

>> Welcome to our second season of Music and the Brain podcasts from the Library of Congress, I'm Steve Mencher. And I'm joined today by Dr. Richard Cytowic, a Professor of Neurology at the George Washington University Medical Center and founder of Capital Neurology, a private clinic in Washington, D.C. Now your book, Richard, has probably the most intriguing title I've heard lately. It's called Wednesday is Indigo Blue and the subtitle is Discovering the Brain of Synesthesia. So let's start by having me ask you what is synesthesia? And then whether the title is based on a specific case study of someone for whom Wednesday is indeed Indigo Blue?

>> Well synesthesia is pretty easy because everybody knows the word anesthesia meaning no sensation so synesthesia means joined sensation, indicating that some people are born with two or more of their senses coupled so that my voice, for instance, is not only something that they hear but something that they might see or taste or feel as a physical touch as well. And as children they're shocked to discover that other people are not like them.

>> And is there someone who you ran into in the course of researching this book who told you that Wednesday for them was Indigo Blue?

>> No. My coauthor and I, David Eagleman, we thought that was a great title because one of the most common types of synesthesia was seeing days of the weeks and months of the year as colored. And so actually on my Facebook page there's an incredible posting going on of no, it's not Indigo blue, it's sort of orangey with mauve speckles in there. No, it's beige. No, it's green, it's this, that and the other. So it's sort of, it's quite fun.

>> Great. Now in the book as I was reading it, you mentioned that there's been an explosion of interest in synesthesia in the past 10 years or maybe a little more and that there was a lot written about it at the turn of the century. But I'm wondering, why was there a long gap in between the time when there was a big interest in it in the teens and early in the century and then it was sort of rediscovered and why has interest reawakened?

>> It fell into oblivion I think largely because of behaviorism, which said that all subjective experience was taboo, so even memory, language and certainly consciousness were certainly off the table as respectable topics for scientific study. So when I became interested in this in 1979, and it happened by accident, people, they looked at me like I was insane and said stay away from this. This is too weird, too new age and will ruin your career. So it took me about 15 years, actually, to convince my colleagues that this was a real phenomenon and then a younger generation of neuroscientists came along. And so we now have researchers in 15 countries who are writing papers and doctrinal thesis and academic books on this.

>> Now there has been, as we've been talking about the subject of music and the brain, also a lot of focus on the fact that we can see stuff happening in the brain in ways that we couldn't before. Is that also hooked into why we can understand a little bit more about synesthesia?

>> Yes and no. The hardest no skeptics have always demanded pictures of the brain and they got them because you can show activation, let's say synesthetes see colors in response to spoken words and indeed you see the color area of the brain light up. But it was always possible to demonstrate synesthesia's reality by much simpler and less expensive means.

>> Again, those means seem to have been, in large part as I'm reading through, that the repetition, the fact that you could talk to someone and then a year later the same number would mean the same color to them. And if they were making it up or if it was an idea that was sort of occurring to them each time, there wouldn't be the same connections between say numbers and colors.

>> Right, that's just one method. Basically it's called psychophysics, which is sort of measuring people's responses in how they perceive. And so things like optical illusions, perceptual grouping. Let's say that I show you a matrix of twos hidden within a group of fives and tell you there's a hidden pattern, you and I would have to search for that. But for a synesthete who sees twos as differently colored from five, it will pop out and they'll have a search advantage and they'll say oh, there's a triangle, there's a square, whatever the hidden figure happens to be.

>> I see, ok. Now we're going to get to music in a minute because we do like to talk about music and the brain but I'd like to start with visual art because I noticed in the book you have a chat with David Hockney and he's someone who is a synesthete and his work represents and demonstrates this. What did you get from talking with him?

>> Well what first called my attention from the fact that David might be synesthetic was when he started painting for operas, he painted opera sets so everything before that was you know silent paintings. And all the critics, Art in America Magazine had a big spread, and all the critics said oh my God, this is so different, you know, wow, what a different direction for him to go in. And there were things that he said like The Tree Music intervals, [foreign language]. He said the music suggested a certain weight and a shape and a color. So I wrote to him and he wrote back, after about a four month gap, and said you know "Dear Dr. Cytowic, I have carried your letter around with me for months, wondering whether I should answer or not." It gives you a whole idea, you know, whether it would destroy the mystery of what he was doing. And so to cut to the chase, what music triggers for David, shape, weight, color and mass, that is the spaciousness of a color, sort of the mass of it, and for him it is the sequence, the melody rather than the key or the timbre of instruments or the actual notes that trigger the color.

>> So has he been feeling this sort of throughout his whole career but hasn't expressed it out loud?

>> Right, he didn't know that there was anything special about this. And that's a common feature that people say, oh, you mean there's a name for this? I didn't know. So they go from thinking that everybody does it until they say something off hand like oh that music is really pink, what

does it look like to you? And their friend will look at them like they're insane. And then they realize, oh, this is not something that everybody does.

>> I hear you know in what you're saying and also in the book you give such a wide range of the prevalence of this in the population. And sitting here today I'd like to get your sense of how many people, if we pass them on the street, if we pass 10 or 20 or 50 people, how many of them have something of this synesthesia?

>> This is hard to believe but one in 23 people have some kind of synesthesia. As I said, the most common form is sensing the days of the week as colored and that will stay constant for a lifetime. And then one in ninety people have another very common type of synesthesia which is proceeding letters and numbers or any kind of written grapheme, it's called, the written symbol, as colored.

>> And they have been sort of hiding this from the rest of their friends and neighbors and in their classes when they feel this? Or it hasn't been appropriate for them to bring this up?

>> Well there's two ways. One woman in her late 60's wrote to me and said oh, I was reading [inaudible] and he's got exactly the same kind of color letters that I do. And I always thought everybody did it but now I'm realizing that it's sort of unusual or the opposite of people feeling incredibly alone and isolated and that they are the only one who perceives the world as they do. So it's been a recurring motif over the past 30 years of people expressing this incredible relief to know that they are finally believed, that this is real, that it is scientifically studied and best of all that there are other people like them. They love to get together with one another. [laughter] And compare notes.

>> That's right.

>> At the medical center in Hanover, Germany they have a synesthesia cafe, which researchers are not allowed to it. It's only the synesthetes themselves. It's terrific fun.

>> That's great. Let's talk about some notable composers and performers and others who have experienced synesthesia. I know in the book you mention Franz Liszt, Rimsky Korsakov, Amy Beach, performers like Itzhak Perlman. I love the fact that Eddie Van Halen, Stevie Wonder might also be synesthetes. In studying these musicians

>> Well you mentioned Stevie Wonder,

>> Yeah.

>> It just shows that synesthesia is actually quit common in blind people.

>> That's fascinating. Now in looking in these artists and performers, have you noticed any commonalities or how, you know, what pops out at you?

>> What's common is that synesthesia is more prevalent in creative individuals so some of the musicians, the Jazz legend, Marian McPartland admits that at the age of 91 she never heard of the word synesthesia but she is dead certain that D Major is daffodil yellow and A is hot pink. [laughter]

>> And you've talked to her about this?

>> Actually I have not talked with her directly but a colleague of mine is actually researching now and writing a book about synesthetic musicians.

>> Oh fabulous. We'd be very eager to hear about that.

>> And you see this work, in the book, Wednesday is Indigo Blue, and the increased interest in it, has allowed people to come forth. Itzhak Perlman for years would never talk about it at Julliard and finally he opened up. And to him it's more of an inward experience than an external light show. But when he bows the G string of his Stradivarius, it's a deep forest green. The A is red. The next B is yellow. So people are finally more willing to talk about it and it doesn't seem as less odd.

>> One of the musicians or composers that people have talked about for years of course is Olivier Messiaen.

>> Oh yes.

>> And you mentioned in the book that he hears music and sees color back and forth. Can you tell me about that?

>> He's one of the minority of synesthesia which it is bidirectional so sight and sound goes both ways. And when he did the commission for the piece about Bryce Canyon, Utah, from the Canyon to the Stars, he said well the music just wrote itself, as my eye went up the canyon walls and that magnificently blue Stellar's Jay flew overhead. And there's a whole movement in that symphony called the orange red rocks. Messiaen invented his odd way of composing specifically to convey the color of sounds and his method is known as the modes of limited transposition which are the strange clusters of notes and they're not harmonies in the conventional sense, they're not even recognized chords, he says, "they sound like colors". And he has three kinds of colors, simple ones, red, green, blue. Others are pairs so blue violet, red orange and then the other, the third kind is an overall color that is flecked hemmed, speckled or studded with other kinds of opalescent colors in them.

>> Wow. At the start of one of your chapters that I particularly enjoyed you asked a number of key questions and I'm sure you'll answer some of these in the lecture that you're about to give in a about a half an hour. But let me throw them out and I'd like you to pick out some of the highlights of stuff you may be talking about. How can synesthesia help us understand the neurological basis of metaphor? What kinds of art does synesthesia inspire? And what might synesthesia tell us about creativity? You can start anywhere with those three but I think what's particularly

interesting to me as you filter your answers is that I'm curious about what does studying synesthesia tell us about everyone, whether or not they're synesthetes?

>> Well brains that work differently are not so strange after all and we can learn about them. Basically there's been a huge paradigm shift. When I started out 30 years ago, the orthodoxy said the brain is organized into modules so there was a language module, a vision module, a memory module and by definition they did not interact with one another, therefore making synesthesia impossible. And I think this is one of the reasons that they had to deny it because they had to protect the theory. Now of course it's totally different. We know that the brain is massively cross connected. And as to what's going on in synesthete's brain, it is increased activity in existing wiring rather than extra wiring causing short circuits. So synesthesia has caused a paradigm shift in two senses. I just said the scientific one but the other way is personal in showing us that everybody doesn't see the world the way you do and each brain uniquely filters the world into its own subjective experience. So it just tells us to be more attentive to the differences among people in the world. It really calls into question how objective is objectivity? Because it's filtered through an enormous subjectivity in all of us.

>> Now today you're going to be standing in front of the crowd and you're wearing this incredible, almost electric yellow sweater. Now do you think some of the synesthetes are going to come and have a particular connection with that color?

>> I think so, yes, they love colors. They describe them in exacting minute detail. When you do tests on the computer you know the windows color picker gives you 16.4 million choices and even then some of them say they can't find the exact match. And the reason for that, of course, is that the V4 area of their brain, which is the color area, is not being stimulated optically. It's being stimulated by other senses and so that's why synesthetes say that they see odd or weird or ugly colors that they wouldn't deliberately choose but you can't do anything about it because synesthesia is involuntary. It happens to you. You can't make it happen and you can't not make it happen.

>> So you've been studying this essentially for more than 30 years.

>> Yes.

>> And what's been your favorite thing that you've discovered or the most interesting person that you've talked to along the way?

>> Well it's hard to say because it is just such a fascinating topic. It's full of surprises. You never know what you will find out. And when you answer one question, 10 more appear. So I mean I could continue with this until I die, probably. My coauthor, David Eagleman, became interested in number forms, which is seeing numbers in space around your body. And he figured that it would take about a year to figure out the gene for this and he would move on to other things. Well that was about seven years ago. And speaking of the synesthesia gene, there are five groups that are hunting down the gene for this because it's very common

and the question is well why are one in 23 people walking around with a mutation for a trait that's pretty but apparently useless? It must be doing something of inapparent value in order for evolution to select for it so strongly. And we think that it's a gene for metaphor and creativity because what the gene is doing is hyperconnecting disparate different areas of the brain and seemingly unrelated things and that's the definition of metaphor, seeing the similar in the dissimilar. And to go back to artists, they use metaphor with ease, you know writers, painters, etcetera. And of course there's much more to creativity than an ease with metaphor but I think it's a starting point and we can turn, they're just being metaphoric, you know, no different than saying loud tie or sharp cheese. We can turn that on its head and say perhaps looking at the perceptual condition can give us a handle on the neurologic basis of metaphor, how the brain represents metaphor.

>> Great so in fact that sort of answers my question about why your work applies to everyone and what's important about it to all of us and why I'm sure you'll get a big and receptive crowd when you go upstairs in a few minutes to give your talk.

>> I'm looking forward to it. Thank you so much.

>> So thank you very much. I've been joined today by Richard Cytowic, a Professor of Neurology at George Washington University Medical Center. I'm Steve Mencher and this has been another one of our Music and the Brain podcasts from the Library of Congress. Thank you.

>> Thank you.