

>> Welcome to another Music and the Brain Podcast from the Library of Congress. I'm Steve Mencher and I'm talking today with Peter Janata, he's an Associate Professor at UC Davis in the Psychology Department and involved there in the Center for Mind and Brain, and I just sat through your wonderful talk upstairs in a fabulous room and the Library of Congress you must admit with the way they. [Peter Janata:] That's a remarkable room.

>> And the talk was great too, but you didn't there get to tell us anything about yourself, so that's where I want to start. Tell me about you and music and growing up.

>> Well, I took piano lessons as a kid, so I was classically trained and very much grew up in a household where my parents are great music lovers, but we only listened to classical music. So on Sunday's, you know, we'd hear Bach, the Bach Cantata Calendar, you know, it was great, but it really wasn't until I was maybe twelve or thirteen, that I started listening to pop music and, in fact, started doing so on the slide because I was afraid that my parents might be upset if they caught me listening to, you know, the radio, other stations on the radio. When they did find out, they assured me that it was fine for me to listen to whatever, you know, I wanted to; they really weren't trying to bias me, it's just that they only listened to classical music, but in that regard, I guess my pop music education was fairly stunted and something that I've been catching up with more in recent years. Starting at the age of fifteen or sixteen, I became very interested in The Beatles, Simon and Garfunkel, then became a great fan of the Grateful Dead; I listened, I know their music inside and out, and then by high school I quit taking piano lessons, but then I started playing music with other people and just trying to improvise, so largely in the folk or folk rocks or singer-songwriter type of veins and I do that to this day. I mean it's so pleasing to sit around with a group of people and make music together and just see what comes out of it, you know, it doesn't always sound good, but when it does those are magical moments.

>> Let me start back with the classical music, because there used to be sort of a theory that it was great for young students, especially to have a sort of a grounding or whatever in classical music; that was where you were going to get a sense of what western harmony was about, where why II chord went to a V chord, in a different way obviously pop, the II also goes to a V, but do you see something that's valuable in teaching young kids "classical music" or do you think let them go for the things that they enjoy that they're hearing on the radio that they're hearing in the streets it doesn't really matter what they hear first as long as it's music?

>> Yeah, I think more the latter, I mean, so watching my own kids growing up and how they engaged with music, I mean it's having them play things that really captivate them that they want to play, I think they make better progress that way, with that said, I mean one part of my music training that I consider extremely valuable and, in fact, it really shaped why I'm doing the science I'm doing now, is that my piano teacher aside from the private lesson, also had us in group theory lessons once a week where we learned a lot of the basics of harmony and music theory and

those things, such that when I went to college I was able to test out of first year theory and it was really having that understanding, you know, those were the first glimpses of, you know, music is such a beautiful thing and trying to, you know, seeing that there's this structure that underlies it that enables it to be glorious. And, I don't think the one gets that sense of understanding if you're necessarily, certainly not explicitly, if you're just working out your, you know, your favorite song.

>> And also I had a feeling, and maybe this is true or not, that in being taught the rules and in learning the rules and in knowing rules, and I find this in lots of different parts of my life, I'm someone who loves to break the rules, but in breaking them I always enjoy breaking them more when I know them. So, I spent, you know, two or three years or however many years, they standup in front of the room and tell you; you will never move in parallel fourths, you will never move parallel fifths, you are not allowed to do x, y, and z when you're harmonizing. And my gosh, as soon as I could start composing and writing things, I would break every single rule, but the fact that I knew what I was listening against because there was something that was not exactly comfortable when I broke the rules it kind of helped my understand what I was listening to.

>> Yeah, I think a lot of that is cultural convention. Right? I mean, I think you have a hard time telling a bunch of metal heads that moving around in parallel fifths of electric guitars is about bad thing to do, you know, because it captivates the audience and I think that different periods in time, certainly across musical styles, it's a very culturally dependent thing that determines what's right and what's wrong, you know, what are those conventions.

>> Sure, absolutely. Before we get to some of your current research I did take a look and see that one of the things that you had studied as you were in school was how birds learn to sing, and since I had you here I want to make sure to ask you, how do birds learn to sing? And, why should we be studying them?

>> Juvenile song birds, by the time they're twenty days of age have already memorized their father's song or a tutor's song, right, and then in isolation they're able to basically start babbling the equivalent of bird babble, and gradually refine their own song until it becomes a very close match of the tutor's song. So, they're doing this entirely from memory, a memory that's actually formed very, very quickly. So, it's an excellent model system for how do we learn auditory sequences. How do we engage perceptual and motor systems in order to refine vocal output, so obviously in humans we're talking about speech and in birds we're talking about, you know, their whistles and the notes and syllables they produce.

>> What's the difference though to help me understand between learning something from a tutor say, and if someone were to tell me I would have also nodded my head and said, of course, they say: "Oh, this is hard wired into the bird, the bird is born and on day twenty as it starts to whistle, it simply whistles the song that genetically is imprinted." Is there such a thing or what's the difference between learning and the genetics?

>> Yeah, well there's a lot of variation across species, and there's also distinctions that are made between calls and songs where calls are vocalizations that are pretty much hardwired. But, then song is learned and I think the best evidence for that are those species who can learn multiple different songs and then you have species such as mockingbirds, nightingales who can learn new auditory material, they can learn to mimic their sounds or they can learn new songs essentially on a single trial basis in some cases. So, that sort of flexibility I think is good evidence for a learning process rather than something that's hardwired.

>> That's fascinating. Alright, let's jump into some of the stuff that you've been doing the last few years, cause that's really great. There's two areas that I really want to talk about; one that has to do with music and it's connection to memories and emotions, and then I'd like to talk a little bit about your current research which involves music evoking spiritual and religious experiences or being somehow connected to those experiences. Let's start with the music evoked autobiographical memories and you've studied them. Can you define what that would mean in laymen's terms?

>> Yeah, I mean I view it as that experience when we're driving down the road in the car, a song comes on the radio, you know, that we haven't heard in a longtime and all of a sudden we're experiencing, you know, the memory of being at a party twenty years ago, you know, and the people who were there and, you know, perhaps if we fell in love or something, you know, those types of things.

>> Okay. And, how is that different, say I know in talk you brought up smells a little bit and of course there's Proust and his famous cookie that he smelled and it brought back a whole world of his childhood, so how would it be different having a cookie or a mandolin that evoked your childhood in a song that evoked a certain time in your adolescence or your growing up?

>> Well, I think that aside from the sensory input then the experience is actually fairly common between the two, and in fact, I showed one slide during my talk of results from a study which compared familiarity for smells and familiarity from music, and show that there's certain parts of the brain that respond more, and it's the same region that responds to either one of those modalities. So, that's very suggestive of a tight coupling there with the autobiographical memory systems.

>> I was thinking when I knew I would be talking to you about this, about things like that in my own childhood, so there I am, I'm in sixth grade or something and this song about its a "Hundred Pounds of Clay" comes on the radio that makes my life worth living. I can picture the transistor radio, I can picture having the radio under my pillow and I can swear to you that if this song came on the radio today, my body would start to change, I would almost start to put myself into that space where I was at the age of eight years old, and you must have had lots of these experiences when you were doing this research yourself and with your research subjects.

>> Yeah, yeah, exactly, I mean, that's the remarkable thing about it, it's so compelling, you know, so I think it shows how music is actually a great way of looking at the structure of these memories and, you know, I think it's going to reveal potentially with tremendous detail about how our brain organizes memories, as well as that experiential state that you're describing, that you just saw this in the field that you're there it's a very compelling sort of mental space to be in.

>> Right, now you're peering into the brains of your subjects with functional magnetic resonance while you're playing the music and then you have a questionnaire afterwards. Tell us a little bit about the process there.

>> We take individuals who that we, we know that we can elicit memories with brief song excerpts and then their lying in the scanner, we present a song, some are familiar some aren't familiar, so after each song they tell us, you know, how familiar was it, how memory evoking was it, how pleasing was it. And, so we use those subjective responses to setup our statistical model to analyze the data and be able to tease apart what brain regions are responding to those changes and the felt emotion or the strength of the memory. So, we do that and then the other thing that I do is that I take a model of how music moves around within the major and minor keys; so we can describe that in great detail and then use that in the statistical model to analyze the brain data, so that I can identify regions that are actually tracking the music, the tonal structure of the music, you know, the melodies the chord progressions, and then look at that activity as a function whether it's evoking memories or not, and that's where I think that some of the, kind of, the detailed aspects of how the memories are being structured in the brain how we're going to be able to get at that.

>> So, your, tell me if I'm getting this, you're sort of watching the brain listening?

>> Exactly, yeah.

>> And the way and the reason that you're watching the brain listening is because this is a really cool way, this is like Grand Central Station or something, there's trains coming and going, some have to do with memories, some have to do with the specific of music, some have to do with sense memories and all of this you're kind of trying to watch to understand more about each of those individual things.

>> That's, that's right. It's a huge web of associations, and if you think about, you know, your train of thought and how you can think about this, and that triggers some other thought or some other memory; our brains just form all these associations. So, what the music is doing its kindling those associations and so by virtue of being able to examine the structure of the music and how our brains are listening to the music as you said, that then let's us get all those various associations.

>> That's fabulous. Now, you're also doing this in a separate set of studies with religion and spirituality, and again this must still also be a very deep place, not literally deep cause I know you describe where in

the brain this was, but a place where music and spirituality come together in the brain; I'm thinking of someone sitting in a church pew it doesn't have to that, it could be someone dancing in a trance, but let them sit for a second in a church pew listening to a hymn or something, and again we have the element of music and memory and also then spirituality and religion. What are you looking for in those studies?

>> Obviously, spiritual states are, you know, difficult in part to define and then looking for those in the brain is a bit tricky so and there are different ways that we can experience those. The way I'm thinking about it is, one way of experiencing those is very closely related to these music evoked autobiographical memories, I mean, you're mentioning sitting in the church, well that's a very social context straight. We may have strong memories of being in church and the people who were there and singing together, and so those types of activities, those types of memories will tend to activate these parts of the brain I was describing as being important for experiencing memories and emotions with the music. So, my guess is that that the strong spiritual states, some of those states will show a pattern that is actually quite similar to the music of autobiographical memories. Another way is, and you mentioned that the singing and really getting into the music feeling very integrated with the music, I think that comes about through how two different brain networks are being coupled basically one brain network that we use for paying attention to our external environments, and the other brain network which includes these medial prefrontal areas as being important for paying attention to ourselves and music and engaging with music, particularly when we're singing or dancing, I think it unifies the activity within those two networks. So, that's the kind of stuff we're looking for. I can't say that we've found that yet. It's kind of like how will you know with the, you know, know it when, you know, when you see it, but that's how I'm thinking about it.

>> Wow, I wish we had a lot more time to talk about these things, but we don't we just have a few more minutes and I saw that a couple of years ago you, at a seminar, you held a workshop called Music Flow and the Groove and I wonder if you could quickly describe the workshop, but only if you promise to call me the next time you offer it. What went on there?

>> That workshop was a kind of a hands on experience to try to get the lay public into the science sphere, so we had a number of experiential activities, we actually were recording people's brainwaves as they were, you know, moving along with music that they find personally compelling, right? So, that's the most conducive to getting a person into that sort of state. So, it was kind of a fun way of exposing the public to the science side of things.

>> Well, I look forward to coming to the next time you offer that workshop.

>> Ah hum, you're very welcome.

>> Because, I want to be there.

>> Yeah.

>> Thanks. I've been talking to Peter Janata as an Associate Professor at UC Davis in the Psychology Department and at the Center for Mind and Brain there. I'm Steve Mencher and this has been another one of our Music and the Brain Podcasts here at the Library of Congress. Thanks a lot Peter.

>> Thank you very much.