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i2eye WITH NEUROSCIENTIST DANIEL LEVITIN



A ROCK 'N' ROLL STATE OF MIND

By Graeme Stemp-Morlock



Neuroscientist Daniel Levitin spends his days exploring how our brains process music as an associate professor at McGill University and head of the Laboratory for Music Perception, Cognition, and Expertise. His music research is a natural extension from his days as a highly acclaimed music producer for the likes of Stevie Wonder and The Grateful Dead. In 1990, Levitin left the recording studio for the research lab, changing his focus from creating music to understanding its neural substrates (the set of brain structures that underlies a specific behavior). His 2006 best-selling book This

Is Your Brain on Music: The Science of a Human Obsession explains the complex relationship between neuroscience and music. InnovationCanada.ca asked Levitin to share his unique perspective as a music maker and researcher.

InnovationCanada.ca (IC): What made you decide to stop producing records to study the brain?

Daniel Levitin (DL): I noticed the record industry was deteriorating — it was becoming more difficult for talented artists to make headway. The industry became more interested in short-term profits than long-term nurturing of talent.

At the same time, I started teaching a course in record production at Stanford because I wanted to give something back to the next generation. We had interesting guest lecturers such as Sandy Pearlman who produced an album by The Clash and managed Black Sabbath, Bernie Taupin, who is the lyricist for Elton John, and Robert Lamm, a founding member of the pop group Chicago. In teaching the course, I realized I liked being around smart people at universities, and I thought that would be a nice way to spend my time.

IC: How does music affect the brain?

DL: There's a particular part of the brain that responds to pleasurable things like winning a lot of money, taking cocaine, or having an orgasm. That's been known for years, but with my colleague from Stanford Medical School, Vinod Menon, I found that the same region of the brain responds to pleasurable music. People tell you that they like music, but to actually see music activating this pleasure centre in a brain image was surprising. We like to think of it as the sex, drugs, and rock 'n' roll centre of the brain.

IC: In your book, you write that the only pleasing sounds that could come from an accordion would be one burning in a bonfire. How do we determine what is "pleasurable music?"

DL: [laughs] I actually do like accordions. Some people really don't like bagpipes, whereas some people really like mandolin. These things are cultural or can be an early association, like a favourite song that featured that instrument. Or, you were at summer camp while an accordion was playing and the kid next to you was punching you, so you developed a negative association.

Some of it is influenced by the physiology of the ear. The pinna, the fleshy part of the ear on the outside of the head, filters sound similar to the way that sunglasses filter light, letting in more of some wavelengths than others. That can set up a case where the accordion physically sounds different to you than me because of the filtering. So, it may be pleasant to one of us and unpleasant to another.

IC: Does personal taste play a role?

DL: Why is it that some people like spicy food and some don't? There are these individual differences for preference all around the world. We haven't figured out the neuroscience of



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aesthetic judgment yet, but it's something people are working on.

IC: Is there a scientific reason why we get songs stuck in our heads?

DL: It's been described as a cognitive itch and the way you scratch it is by having your brain play it over and over again. And, it's partly mediated by neurochemical changes in your brain, meaning if you are feeling especially anxious or tense or if you've taken certain medications, it's going to get worse. On the contrary, some medications can improve the condition. We know this because some people have songs stuck in their head so bad that it interferes with their ability to sleep or work. There's a class of drugs that will relax the neural circuit and reduce the likelihood that the song will keep playing in your head.

IC: You emphasize using actual music — not abstract electronic sounds — in your studies. Is rap music by Busta Rhymes better than classical Bach for your research purposes?

DL: Part of the challenge in designing a rigorous experiment is ensuring that each subject has something equivalent. In the old way of thinking, you played everybody the same piece of music, but if you hate classical music and I make you sit for an hour and answer difficult questions about music while listening to Beethoven, I may not be getting meaningful answers out of the experiment. The newer way of thinking is that we need to be flexible about equivalence across subjects. That doesn't mean a loss of rigour, it means that you might have an experiment where everyone brings in their own music and each subject serves as their own control. So, the experiment may steer more to [rapper] Ludacris than [virtuoso pianist/composer] Liszt depending on who your subject is.

IC: What do you think the next five years hold for music brain research?

DL: I'm not sure about the next five years, but I think in our lifetimes we are going to see a better understanding of the relationship between genes, brain development, and cognition. We are going to see a better understanding of what the components of music are and how they are represented in the brain.

If I were a betting man, I'd say a disproportionately large amount of these results are going to come from Canada because Canadians have been at the forefront of this work for the last quarter century, longer than anyone else. Canada has a very rich history of real innovation in the neuroscience of music, and it's nice to be part of that.

Watch a video of Daniel Levitin and David Byrne from *SEED magazine*.

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