glues. And it's hard to imagine a strand of graphite, something that's so hard, as elastic, but that's what's happening. That elastic fiber is stretching. And you pull on it or you push on it, and just like a piece of rubber; you can compress rubber, you can actually compress the fiber. You can actually jam its molecules together, or you can separate the molecules.

So when I started thinking about that, and I had the literature from in that laboratory that I had come across about the tendons of various animals, it kept coming back to me to try to maximize the length of the material that I utilized.

And also I had—there's a guy in the high school, one of these kind of guys you'd see in the back of *Ripley's Believe It or Not*, this kind of scientific wizard-looking guy, and he had made this slingshot that was a multiple-stage launching slingshot. Dense, thick rubber bands, smaller thinner ones, smaller thinner ones, smaller thinner ones, so it had, like, an accelerometer effect on its projectile, you know. And the thing would stretch, like, six feet back and he'd say

you could put a hole in the side of a building with it, you know, or something like that. He looked like he knew what he was talking about, and we believed him. You know, we never wanted to get in the way of his metal ball projectile that he was demonstrating in the lunchroom.

So when you design a foot to roll off the toe and to have it propel you forward, some of the other competitors, Seattle Foot, came out—*Reader's Digest* did an article on them before they ever came out. They did a national magazine and a newspaper offering, the UPI, I remember, EPS or whatever it is. They came out and launched record-breaking foot that was supposed to come out in 1983. It didn't come out till, I think, six months later, after Flex-Foot. But they utilized a piece of Delrin®, which is—they used about a five- or six-inch piece of plastic, that same type of plastic that I had described this morning in the lecture to the kids, where I'd gotten a sample from them and broke.

And it's very difficult to ask a five-inch or six-inch piece of plastic to store hundreds of foot pounds of energy, and not only to store it, but to release it when the foot needs to release it during a very complicated gait cycle, as opposed to a long piece of tapered graphite that can release its energy in a more synchronous fashion, in much more complementary to the way the foot wants to start to propel itself and finally come off its toe.

So, coupled with knowing that the longer I can make it, the more energy I can store, the more I can make it more synchronous in terms of how it works like my other foot, I kind of looked at animals that were very effective at running, like horses. And finally the cheetah was the ultimate, and if you look at that long tendon is connected, once again, between three and four joints, and it's actually storing energy and releasing energy through a continuum of phase cycles through its gait cycle when it's running.

It does it in a way that I'll probably never be able to comprehend, but, once again, in making something simple—what's that phrase? Simple is—Be simple, stupid, or something like that. Keep it simple, stupid, or something. Whatever it is. All the Flex-Foot designs are basically as simple as possible for many reasons, but, once again, keeping it simple, and you look at nature, that long continuous fiber down the cheetah's back section is about as simple as you can get. So it kept coming back to simple, simple, simple shapes.

OTT: What's with the split-toe design?

PHILLIPS: Yes, the split toe—there were many years that I never wore even a shoe. Weight was such a factor for me. This was especially before I had my surgery. Before I had my surgery, I had a lot of pain in my stump, and any bending forces, any weight forces—I had neuromas the size of my—which is an exposed nerve—the size of my little finger, buried just under three or four layers of skin, you know, in my leg. And so it didn't take very much pressure to, like, aggravate that neuroma. So any additional weight on my foot would have to be weight that eventually my stump would have to see up here. So going barefoot would just bring a lot more ease of lack of pain in my stump.

So I would put pads on the bottom of my graphite and, oh, very corrugated shoe surfaces, you know, to walk on. And with a solid flat surface all the way across, there's little bending that occurs if I were to step on a rock or go down an uneven surface. There's little means for the foot to adapt, especially since I'm not wearing a shoe. If I was wearing a shoe, the shoe could kind of accommodate on the outside of the foot.

So I came up with the idea, what if I split it? That means if I stepped on a pebble here, the pebble could push up and this part of the foot would still be flat on the ground. So only one half of the foot would have to rise, and this wouldn't really affect my stump. And if I walked on inclines, if this was a sloped surface, and I pushed hard enough down, this would come down and I'd have most of the foot in contact with the sloped surface. So it was just a better way to adapt the foot to terrain, and that actually worked quite well.

The foot that I'm wearing right now is this version [referring to artifact], and there's so much compliability in this dense polyurethane foam here, so that if I was to push normal body weight here, you'd see that the foot would rotate with its pressure, as well as articulate this way, this way, some rotation. So all the compliancy that you needed for inversion, eversion, was taken out by this piece of foam rubber here.

[Begin Tape 2, Side A]

DENNIS: You had mentioned the second surgery that you had to relieve the pain from wearing the prosthesis. So I was wondering if you could talk a little bit about what happened with the surgery after the accident that caused this, to begin with, and what the relationship is between that and the feet you were trying to invent.

PHILLIPS: I'm not sure if I understand.

DENNIS: Well, you had mentioned—

PHILLIPS: My surgery.

DENNIS: Your second—

PHILLIPS: Yes, that was the first surgery.

DENNIS: Yes, and you explained that this morning, but I was wondering if, for the tape, you can explain that again, because you had made some comment about that and how that encouraged you to become an inventor.

PHILLIPS: Well, I lost my leg waterskiing. A waterski boat ran me over, or another boat ran me over in the lake. It was five hours before they got me to the hospital, and even when I got to the hospital, I had to wait for the surgeon on duty to finish up with a motorcycle accident. A guy had lost his leg from a motorcycle that same Sunday. By the time he was finally done, it was such a difficult operation, he was exhausted. So now I had to wait for them to get the other surgeon in, and he was off somewhere, so I had to wait like three or four hours for him to get in the hospital.

This surgeon, who I don't particularly care for, retired a year after he did my surgery, which meant he had been around a long time; he was an old man. And basically the style of surgery was just to cut me. "Cut it clean, sew him up."

Now what they do is they take muscles and they tie them off so you have proper muscle tension. Without tension to a muscle, a muscle can't contract; it has to have an attachment. I didn't have any attachments, so my muscles kept receding back, back, which kept leaving more and more of my tibia exposed. A lot of surgeons, they'll take that tibia and they'll make a nice

round finger-looking end to it. But my surgeon, it looked just like a chisel; had two corners on the end, shaped front, knife edge on the bottom, and you couldn't put very much pressure on at all. Had no muscle covering, no venous supply to the end of it, left nerves just resected, you know, just barely buried in fascial tissue underneath.

It was very painful surgery that was just getting worse and worse each year. You know, without great muscle tension, you can't develop good capillary blood supply to what's existing, and that kept getting worse and my stump kept getting colder and less blood supply.

So hadn't I done anything, probably as I got older I probably would have had a major revision. I might have become an above-knee amputee. I probably would have had breakdown and not enough blood supply to repair the wound. I couldn't weight-bear on the end of it, I have a very short stump, and it was getting smaller every year.

So I finally, after about ten years of putting it off, I finally had what's called an Ertl technique, which I highly recommend to any amputee. What they do is, they take a piece of bone from your hip and there's what's called periosteum that surrounds and actually grows bone; it's like a sheath that actually feeds the bone and grows it. They took some of the periosteum from my fibula—actually, my fibula and my tibia had grown to look like this [gestures], you know, if you looked at an x-ray, and they were almost touching. So they separated them a little to normal, and they were about this distance, too. They shaved a little bit of the tibia off, they took a piece of bone from my hip, and they took the periosteum, a flap of periosteum with it, and they sewed it to this periosteum and they sewed it to this periosteum, and the bone kind of ceded in the middle and the body filled in bone. So I have what's called a bony bridge between the two. Now, you know, it looks more like this [gestures], and if I had a foam cushion I could stand on the end of that.

So now I have end-bearing inside my socket, where before I had a chisel, which would have—like, I couldn't tolerate any weight bearing. And when you hear about these astronauts that come back from being in weightlessness, they've lost so much calcium from their bones, their bones are brittle and soft. Well, because I wasn't able to load that bone, I was losing bone from my bone, losing bone metrix. Looking at it on an x-ray, it was very, very highly calcified. It was little bone structure within at all. So I was lucky that at the state of the health that my bones were in, that they actually receded and they grew back. But, nature, with force, grew back those bones.

When I had that surgery done, they also resected a nerve from my leg that was about the size of my little finger. Pulled it out and they cut it so it would bury itself way up inside my stump. Relieved almost all of that pain. And now I have an end-bearing stump with good muscles that are now reconnected and sewn to the bone so they're not going to retract anymore. And I could start to run again. I could actually—didn't have the nerve problem, I had good venous supply, end-bearing support, I could tolerate pressures over the whole stump.

It was about the same time that I invented the vertical shock leg. In fact, I put out a videotape that I tried to get Flex-Foot to distribute, about rehabilitation after one loses an artificial leg. Because essentially I had almost a brand-new operation when they did my re-surgery. Almost a month after my surgery, I got this leg on a socket that was now going to fit me because my whole stump had changed, and I got my crutches, forearm crutches, which are much better than axillary bearing, you know. Typical ones that you see. And I was running, just putting a little bit of weight on this foot, but fully running on this foot, and using my crutches to help me along with my amputated side.

So my rehabilitation process was, I was running two and three miles a day with crutches, with my vertical shock prosthesis. And that really stimulated the bone to grow, and didn't put a lot of trauma on my leg. I just had to keep it moving and lightly, you know, weight support with my crutches and my leg. And in my community, you could see, here's this guy running around town on forearm crutches. Got triceps that were quite strong, and it worked out pretty well.

And then from there I started—prior to that, the Paralympics athletes, I had already designed legs for them, but I wasn't wearing them. I couldn't tolerate the pressures on them. And now I could start to wear my own designs on these *C*-sprint legs that I was building for them. And they only got better and got better and got better. I think mine's around here somewhere. Right here [referring to his own C-Sprint]. And this is as far as it's gotten today in terms of the work that I've done on it.

Once again, you see that same *C*-shape, long fibrous continual shape, and this toe will actually move up towards, this will bend. When I'm running, there's three times body weight; I'm about 150 pounds, so that's 450 pounds. As I mentioned earlier, that's like two big football players, one sitting on top of the other guys' shoulders, sitting on that. That's how much force that leg will see when I'm running; 450 pounds. That's a lot.

So when I come off the ground, I mean, I can kind of demonstrate it, too, how quick this thing moves. I'm just pulling back fifty pounds, like one-seventh, one-eight, one-ninth, of what I'm really putting into it. That's faster than—I mean, that's probably three or four thousand miles an hour that it's moving. No, not that much. It would probably be three, four hundred miles an hour, probably, that's moving that fast.

If you take your ankle and you dorsiflex your foot and you plantar flex your foot, and you try to do that—you can try right now with your foot. Try to do it five times, as fast as you can.

All the way back and forth now, not just little motions; up and down all the way as fast as you can. It's really slow, isn't it? So you think about how fast can Carl Lewis plantar-flex his foot and push his foot up? Not very fast. So that's why, as I said earlier, this is much faster than the foot portion that I'm replacing, and much lighter. I can swing this—when this is attached to my leg, I can knock a cigarette out of your mouth in a bat's-eye wink, you know, five times faster than I could do with my sound side. It's that much lighter and that much quicker.

OTT: Is that plastic attachment, sleeve, was that your idea, too?

PHILLIPS: No, that had already come up by somebody else.

DENNIS: I was going to move on maybe a little bit. If you could talk a little bit about your overall experience with the patent system. I know you have maybe forty patents or more. Can you talk a little bit about that?

PHILLIPS: I'm not sure where I'm going to go with this, except that I would probably give a warning out there. I think if I was to do it all over again, I might not use the patent services. I'm involved right now in another litigation where someone has come in and completely stolen my ideas. Twice it's happened to me that our manufacturer has broken away and copied my ideas and involved millions of dollars of litigation expenses. The time and the effort to defend them and to—all the work that, you know, you have to spend time interviewing with lawyers and doing—what's the word when you do these interviews with lawyers?

DENNIS: Depositions.

PHILLIPS: Yes, depositions. Time spent is just endless. And the money spent. And the money spent for patents are incredible. I mean, patents these days are ten to fifteen thousand dollars, you know, completed patent. Not to mention re-filing and foreign filings, and addendums, and continuations in part, and defending your patents. I mean, most of my trips to Washington, D.C., have been for a day just flying out from the West Coast to try to educate the patent examiner to help him understand why this is different from anything else. It usually pays off, but, once again, there's a lot of time spent, a lot of money.

Has it been worth it? I suppose in the long run it is, because we were able to grow the business, sell it. A lot of it was based on, you know, it's proprietary knowledge of what's patented. But it's such a laborious, painful thing. And then to have people two and three times in my life just come in and blatantly say, "To heck with you. Take us to court." Or, "No, it's not the same as yours. We've done *this*." And my analogy is, you've invented the steering wheel, and someone puts a little handle in the steering wheel, or knobby grips on the steering wheel, either one, and says, "No, we didn't copy your steering wheel. We invented *this*."

And that's what it's usually boiled down to, is defending patents against people who are—actually, it's teaching me a lot about human nature. People who want to believe themselves, I think really do believe their own lies. And it's a tough one. I mean, psychologically you look at it and do they really believe what they're saying? I vacillate. Some days I really do believe they do believe they're not lying, and some days they know they're lying through their teeth. It's really hard to have them work for you for ten, twelve years and to have them go off and just copy all of your product. And that's what's happened again to me. It's like

getting your house robbed, or being raped if you're a woman, you know. It's just really hard. It's inevitable, I think, in the world, but that's a reality.

So if I was to come back, you know, I worked on a lot of feet. My one thought was you just keep inventing, just keep inventing. Okay, let them copy that one, let them copy that one. You know, the world knows that they're only going to copy what's two years old, and it's like, why would a car manufacturer copy what's two years old? Because they're already outdated. There's already bigger disk brakes and power steering now, and whatever it is. So that's kind of the way I'd probably approach it now.

OTT: Can I go in a different direction? Tell us a little about Aimee Mullins and the whole working with her, and then that resulted in the sprint leg having so much more cachet and the whole thing.

PHILLIPS: Yes, I love Aimee Mullins. I think she knows that, too.

DENNIS: Now she does.

PHILLIPS: If she ever looks at this tape. I think she already knows that. Aimee Mullins is—I'm surprised they didn't make a movie, *Aimee Mullins*, you know. She really is—I think we first met Aimee Mullins when she was, I think, a junior or a senior in high school. It was somewhere like Philadelphia or somewhere. Flex-Foot had gone to a national track meet and Aimee had shown up, just started running. She was on Flex-Feet, she was on Modular 3s, which is essentially this one here [referring to artifact]. But she had tennis shoes on, and cosmetic cover;

thing probably weighed four pounds by the time it was fully covered. She had a really bad socket design and was wearing socks, and she had blisters, and straps trying to hold the leg on. And she probably had, like, ten prosthetists, "Let me be your knight in shining armor. Let me help you," even though she wasn't even eighteen.

But you just couldn't help but want to help Aimee Mullins. Both, you know, bilateral, both legs off, trying her heart out. So I think I did what I could for her that day. I think I suggested something else, or, "Try running without your shoes on and we'll send you different heel heights," or something.

Then she went to college. She called, and I had just had my surgery and I was just now wearing the *C*-sprint, and I was running. Before then, it was [unclear] for Dennis Oehler, just, you know, always taking pictures of Dennis Oehler. "How did that feel? Oh, should I make it a little softer here? Tell me, did that work? Oh, I'll do it this way for you next time."

But now I was making my own legs and I had just come up with this *C*-Sprint design. And Aimee called me up, and I said, "You know, Aimee, I think I could do a lot better for you. I don't know if you know, I had this surgery, and I'm running, wearing my own design legs. Why don't you come out to San Diego. I'm working with this great prosthetist, Wayne Wilkerson."

Aimee took me up on it. She flew out, she stayed at a hotel, I think in Del Mar or something like that, or some friends, and she saw Wayne. Wayne is amazing. She flew out, Wayne casted Aimee, both legs, did check sockets, which is a long, lengthy ordeal. We had the *C*-shapes already made. So we made a socket, we attached the sockets, we put the feet on them, running pad, the whole thing.

Took Aimee Mullins to University of California, San Diego, La Jolla campus, where they have a poured red rubber track where I was training, where you could fall down and not kill

yourself on gravel or hard surface. And Aimee ran. I mean, she really ran. It was the funniest thing, all of her other feet had had heels on them, now we're just putting her up on her toes. She has no way to—I mean, when I wear this, I stand on my right leg when I'm not running, and this one kind of just bounces, goes off to the side.

So there's Aimee Mullins, like a ballerina, "You want me to do what?" She's kind of like doing a little tutu thing, trying to balance. Then she goes off and she runs back and she runs. So I think it was one of the high points in my whole career, to kind of set her free, I mean to really let her run and to give her full leaps and bounds and to watch her try to stop. You know, at the end of the track, "Come on, Aimee, stop, stop, stop."

"I'm trying." There's no heel to put your foot down with when you're kind of going to a stop.

Then, from then she got interested in the Paralympic track team and set world records. Then Aimee, of course, you know, didn't stop there. She took it to Paris runways and she became an international fashion model and had her own TV show. You couldn't keep up with Aimee Mullins. She was on every talk show in the country and all around Europe. I haven't talked to her in a good number of years; I'm not even sure what she's doing now. Something big.

OTT: Is that what sort of propelled the sprint leg into popular culture, do you think, with Aimee wearing it, or had it already happened?

PHILLIPS: Well, it had already happened. Dennis Oehler, you know, tribute to him, and Todd Schaffhauser —I mean, part Aimee Mullins, Dennis—in fact, on myself, there wasn't one *48 Hours*, or was it—it's been so long now—*20/20*, *48 Hours*, all those TV documentaries, Dennis

and I were on every one of those. Actually, when Aimee came out, I can remember her coming out, and *20/20* had us go to a little cute Italian restaurant in Del Mar. Like, here's the inventor with the newly running bilateral, first female running amputee in the world, working out their running designs over a cappuccino and a tiramisu. [Laughs] I wish I could remember the restaurant. They used that piece on the television shot.

But, no, the running world or the audiences throughout the country had already been acquainted with Dennis Oehler and graphite technology and Flex-Feet. But now women entered into the scene. And Aimee's pretty. And pretty women coming on and doing things that only guy athletes, amputees, were doing before, in a very sophisticated, elegant way.

And then there was another bilateral. She's going to hate me; I forgot her name. And the women just kept coming, women who can run. Because I can take—it's a claim to simplicity—I can take anybody forty and under who's ever jogged before, and in five minutes I can teach them how to run on this leg. It's just that easy. I mean, just so naturally get on, you bounce of it. It's like, how long does it take a kid to learn how to bounce on a trampoline or a pogo stick? They just get on and do it.

But Aimee and her flair for style and her beauty, I mean, some of her shots were just downright evocative, you know. I don't know if you've seen those. You cannot tell for a split second that her painted silicone skin is anything but real, and the way her stockings fit over it, and her high-heel shoes. And then it was a real testimony; I think she came out on a pretty renowned international runway with her Flex-Feet and a Gucci gown, or some top Italian designer. It was quite a statement.

OTT: I was going to ask you to comment on the politics of disability and disability culture and where we are today and how you've seen things change.

PHILLIPS: This is from my own vantage point, obviously. When I lost my leg, I didn't know there were artificial legs, because the only people you saw wear artificial—no. The only people you saw without legs were street people. I grew up outside of Chicago, so you drive down to Chicago either with a school outing or with your parents, in the back seat of the car, and you look out and you see a guy with his pant rolled up pinned, you know, on crutches. So usually you thought of people without legs as those being the down and out. Because everybody else was wearing long pants, high-top socks, and nobody talked about them. It just wasn't public.

My experience as to why that occurred was because artificial legs were pretty horrible devices. They were heavy, they didn't fit, there were blisters, there were sores, they were equated with ugly war stories, people coming back—Uncle Joe, you know, who's kind of unhappy and kind of grouchy, or diabetics who died three years after they got their leg. Just the fact that a surgeon has to cut off a leg that he can't salvage is a bad story for even surgeons. You know, they lost a case.

So amputation, amputee prosthetics, has always been not a very pleasing, not a very profound medical science. It's been kind of kept under the rug. I can even remember with my Sach foot, my Greisinger foot, I hated those feet. I haven't hated very many things in my life, I mean real hate. I don't have a hate—even say the word, it has a sour taste, and I've only experienced that two, three times in my life. But I hated my artificial legs prior to Flex-Feet. I hated them. I would get so mad at them, I'd throw them across the room.

They hurt, they were heavy, you couldn't do anything in them, people stare at you. If you wore socks, they gave you blisters, you had sores. You had to take them off at night. They smell bad. You had to wait hours—you know, the prosthetic shops of yesteryear were kind of antiquated. You usually had to sit there and wait for hours and hours. It's not like going to a doctor's office and waiting twenty minutes to see a doctor; you waited four hours sometimes. To get an appointment took months. So there was a lot of things wrong with artificial legs.

So the mentality, there wasn't a supportive mentality to support investment dollars into it. Well, there's no money in it. There's a reason why no one had come in, like 3M or Johnson and Johnson, said, "Hey, we're going to make the world's best artificial limb and capture the market." If they did, there was no profit, even for the number of legs they could sell. There were 200,000 legs compared to they create a prescription eyewear, and there's 50 million people who wear glasses. Or artificial heart, you know, you can sell an artificial heart for hundreds of thousands of dollars, whatever the total bill is. There's thousands of people that have hearts that are bad.

So, why? When I designed the Flex-Foot, the wholesale cost on an artificial foot, one of the most important body parts on your body, was thirty-five dollars. That's what the foot cost to a prosthetist. Thirty-five dollars. What body part could you replace for thirty-five dollars? I mean, to this day I think it's just kind of ludicrous.

So we come out with Flex-Foot, there's no way you can make a Flex-Foot and sell it for thirty-five dollars. So we had to fight, we had to go up against third-party payees, Medicare, MediCal, state reimbursement funds, insurance companies. "No, that's wrong. You need to be willing to pay more than thirty-five dollars because this man's life is worth more than the thirty-five-dollar foot that you're willing to pay for." You get what you pay for. You put a thirty-five-

dollar foot on a person who wants to do anything but get to the refrigerator, to the toilet, and back to his bed, you're really harming him. You're dysfunctioning his whole total outlook on life.

So that was a big battle that Flex-Foot played out for many years. And as more and more people understood that there was room in the industry for products that actually function quite well, and that they deserve to be paid for more than the thirty-five-dollar-foot level, we had more and more support. And now there's different categories, and still we're trying to expand the categories so that even the diabetic, who isn't going to do a Dennis Oehler hundred-meter around eleven seconds, still, when he ambulates to the grocery store, even if he gets the handicapped parking place, he's working just as hard as Dennis Oehler is running the hundred meters as walking down the supermarket aisle. When he comes home, even wearing a Flex-Foot, he's just as tired as Dennis is from a two-hour training at the track. So he should have every advantage in something that stores energy and releases energy rather than lugging some heavy, dead inertia-laden product around.

So it's taken a long time for people to understand that. Because I could put on a Sach foot and walk across, walk down the hallway, and you go, "Wow, that foot does pretty good for you." But you're not feeling what I feel. You're not exerting the energy that I am from underneath my pants to push that foot forward, to land kind of abruptly to stop, to have to pull back just before I hit, because it's not going to cushion my impact. And I'm not even attempting to run for you. And not to even say anything about what if a car is coming down an alley and it doesn't see me, how quickly can I get out of the way? I'm a dad. I should be able to run with my daughter if she wants to run, or I should be able to go to museum all day long, or go to Disneyland and be able to keep up with her.

So there are so many things that doctors in offices don't see when they're asking the patient to walk across the room for five or six physical therapists to see if that patient has been rehabilitated in a hospital setting. That's not real life, but that's how they're judged and evaluated.

[Begin Tape 2, Side B]

OTT: What groups of people do you see as a cohort, people with disabilities or able-bodied people, typically-abled. What do you think, open-ended?

PHILLIPS: Well, just give me a little bit more direction in terms of what you'd like me to comment on in terms of the disabilities out there.

OTT: Well, amputees or diabetics or people who use wheelchairs, do you think of yourself as a person with a disability or do you identify in another way?

PHILLIPS: Well, just a couple of comments or thoughts that jump right out. Something interesting to hear is if you went to a disability track meet where there were amputees and quads or paras in wheelchairs, it's very rare that you'll ever see an amputee go over and talk to anybody in a wheelchair. I know you're wondering why, and that is because—this is my strict opinion and I'll bet you a dollar I'm right—is that every amputee is downright grateful but also fearful that they didn't end up a quad or a para. I believe it's every amputee's worst nightmare that they should ever become a para or a quadriplegic in a wheelchair. And they know that it could have

happened to them. You know, the motorboat could have run over my spine. I could have bled so much that I would have lost both legs; they could have cut both of them.

So there is a different life between what an amputee experiences and what somebody wheelchair-bound has to experience. I can't say I've fully fathomed what a wheelchair-bound person experiences other than to say I'm glad I don't have to.

I will say I don't understand all the handicap, "You've got to have this and you've got to have that." I think that may have gone a little bit too far. I don't know. I think it's too bad in this country that there's not an understanding or a willingness for people, if the one in 500 people in a wheelchair needs to get in a building, that there aren't enough people that could just pick the person up and carry them in, as opposing to having to build a whole structure for them that's not going to work for somebody. But that may well be a comment of our society rather than the disability itself.

I know that on a good day—well, on this leg, I can—looking around, except for—well, maybe both you guys, I can probably—what else is in there? I can beat almost 95 percent of males my age I can beat in a race. So do I consider myself disabled when I look at that? Yes, I do when I think about—I live in Mendocino, and a lot of guys go out abalone diving, which means they have to carry their tanks, they put on a full wetsuit, they go in the water, they come out, they take off their fins. That's really hard for me to do. I mean, I can do every one of those things, but it's so hard. And if I go in cold water, so much blood goes out of my stump into my vital organs, my leg's not going to fit and, you know, it's just so much hassle.

There's so many things that are disabling to me. For me to go tour your whole museum, to stand there on my leg, is going to drive a lot of the fluid out of my stump, which means my stump's going to get small, which it's going to be uncomfortable. That's not fun.

So I've been to Disneyworld. We had a convention there. I went in a wheelchair. This was before my operation. I think I could do it now because I could just keep walking. But I sat in a wheelchair. I got pushed around by my partner's wife. I can usually dance all I want. I'm afraid to go to the Himalayas or to go hiking for any long period of time because, once again, my stump gets so small. What happens if I get a blister or something like that?

So there are a lot of things I can't do, but I don't consider myself disabled. But the people who I empathize for—and I come across this every now and then—right now I have a sore on my leg. It doesn't go through the skin; it's just like a little pea underneath my skin. Well, there's no room for my leg to expand because my socket fits so perfectly. So it can only get worse because my body wants to relieve the pressure and it does that by creating a swelling. It's kind of a catch-22 that goes on there. So I've had to take off my legs, leg, and go on crutches. I'll tell you, in a small town like Mendocino, you go where everybody sees you every single day either with shorts or a leg that works pretty well, and they see you on crutches with your stump dangling behind you, that feels awfully debilitating, awfully—you know, it feels awfully like a handicapped person.

And to think about getting old, where the leg may not fit, or for whatever reason it may not work. So in the back of every amputee's mind, there's, "I can wear it fine today, but what about twenty years, thirty years from now?"

So there are those thoughts. And diabetics, in particular, are those who most likely, eventually, will get sore, and that sore won't heal, and then their health will decline and they'll slip into death. For most diabetics, you usually surround the ability to not wear their leg, to not ambulate, because as soon as a diabetic doesn't ambulate, it's very difficult for them to control their body's homeostasis and their blood sugar rises and drops and they become ill quickly. So

for a diabetic, their amputation will eventually be their disabling handicap which they'll have to face before they die.

So there are all different levels, but to resound and complete your question, today I feel okay. I'm not handicapped today.

DENNIS: Well, we're running to the end of the questions here, so I don't want to have to make an abrupt transition, but you say you don't feel handicapped today, and where I was headed was, if you could talk a little bit about kind of like a snapshot of your life before your accident, boating accident. What were you doing?

PHILLIPS: In terms of able-body-wise kind of thing?

DENNIS: Well, I know you were a college student, but what were you majoring in, what were your plans for your life, what did you think you were going to be at that point?

PHILLIPS: Well, I was enrolled at Arizona State University and I was enrolled in mass communications and advertising. So I was doing kind of a joint thing. I was doing TV announcer broadcasting and/or I was going to go into directing, creating, producing TV commercials, which meant a lot of time in studios behind cameras and kind of closed, cold, dark kind of TV studio-lit areas. I found that really, really difficult to do. Usually when you start out in television broadcasting, you're a grip, you're behind the camera and you're standing and you're standing. Right now, our camera operator is sitting right there. That would have been a

luxury for me back in that studio when I was trying to see if that was suitable for me. So I made a choice. I shifted. I said, "I can't do this." Just realized it wasn't something I could have done.

Plus I had other interests at the time. After I lost my leg, I had met a man who was interested in biofeedback. I was already meditating and I was taking yoga classes, and I was fascinated with the idea of maybe getting a master's in social work with a biofeedback background. I was interested in the powers of the mind and what could be done with electrical feedback in terms of helping and monitoring and altering brain waves for altered states and that sort of thing. So I kind of easily fell out of it. I kind of look back, and I look back, well, gee, where would I have been had I been in some advertising company, creative guy working with some advertising agency? You know, you kind of have a stereotypical image of who that person is and where his life goes. I don't know.

I'm happy to have contributed what I've done and not the least bit unhappy where my life is right now, and can only be curious about where it would have gone, what things would have driven me, how far they would have driven me, and how I might have, or might not have, come to have known myself as I do now from those professional careers. It's only speculation.

DENNIS: I had several questions about where the future is headed in terms of prosthetic technology, and one of them was what are the problems with—I mean, is this foot that you're wearing, is this the perfect foot, or what would you do next to it? I'm not really thinking about the other project you mentioned about the foot for landmine victims.

PHILLIPS: The perfect foot is not attainable today, and I probably won't be involved in it. The perfect foot will be a foot that has power, and right now nobody knows how to create enough

power or to pack enough power to function a foot. Not only do they know how to power a foot with enough power—we're talking battery packs that would be twenty, thirty pounds on your back, or your extension cable would have to go, you know. Because to push your foot—see, not only do I weigh 150 pounds, there's a seven-inch toe lever there. So the amount of force needed to push that toe lever is not 150; it's seven times 150. You know, it's close to 1,000 pounds. So that power plant has to push 1,000 pounds thousands of times a day, and that's only if I'm walking. If I were to run, it would be three times that. That's a lot of power. It's a lot of energy. And that's a very, very, very strong motor, or a very, very, very strong mechanism that drives the power.

So there's not only the power, there's the mechanism. The mechanism has to be able to be waterproof, dustproof, it has to be extremely lightweight. Already this foot that I'm wearing, which is just a lightweight foam ankle block, is already too heavy. In my opinion, this foot would sell a lot better if somebody could make it a lot lighter, and I have plans to do that. It's just too heavy to go dancing quickly or to play tennis. It's too heavy to play tennis, in my opinion. I'd much rather play on this foot with the weight [referring to his other prosthesis].

So to add any complexity in the foot, power and ankle, have a battery pack, have all that reliability built into it, I don't know how to do it. I think anyone who thinks today that they know how would be kidding themselves, because by the time they finish with the foot and cover it so it wouldn't get dirty and break down, it would weigh just so much that the amputee wouldn't want to wear it; take something simpler.

But the next evolution in this foot is what is attainable today, and that is a foot that's adjustable in terms of its resistance for walking and/or for high sports use.

We did a lot of groundwork in that area with this air foot. This foot here [referring to his own prosthesis] has the same graphite leaf structure here, and it has an auxiliary graphite leaf-spring up on top. And the only way that this spring comes into play is when this foot moves up and engages the top spring. And it will engage it a lot quicker if there is air pressure in this airbag. It will engage it instantly if there's forty pounds of pressure in there. It will be as if this is already connected to this; it will just move right in that air, the air will push right up on the spring.

So what the amputee had to have done when this came out was to take an air pump, and if you want to start running or increase his activity level, he'd pressurize the air cell and then he'd have a foot that was two times stiffer as needed for his running requirements. So that's where my next design would go, is a foot that has the ability to do that on the fly. It's kind of like we've got four-wheel-drive vehicles now, as opposed to when they had Willie's Jeeps twenty years ago. You had to get out, turn the hubs, throw the transverse case in. And now it just engages automatically. If one wheel spins, it will just kick in.

So that same technology is something I'm working on right now, is the foot will automatically adapt, footstep by footstep by footstep. And the technology I can allude on a little bit, is pretty simple. There is a direct linear response—linear means steady state, equal response—to if I walk—normal walking cadence—I'm having to guess, it's been a while since I've looked—is forty to sixty steps per minute. Every second, every couple of seconds, I've taken a step. When I run, when I jog, I'm probably taking twice as many. If I run fast, I'm running another twice as many then again. And if I had force plates on the ground, if I'm walking, I'm 1-G. If I'm jogging, I'm 2-G. If I'm sprinting, I'm 3-G; 3- force is my body

weight, the force the foot needs to respond with against is three times as much. And that equivalates linearly with how many steps I'm either walking or running per minute.

So the smarts needed for the foot is basically a simple step counter, and those are twenty-five-cent electronic items that are already on the market and they weigh a fraction of an ounce. So the steady state, you know, the little tiny circuitry needed to count the number of steps, is already out there. What then has to happen is the foot needs to become stiffer according to how fast, how many footsteps it's taking. And that I can't tell you because that's patented, and I couldn't patent it if I publicly disclosed it right now. But that is what I'm working on right now, as to how the foot will automatically engage into a soft or a stiff mode.

So if I was dancing tango, which I want to start doing—did you see the movie—what was that called? *The Last Tango*? With Robert Duvall, he directed and starred in it. It's kind of a fun movie. I think I'd like to start tango dancing, and a lot of the dances, you really have to put your foot out and go into elongated, accentuated posture or pose. Well, at the same time you can speed up and you need to have the foot respond quickly. So if I have an ankle that allows the foot to dorsiflex or plantarflex, it will have to be very, very flexible, you know, in a mode that's not going to be suitable if I want to push quickly on it because the response will be too slow. It will be too flexible, it will come all the way back, and I'll have to wait for it to come all the way back and then respond off of it. So you'll need to have a foot that responds pretty quickly to be able to have really long, slow, kind of unresponsive reflexions, versus ones that cause for snap, highly quick responses. That, to me, is the next level.

Also, the amount of, as I said before, the weight. I think I can probably take a third of the weight off the current foot that I'm walking on, which is a lot of weight. That just means I can put it wherever I want a lot quicker.

I think in my lifetime—I'm making a big statement here; it's pretty bold—I think in my lifetime that's what I'm going to experience. I don't think I'm going to experience a powered ankle that's going to give me what I want, because my weight requirements are so much more stringent than most. There are people that can tolerate maybe another pound. I wouldn't be able to tolerate that. So I probably wouldn't be able to tolerate the first powered ankles. Especially as I get older, I'll want it lighter and lighter all the time.

OTT: What do you think about the C-leg, the microprocessor, hydraulic—

PHILLIPS: Oh, the above-knee?

OTT: Yes.

PHILLIPS: I'm not an above-knee. If I were above-knee, I'd want, yes, I'd want an intelligent knee. In fact, the project—Flex-Foot had MIT do their artificial intelligent leg that is just now coming on the market. And Van and his group of engineers was supposed to do that leg at Flex-Foot, but Flex-Foot didn't believe that Van could pull it off.

So Flex-Foot allowed Van to contact his buddies at MIT and for Van to take his ideas and for MIT to take them. And so they took the basic concept, and, of course, they had to put their spin on it, and then they did all the microprocessing computer work that Van would have had to hire his microprocessor engineer to come on board at Flex-Foot, which we had lined up to do, but Flex-Foot chose not to go down that path.

So I was already working on an intelligent electronic knee and had some fairly sophisticated means and ways to do it, which MIT borrowed most of them, or a lot of them, put it that way, and changed it and made their own. So I would have gone down the electronic knee path had I been given the opportunity.

DENNIS: So is it a good product, then?

PHILLIPS: Oh, I think an amputee needs to have an intelligent knee. There's too many things you're asking the knee to do. You can't—you know, there's 120 degrees of arc of movement that the knee has to go through. The ankle is relatively nominal and can be accommodated in many different modes than you can ask a knee to do. Especially if you're going to tango on a knee, you're going to want the knee to be able to respond and come down and snap and come down. There are five times as many requirements as a knee as an ankle, even though it seems like just a joint. It positions the final joint in a critical place in space. It has to be perfectly right on. I mean, if it's a half second late, you'll stub your toe and you'll fall down. You know, my ankle will never stub my toe. I'm not going to worry about stubbing my toe and falling down.

DENNIS: So what do you think, then, about osseo-integration?

PHILLIPS: I'd like it to be perfected right now. Össur—I mean Flex-Foot, before Össur came on board, the pioneer in osseo-integration is a Swedish man by the name Branemark from Sweden, who has his history basically in dental implants and took that and formulated into osseo-integratingly taking prosthetics and having them work.

If you look at the research, as we did at least—well, this was five, six years ago when Flex-Foot was intact—the results were astounding, yet they weren't asking the amputees to do very much on their legs. Most of the results were above-knee; they had some success in below-knee amputations. Not about to become an above-knee just so I can do an osseo-integrative prosthetic. But there are still too many incidences of tibular failure; the tibia would shatter. You know, the loading forces, as you can imagine, by putting a titanium rod up inside the hollow of your fibula, are tremendous. How do you keep that from prying open?

The other thing that's difficult, that they're facing is—you know, most amputees are diabetic, which means they already have a poor blood supply. So you're asking the body to keep the blood supply healthy to the bone and the muscles without being contained by a socket that's actually beneficial in some ways just because it helps condition the body for pumping and keeping the body from blowing up with atrophy.

Have you ever been on a plane, long plane ride, and you can't get your shoes on? Well, without support around your limb, your leg will kind of blow up, especially with diabetics. So they have vascular problems, and if the problems get out of hand, then they don't have blood supply and then they don't have good bone health and they have fragile bones. Most people over fifty have osteoporosis, so you're going to get osteoporosis in your extremities before you will closer to large blood supplies. So it's an area that probably needs a lot of research, at least before I would try to do it. But I'd love to have it. I'd love to just be able to ["pop" sound], never have a socket, never have a silicone sleeve, never have another blister. But they're still working on it. They're far from being perfect right now.

I would think that just as quickly as they perfect that they'll have donor—I'm more expectant on donor than I am osseo-integration for long-term success.

DENNIS: Donor limbs?

PHILLIPS: Yes. I mean, you can already—I could completely cut my leg off and they could sew it on, I'd have most of my function. If, you know, it's right there and it's bacteria, and the nerves haven't degenerated, they can sew legs back on and get most of the function back. So right now it's just body rejection, as I understand it. So I'm—perfect that, I'd take somebody's leg. I mean, I can still wiggle all my toes in my leg, and I always rehearse and practice that. I want to keep those nerves intact. I can do it right now. I can wiggle every one of my toes, I can do this with my foot, up and down.

DENNIS: I guess my last question would be, is there anything you want to add, or is there a question we should have asked but we didn't?

PHILLIPS: There's probably something about—it depends on who's going to watch this tape. Something that an amputee—if you're a new amputee and you're watching this tape, it's almost—and I forgot to mention in this morning's talk. I can remember on crutches, when I just got my temporary, my first temporary prosthesis, I was told to walk three times a day, twenty minutes a day, to start conditioning my limb, to start forming and allowing my body to be able to tolerate an artificial leg.

So, doing what the doctor ordered, I was out with my crutches walking on my pink foot and my tubular aluminum pylon and a little bedroom slipper hump, the back streets. And I remember stepping on a pebble that big [gestures], and I didn't have a split toe, so, of course, it

really threw my foot over and I almost fell down. And I remember standing there—to this day I can remember standing there with crutches, crying, thinking to myself, "I never, ever, am going to be able to walk." I couldn't imagine. That little stone. How could I ever walk?

And it wasn't until my mom brought—a couple of days later, she had some young teenage kid who had lost his leg come over, and he had a very long stump. He got bit by a rattlesnake and the doctor salvaged almost his entire limb. The guy could run really well because he had the lever on that pushed the prosthesis. And he ran in my backyard, and I was sitting in my bed feeling sorry for myself, and I sat up, and I yelled out, "Yahoo! Wow!" I could envision it now. I could see that I could do it.

So part of it is, you just can't, as a new amputee, you just can't imagine what's possible. And just like that young boy came over to my house and tried to help me imagine my life, once again fulfilling my dreams, I'd just like to add that, you know, that is so much of a part of one's rehabilitation, is just to keep the possibility open that things will be different, that things can only get better. But for that to happen, one has to really take the care and the time and the consideration with oneself.

It's a very internal road one has to take, being a new amputee, and a lot of times you can learn that from other amputees. They have amputee support groups and they have people that have been there and done that. But that's a big part of becoming—learning to deal with one's amputation, is the belief and the effort that it takes to overcome the situation. So if you're an amputee, or you're not an amputee and you know someone, a lot can be said about offering that possibility in terms of hope to that person, either to yourself or to an amputee. There's a lot of mileage there.

That's probably all.

DENNIS: We're done. Thank you.

[End of interview]

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