npr

krulwich wonders

< Going Binocular: Susan's First Snowfall

June 26, 2006 · 5:38 PM ET

STEVE INSKEEP, host:

It's MORNING EDITION, from NPR News. I'm Steve Inskeep. Good morning.

Here's the story of a little girl and a little miracle as it can only be told by NPR Science Correspondent Robert Krulwich.

ROBERT KRULWICH reporting:

Dr. Oliver Sacks, famous author and neuroscientist, was at a party a few years ago and he was introduced to another neuroscientist named Susan Barry. They got talking, and at one point he remembers Susan turned to him and she said:

Dr. OLIVER SACKS (Author; Neuroscientist): You've observed I have a little squint. And I said, no, no, no, well - and I said, well, well, yes, I have.

(Soundbite of laughter)

KRULWICH: Because there was something a little off about Susan.

Dr. SACKS: And she said, yes, she said she had, in fact, been born cross-eyed.

KRULWICH: All her life, she told him, she had never been able to see with both eyes at the same time.

Dr. SUSAN BARRY (Neuroscientist): I have no stereoscopic vision.

KRULWICH: But aside from that, she said, I'm pretty normal. I see what other people see. And that is when Dr. Sacks leaned in...

Dr. BARRY: And he looked very seriously at me and he said, do you think you can imagine what it's like to see the world with two eyes? And I said, yes, of course, I can imagine that. I'm a college professor, I teach about it in class. So, yes, I think I know exactly what it is I'm missing. And...

KRULWICH: Did he say anything?

Dr. BARRY: No.

Dr. SACKS: Oh, I left it there. Then, three months ago, I got a letter from her, an amazing letter, in which she said:

Dr. BARRY: Dear Dr. Sacks, you asked me this question, I gave you this answer, and I was completely wrong. And then I went on for nine single-spaced pages documenting in detail the changes that had happened to me.

KRULWICH: What had happened was that, first, for years and years, Susan had no idea that she saw things differently from other kids. It wasn't until she was 20 and she was sitting in a lecture hall in college.

Dr. SUSAN BARRY: And I'm taking a neurophysiology course. And the professor mentions these experiments by Hubel and Wiesel with a cross-eyed kitten.

KRULWICH: Hubel and Weisel jointly won the Nobel Prize in 1981 for a number of famous experiments, one of which was they made very young kittens cross-eyed. And because they were cross-eyed at a critical time in their brain development, those kittens couldn't focus. So, says Dr. Sacks...

Dr. SACKS: If the eyes are not well-aligned then, you may never - the brain mechanism, the special binocular cells, which are needed for stereo vision, may not develop.

KRULWICH: Hubel and Wiesel's kittens never learned to see in stereo. And the same thing happened with cross-eyed monkeys, suggesting it's when you're a baby, that's when your brain learns binocular vision. If you don't learn then, the window in your brain closes and you may never learn.

And Susan's professor, he went further.

Dr. BARRY: He said that this change was irreversible and that this happened in people, too. And I was completely floored. First of all, I was cross-eyed, and could this be happening to me as well?

KRULWICH: It turned out that she hadn't been operated on until she was two years old. So during the critical period she was cross-eyed. And then when she tested herself, well, it turned out she was monocular.

Dr. BARRY: Just like Hubel and Wiesel's cats.

KRULWICH: Which means what, exactly? Like, if you were just looking at, I don't know, me holding a pencil...

Dr. BARRY: Right.

KRULWICH: ...in front of your eyes.

Dr. BARRY: Right.

KRULWICH: So there's a pencil between me and you.

Dr. BARRY: Right.

KRULWICH: As a monocular viewer, what are you seeing?

Dr. BARRY: I don't see any space - palpable space.

KRULWICH: I mean, is it a Robert-and-pencil unit, or is there Robert, space, and a pencil.

Dr. BARRY: No, it's a Robert and pencil unit.

KRULWICH: Huh. Still, she was able to drive. She played a mean game of tennis.

Dr. SACKS: She was, in fact, something of a monocular virtuoso.

KRULWICH: But after years and years, as she approached her 50th birthday, when she looked at distant objects they began to - what?

Dr. BARRY: Jitter.

KRULWICH: Jitter?

Dr. BARRY: Jitter.

KRULWICH: Playing tennis, for example. Her opponent on the other side of the court would appear to shift left, then shift right, then shift left...

Dr. BARRY: The jittering was due to the fact I was constantly switching between the two eyes, and the eyes were seeing a slightly different view of the world.

KRULWICH: So she went to the eye doctor.

Dr. THERESA RUGGIERO (Developmental Optometrist): I am Theresa Ruggiero, and I am a developmental optometrist.

KRULWICH: And Dr. Ruggiero said I have a way to train your brain so your eyes can work together. She gave Susan a new pair of glasses and a string. It was a five-foot-long string with beads attached.

Dr. RUGGIERO: What you're referring to is the Brach's String...

KRULWICH: Right. And she told Susan, I want you to attach this string to the wall and then pull the other end to the very tip of your nose. And on this string you're going to see a bunch of beads. What I want you to do is fix your gaze on each bead.

Dr. BARRY: So I had to learn to fixate both eyes at the same point, at the same time.

KRULWICH: And after three weeks, one morning she got into her car.

Dr. BARRY: And I glanced down at the steering wheel - I was sitting in the driver's seat - and the steering wheel was floating in front of the dashboard.

KRULWICH: What do you mean?

Dr. BARRY: It was in its own three-dimensional space. I had never had that type of perception before and I didn't believe it, cause I knew that this was impossible. I could not develop stereo vision, and so I drove home and tried to forget about it.

KRULWICH: And then?

Dr. BARRY: And then the next day I got up and I did the exercises and I got into the car and I went to adjust the rearview mirror and it was floating in front of the windshield.

KRULWICH: Somehow, the rearview mirror had popped into its own space.

Dr. SACKS: Consciously, for the first time in her life, after 50 years of being stereo blind, she had suddenly gained a sense.

KRULWICH: But brains that old shouldn't change so dramatically; all the textbooks said so. Which is why when Dr. Sacks heard her story, he said I want to visit you.

Dr. BARRY: Well, I was thrilled, I mean, I couldn't believe it. Oliver Sacks was coming to my house!

KRULWICH: He came with two eye specialists and some eye tests that contained hidden images - say, a fish that would only pop up if you could really see in stereo.

Dr. BARRY: And so he put this book and these glasses in front of me and he said what do you see? And I got all excited - wow! The fish! I would look at its mouth! It's coming out at you and all this sort of stuff! And he looked really happy.

Dr. SACKS: So, at that point, I was persuaded.

KRULWICH: But the question does remain, how did this happen? The doctors think that maybe when Susan was a baby, a few of her cells, the bare minimum, developed binocular vision, so she had the machinery.

Dr. BARRY: The machinery was there; it needed my two eyes to work together.

KRULWICH: And Dr. Ruggiero's glasses and beads, they got her eyes in sync, strengthened the signal to the cells in her brain and got them working again -or not. I mean, nobody really knows what happened here. What is now clear - and this is new - is that adult brains like Susan's can change. Even the Nobel Prize winner, David Hubel, he now says if you have a problem like Susan's and your doctor says to you, sorry, there is nothing I can do for you; you should've come to me as a baby, after meeting Susan, he said:

Dr. David Hubel (Nobel Prize Laureate, Physiology and Medicine): I think Sue's case makes it very clear, if an ophthalmologist or optometrist tells you this, you should find somebody else who's more open. And she obviously did, and it's a darn good thing that she did.

KRULWICH: And this is you talking like the Nobel Prize winner that you are?

Dr. HUBEL: I suppose you can't divest yourself of these things, I suppose.

KRULWICH: So, in the end, because she was so willing to try, and so willing to exercise, and so lucky in her choice of eye doctor, Susan Barry stepped into a world different from anything she could ever have imagined. That's what literally happened when, one day at lunchtime, she stepped out of her college building into a snowfall.

Dr. BARRY: And it was one of those late winter snows with big, thick snowflakes coming down very lazily, and I could see each snowflake in its own three-dimensional space, and there was space between each snowflake, and it was like this beautiful, three-dimensional dance, and I had this real sense of being within the snowfall.

Prior to that, before my therapy, if I looked at a snowfall, all the snowflakes fell in one plane, slightly in front of me, and I was not really part of the snowfall, I was looking into the snowfall. And now, I had the sense of being within the snowfall - in the midst of the snowfall - all these beautiful flakes just falling all around me, and I just was completely filled with a sense of joy.

I'd never seen anything like that. I completely forgot about lunch. I just stood there in the middle of the campus watching the snow.

KRULWICH: Robert Krulwich, NPR News in New York.

INSKEEP: You can learn more about seeing in stereo by looking at our flat, but very interesting website at npr.org.